









# PHYTOLOGIA

*Designed to expedite botanical publication*

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Vol. 41

December 1978

No. 1

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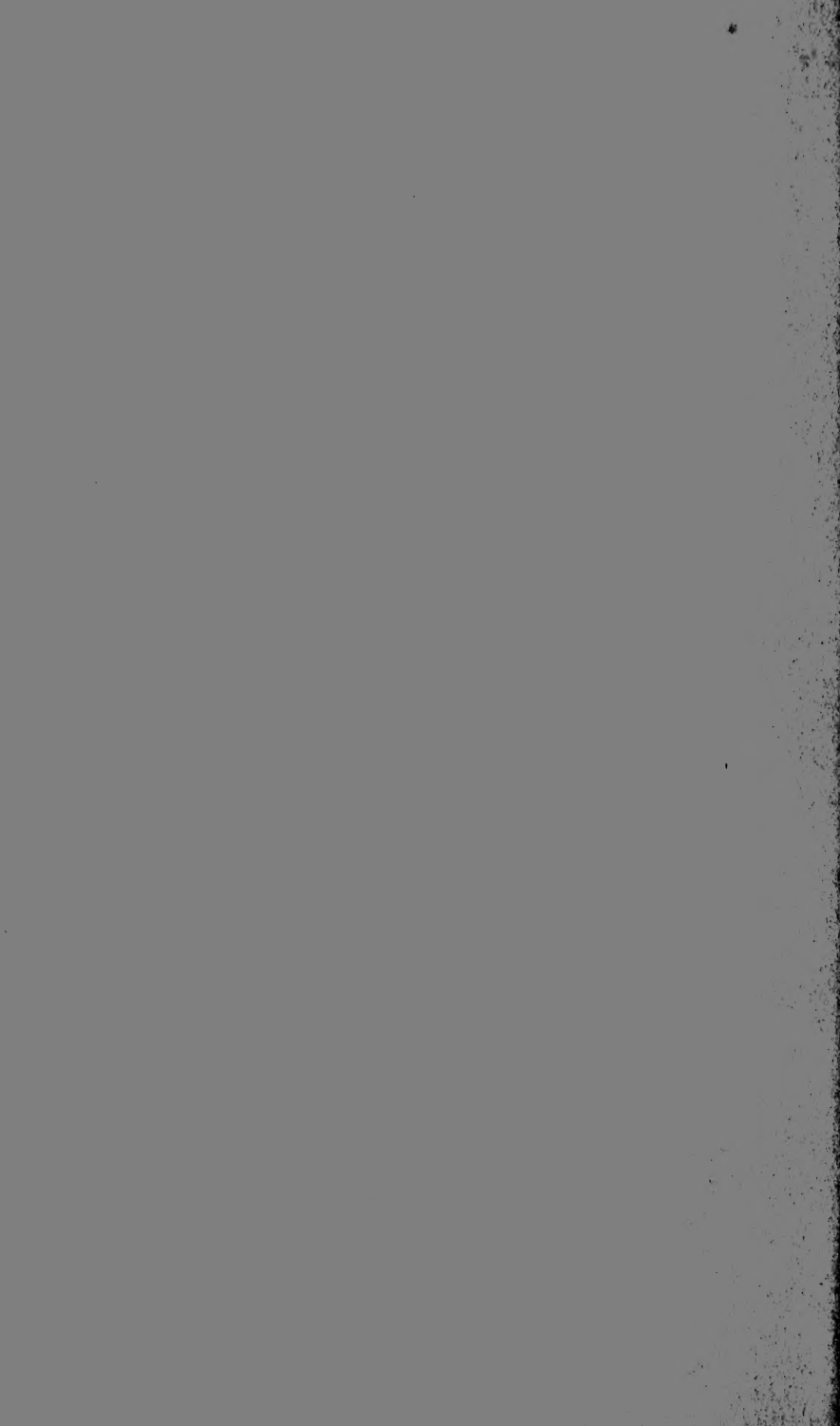
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Published by Harold N. Moldenke and Alma L. Moldenke

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

Price of this number \$2.00; per volume \$10.00 in advance or \$11.00 after close of the volume; \$2.00 extra to all foreign addresses; 512 pages constitute a full volume; claims for numbers lost in the mails must be made immediately after receipt of the next following number.





CERTAMEN MELASTOMATACEIS XXIX.

John J. Wurdack

U. S. National Herbarium, Smithsonian Institution

*CHAETOLEPIS PERIJENSIS* Wurdack var. *GLANDULOSA* Wurdack, var. nov.

*Hypanthiis modice pilis laevibus glanduliferis 0.4-0.6 mm longis setulosis differt.*

Type Collection: S. S. Tillett & K. W. Hönic 747-946 (holotype US 2847721), collected in open areas on rocks and at cliff bases of Cerro "Laminado" ca 5 km north of Buena Vista, headwaters of Río Apón, 10° 20' 23" N, 72° 54' 14" W, Sierra de Perijá, Serranía de Valledupar, Distrito Perijá, Estado Zulia, Venezuela, elev. 3300-3650 m, 9-10 July 1974. "Shrub to 3 dm tall, very infrequent to locally frequent. Stems medium tan flushed red toward tips; leaves matte, medium green above, light green beneath. Calyx flushed red-orange; corolla in bud red without on exposed portion, remainder and within matte deep yellow; fruit gray-tan. Also seen along ridge above Campamento Frontera V ca 10 km to north."

The typical variety, still known only from the Colombian side of the Sierra Perijá at 3000-3300 m, has hypanthia merely granulose furfuraceous; no other significant differences vegetatively or florally are apparent. The species was included in the Flora de Venezuela, being known in Colombia as close as 1 km from the Venezuelan border.

*MICONIA SUBSPICATA* Wurdack, sp. nov.

Sect. Miconia. M. gracili Triana affinis, foliis paulo plinervatis floribus subsessilibus minoribus petalis extus sparse glanduloso-setulosis differt.

Ramuli teretes primum sicut petioli laminarum venae primariae subtus inflorescentia hypanthiaque sparsiuscule pilis subamorpho-stellulatis 0.05-0.1 mm latis demum deciduis obsiti; ramulorum linea interpeticularis non evoluta. Petioli 0.5-1.5(-2) cm longi; lamina (6-)8-13 X (2-)3-6 cm elliptica apice gradatim per 0.5-1 cm hebeti-acuminato basi acuta, membranacea et essentialiter integra eciliata, ubique in superficie glabra, breviter (0.5-1 cm) 3-plinervata vel pseudoplinervata nervis secundariis principalibus 5-7 mm inter se distantibus nervulis subtus planis laxe reticulatis areolis 2-3 mm latis. Inflorescentia 4-11 cm longa et subspicata, floribus in ramis primariis ca 1-1.5 mm longis plerumque ternis; flores 5-meri, pedicellis obscuris ca 0.3 mm longis, bracteolis 0.2-0.3 mm longis subulatis caducis. Hypanthium (ad torum) 2 mm longum; calyx ca 0.15 mm longus et vix (0.05 mm) lobulatus, dentibus exterioribus minutis paullulo (0.05 mm) eminentibus. Petala 2.4-2.7 X 1-1.1 mm obovato-oblonga extus minute granulosa et centraliter basim versus sparse glanduloso-setulosa (0.1-0.15 mm). Stamina paulo dimorphica glabra;

filamenta 3.6-3.8 mm longa; antherarum thecae 3-3.1 vel 2.5 X 0.3 X 0.3 mm oblongo-subulatae, poro 0.1 mm diam. ventraliter (stamina maiora) vel dorsaliter (stamina minora) inclinato; connectivum non prolongatum ad basim ventraliter bilobulatum dorsaliter inerme. Stigma expansum 0.4-0.5 mm diam.; stylus 7.5 X 0.25 mm glaber; ovarium 3-loculare et 1/2 inferum apice minute granuloso.

Type Collection: M. T. Madison, T. C. Plowman, & L. Besse 5313 (holotype US 2847798; isotype SEL), collected in wet tropical forest near Limoncocha, Prov. Napo, Ecuador, elev. 240 m, 16 June 1978. "Shrub 2.5 m tall. Leaves shiny green above, dull below. Inflorescence rachis and calyx yellow-green; petals and filaments white; anthers cream."

Paratypes (all Ecuador): Napo: Grubb, Lloyd, Pennington, & Whitmore 1550 (K, NY, US), from Shingupino Forest between Ríos Napo and Tena 8 km southeast of Tena, elev. 450 m, 5/9/1960 ("Understory treelet to 4 m. Fruiting spikes erect, coral pink."); Holm-Nielsen & Jeppesen 862 (AAU, US), from primary rain forest at Río Suno 3 km west of Río Napo, 77° 10' W, 0° 42' S, elev. 400 m, 22 June 1968 ("Bushes. Fruits red."). Pastaza: Holm-Nielsen & Jeppesen 950 (AAU, US), from primary rain forest on southern border of Río Napo 2 km west of Yuralpa, 77° 21' W, 0° 55' S, elev. 440 m ("Bush in light places. Fruits red").

Miconia gracilis has basally nerved leaf blades, more evolved primary inflorescence branches, flowers on pedicels 2-3 mm long, hypanthium ca 2.8 mm long, triangular calyx lobes 0.7 mm long, and petals externally merely granulose. Miconia cazaletii Wurdack and M. smaragdina Naud., both with well-branched inflorescences, seem more distantly related. Because of the subracemiform inflorescences, M. subspicata would perhaps key to near M. tenensis Markgraf and M. triplinervis R. & P., both of which do not otherwise seem closely related in pubescence or flowers.

MICONIA LAXA Wurdack, sp. nov.

Sect. Amblyarrhena. M. lividae Triana affinis, ramulis novellis laminarum subtus venis primariis petiolisque modice furfuraceis calycis lobis petalisque brevioribus differt.

Ramuli primum obscure quadrangulati demum teretes sicut laminarum subtus venae primariae petiolique modice pilis 0.1-0.2 mm longis subclavatis induti demum glabrati. Petioli liberi 0.2-0.3 cm longi; lamina 6-9 X 1-2 cm lanceato-oblonga apice gradatim 1-1.5 cm hebeti-acuminato basi acuta decurrenti, firme membranacea et integra, distanter (2-3 mm) ciliolata (ciliis 0.2-0.3 mm longis), ubique venis primariis exceptis glabra, 0.5-1 cm 3-plinervata nervis secundariis 2-3 mm inter se distantibus nervulis subtus planis areolis ca 0.7 mm latis. Panicula 7-10 cm longa laxa submultiflora; flores 5-meri, pedicellis 1-2 mm longis et 0.2-0.3 mm infra hypanthium articulatis, bracteolis caducis non visis. Hypanthium (ad torum) ca 1.8 mm longum glabrum; calycis tubus 0.1 mm altus, lobis interioribus 0.2 mm altis remotis, dentibus exterioribus minutis inframarginalibus. Petala 1.3-1.4 X 1.3-1.4 mm suborbicularia glabra. Stamina iso-

*morphica glabra*; filamenta 1.8-1.9 mm longa; antherarum thecae 1.8-1.9 X 0.35 X 0.4 mm oblongae, poro 0.15 mm diam. dorsaliter inclinato, connectivo nec prolongato nec appendiculato. Stigma paullulo expansum 0.3 mm diam.; stylus 4.7 X 0.2 mm glaber in ovarii cono ca 0.3 mm immersus; ovarium 5-loculare et ca 1/3 inferum glabrum.

Type Collection: Benkt Sparre 18735 (holotype S), collected in cloud forest near Km 39-41 of Cuenca-General Plaza (Limón) road, Prov. Morona-Santiago, Ecuador, elev. ca 2300 m, 19 Sept. 1967.

*Miconia livida*, known from Amazonian Ecuador, Peru, and Bolivia, is vegetatively glabrous, with furfuraceous calyx lobes 0.5 mm long and petals 2.4-2.6 mm long. The glabrous *M. pergamentacea* Cogn. has somewhat smaller flowers, stamen connectives bilobulate-prolonged ventrally, and ovaries 3-celled.

MICONIA MACBRYDEANA Wurdack, sp. nov.

Sect. Amblyarrhena. *M. sepositae* Wurdack affinis, ramulorum foliorumque trichomatibus essentialiter sessilibus floribus paullulo minoribus ovarii cono brevior differt.

Ramuli primum obtuse sulcato-quadrangulati demum teretes sicut folia novella inflorescentiaque pilis stellatis 0.6-0.8 mm diam. sessilibus vel subsessilibus (stipite ca 0.1-0.2 mm longo) modice puberulis demum (inflorescentiis et foliorum subtus venis primariis exceptis) glabrati. Petioli 2.5-3 cm longi; lamina 21-25 X 8.5-11 cm elliptica apice gradatim per 2-2.5 cm acuminato basi acuta, firme membranacea et ciliolato-serrulata, breviter (0.7-1 cm) 5-plinervata nervis secundariis principalibus ca 4-5 mm inter se distantibus nervulis subtus planis obscuris areolis ca 1.5-2 mm latis. Panicula ca 15 cm longa submultiflora; flores 5-meri subsessiles (pedicellis crassis 0.2-0.5 mm longis), bracteolis 4.5-6 X 2-3.5 mm obovato-ellipticis ad anthesim deciduis extus sicut hypanthiis sparse stellulato-puberulis. Hypanthium (ad torum) 2.7 mm longum; calycis tubus 1.3 mm longus, lobis interioribus 1-1.1 mm longis oblongo-ovatis (apice rotundato) sparse stellulato-ciliolatis, dentibus exterioribus minutis inframarginalibus stellulato-puberulis; torus intus glaber. Petala 6-6.6 X 2.3-2.5 mm obovato-oblonga glabra. Stamina isomorphica glabra; filamenta 3.5-3.7 mm longa; antherarum thecae 2.6-2.9 X 0.5 X 0.6 mm anguste oblongae poro ca 0.15 mm diam. ventraliter inclinato, connectivo nec prolongato nec appendiculato. Stigma non expansum; stylus 4-4.7 X 0.4 mm glaber vel basim versus sparsissime stellulato-puberulus; ovarium 3-loculare et fere omnino inferum (cono ca 0.2 mm alto) glabrum.

Type Collection: Bruce MacBryde 983 (holotype US 2828303), collected in cloud forest overlooking Río Zamora at headwaters of Río Piuntza, NW range of Cordillera Condor, Prov. Morona-Santiago, Ecuador, elev. 1850 m, 5 Jan. 1972. "Shrub to 3 m; petals white; anthers and stigma violet."

*Miconia seposita* has the stellate cauline and foliar hairs stipitate 0.5-1.5 mm, all floral parts ca 1/4 larger, and a truncate-conic ovary cone 0.6-0.8 mm high. Cuatrecasas 15656

(La Laguna, headwaters of Río Sanjuniquín, Valle, elev. 1250-1400 m), with mature flower buds, seems to represent a Colombian record for M. seposita. To obviate any allegations of homonymy with M. macbridei Gleason, the adjectival epithet, commemorating both Bruce and Olga MacBryde, has been used for the Condor endemic.

MICONIA BENOISTII Wurdack, sp. nov.

Sect. Amblyarrhena. M. papillosae (Desr.) Naud. affinis, foliorum laminis supra essentialiter glabris subtus in venis primariis sicut ramulis inflorescentisque sparse pilis stellulatis vix 0.1 mm longis caducis indutis floribus minoribus differt.

Ramuli primum obtuse quadrangulati demum teretes sicut petioli (apicem versus) inflorescentiaque sparse caduceque setulosi pilis ca 1 mm longis paulo asperis et sicut foliorum subtus venae primariae inflorescentiae hypanthiaque sparse pilis stellulatis caducis vix 0.1 mm longis puberuli; nodi incrassati circum petiolorum bases ca 0.5 mm elevato-tumidi linea interpetiolarum gracili evoluta. Petioli (1-)1.5-2.5 cm longi; lamina (4-)6-9 X (2-)3-4.5 cm anguste ovata apice acuto basi paulo (0.3-0.5 cm) cordulata, firmę membranacea et minute serrulata, 0.3-0.5 mm appresso-ciliolata, supra paulo rugulosa et glabra vel sparsissime caduceque strigulosa (pilis 0.1-0.2 mm longis), subtus in venis primariis secundariisque sparse setulosa pilis laevibus ca 0.5(-1) mm longis, 5-nervata nervis secundariis ca 3 mm inter se distantibus nervulis subtus planis obscuris areolis ca 1 mm latis. Panicula 4-7 cm longa submultiflora; flores 5(-6)-meri, pedicellis 0.8-1 mm longis, bracteolis 0.8-1 X 0.1-0.2 mm ante anthesim deciduis. Hypanthium (ad torum) 2 mm longum sparsiuscule setulosum pilis laevibus 0.2-0.3 mm longis; calycis tubus 0.3-0.4 mm longus, lobis interioribus hebeti-ovatis 0.6-0.8 mm longis, dentibus exterioribus crassis ca 0.1-0.2 mm eminentibus; torus intus modice 0.1-0.2 mm glanduloso-puberulus. Petala 2.1-2.2 X 2.2-2.3 mm suborbicularia modice granulosa. Stamina isomorphica glabra; filamenta 2 mm longa; antherarum thecae 1.4-1.6 X 0.45 X 0.5 mm oblongae, poro 0.1 mm diam. paullulo ventraliter inclinato; connectivum nec prolongatum nec appendiculatum. Stigma expansum 0.8 mm diam.; stylus 6 X 0.3-0.5 mm modice glanduloso-puberulus in ovario cono 0.2 mm immersus; ovarium 4-loculare et ca 1/2 inferum, cono 0.6 mm alto modice glanduloso-puberulo.

Type Collection: R. Benoist 2504 (holotype P), collected at "base du Pichincha," Prov. Pichincha, Ecuador, 8 May 1930. "Arbuste à fl. blanches."

Miconia papillosa has the branchlets, petioles, primary leaf veins beneath, and inflorescences densely setulose with pinoid hairs mostly 0.2-0.6 mm long, leaf blades above moderately setuliferous-bullate, hypanthia ca 3 mm long, and anther thecae 2.1-2.6 mm long. Miconia pichinchensis Benth. has dendritic-stellulate hairs moderately on the branchlets, petioles, and inflorescences, somewhat larger hypanthia, interior calyx lobes

only 0.1-0.3 mm long, and the torus glabrous within. The possibility of hybrid origin for M. benoistii has been considered; however, part of the morphologic deviation (branchlet nodes, small flowers) is in a somewhat different direction than either of the two suggested relatives. The flowers in M. benoistii are predominantly 5-merous (perhaps 30% 6-merous).

MICONIA VESCA Wurdack, sp. nov.

Sect. Amblyarrhena. In systemate Cogniauxii a M. asclepiadea Triana et M. cruenta Triana foliis minoribus subtus in venis primariis sicut ramulis dense pilis laevibus gracilibus indutis differt.

Ramuli teretes sicut foliorum subtus costae petiolique dense pilis laevibus gracilibus 1-1.5 mm longis setosi et sicut venae secundariae inflorescentia hypanthiaque modice pilis stellulatis ca 0.1 mm longis induti. Folia subsessilia (petiolis usque 0.3 cm longis) in quoque pari non vel paullulo dimorphica; lamina (2-)3-4.5 X (1.3-)1.7-2.6 cm anguste ovata apice hebeti-acuto basi 0.2-0.5 cm cordata, firme membranacea et essentialiter integra, distanter ciliolata, supra primum paullulo (0.05 mm) sparseque aspera demum laevis, subtus in venis secundariis tertiariisque sparse vel sparsissime pilis laevibus 0.5-1 mm longis setulosa in superficie glabra, 5(-sub-7)-nervata nervis secundariis ca 2-3 mm inter se distantibus nervulis subtus planis areolis ca 0.7-1 mm latis. Panicula 1-2.5 cm longa pauciflora; flores 5-meri, pedicellis ca 0.5 mm longis crassis, bracteolis 0.5-0.7 X 0.2 mm persistentibus. Hypanthium (ad torum) ca 2.3 mm longum sparsiuscule pilis laevibus gracilibus ca 0.5 mm longis setosum; calycis tubus ca 0.2 mm longus, lobis interioribus ca 0.5 mm longis obtusis, dentibus exterioribus crassis lobos interiores aequantibus. Petala plus quam 1.4 X 1.2 mm granulosa apice rotundato. Stamina dimorphica glabra; antherarum thecae 1.5 X 0.45 X 0.4 mm oblongae exappendiculatae poro minuto terminali. Stigma paulo expansum 0.35 mm diam.; stylus plus quam 2.5 mm longus 0.25 mm diam. basim versus sparsissime puberulus; ovarium 3-loculare et 4/5 inferum glabrum.

Type Collection: J. A. Steyermark 53582 (holotype F 1208015; isotypes NY, US), collected in moist forest at Arenillas along Río Tintas, Prov. Morona-Santiago, Ecuador, elev. 2195 m, 13 July 1943. "Shrub 5 ft. tall; hairs on stems and nerves on lower leaf surface buff-brown; calyx pale green; petals white."

Miconia asclepiadea is glabrous and with leaf blades mostly 9-20 X 5-8 cm, as well as larger flowers; M. cruenta (syn.: M. neurocarpa) has (ex descr. and photo) fine appressed cauline pubescence and much larger flowers with strongly ridged merely stellulate-puberulent hypanthia and petals externally densely stellulate-lepidote-puberulent. Miconia vesca is somewhat similar to M. pichinchensis Benth., which has dendritic-stellulate cauline hairs to 0.3 mm long, less development of smooth vegetative hairs, and a 5-celled 1/3-1/2-inferior ovary. Flowers at anthesis are lacking in Steyermark 53582, the petal and stylar

dimensions from mature buds surely too small.

*MICONIA LONGISETOSA* Wurdack, sp. nov.

Sect. *Chaenopleura*. *M. ascendenti* Wurdack affinis, ramulorum pilis longioribus inflorescentiae pilis eglandulosis antherarum thecis maioribus connectivis dorsaliter ecalcaratis differt.

Ramuli sulcato-quadrangulati sicut petioli dense et foliorum venae primariae subtus inflorescentiaque modice pilis laevibus eglandulosis 5-8 mm longis flexuosis subreflexis induti; nodi inter petiolos non manicati ad petiolorum insertiones elevato-callosi. Petioli 3-4 cm longi; lamina 12-17 X 8-11 cm elliptico-ovata apice subabrupte ca 1 cm acuminato basi rotundata, membranacea et essentialiter integra, modice ciliata, supra sparse appresso-setosa pilis ca 1.5-2 mm longis gracilibus, subtus in venis secundariis sparse pilis gracilibus 2-3 mm longis setosa in superficie glabra, 5(-7)-nervata nervis secundariis ca 4-5 mm inter se distantibus nervulis subtus planis areolis ca 1-1.5 mm latis. Panicula ca 12 cm longa (pedunculo ca 5 cm longo incluso) subcorymbiformis, floribus ca 30 et 5-meris, pedicellis 5-8 mm longis et ca 0.5 mm infra hypanthium articulatis, bracteolis ca 3.5 X 0.7 mm caducis. Hypanthium (ad torum) 5 mm longum glabrum; calycis tubus 0.5 mm longus, lobis interioribus 0.5-0.7 mm longis oblatis, dentibus exterioribus non eminentibus apice ca 0.3-0.5 mm setuliforme protracto.

Petala paulo immatura ca 6 X 5 mm obovato-suborbicularia minute granulosa. Filamenta glabra; antherarum thecae 3.1-3.2 X 0.5 X 1 mm oblongae ventraliter ca 1.2-1.5 mm rimosae; connectivum ad basim ventraliter 0.5 mm bilobulato-prolongatum dorsaliter inerme. Stigma paulo expansum ca 1.3 mm diam.; stylus immaturus ca 6 X 1 mm basim versus sparse glandulosus; ovarium 5-loculare et ca 2/3 inferum, cono costulato 1.5 mm alto sparse glanduloso.

Type Collection: L. Sodiro 490 (holotype BR), collected "in silv. reg. occid. m. Pichincha," 1886.

*Miconia ascendens* has sparser cauline pubescence up to only 4 mm long, trichomes in part gland-tipped, anther thecae only 1.7 mm long, and a distinct dorso-basal tubercle on the anther connectives. The other South American species of Sect.

*Chaenopleura* with corymbiform inflorescences and large flowers, *M. corymbiformis* Cogn., *M. campi* Wurdack, and *M. harlingii* Wurdack, all have anther thecae only 1.5-2 mm long and distinct dorso-basal connective tubercles, as well as less similarity vegetatively. The floral dimensions given for *M. longisetosa* are taken from mature buds, the petals and style thus surely somewhat larger at anthesis.

*MICONIA POPAYANENSIS* Wurdack, sp. nov.

Sect. *Chaenopleura*. *M. hymenantherae* Triana affinis, foliis 5-nervatis ubique sicut hypanthiis modice pilis laevibus setosis differt.

Ramuli teretes sicut petioli foliorum subtus venae primariae et secundariae inflorescentiaque modice setosi pilis laevibus gracilibus plerumque 2-3 mm longis patentibus vel paulo

reflexis; ramulorum nodi incrassati inter petiolos paulo elevati ad petiolorum bases crasse annulo ca 0.5 mm elevato armati. Petioli 0.4-0.6 cm longi; lamina (2.5-)3-5 X (1.7-)2-3 cm oblongo-ovata apice paulo (ca 0.5 cm) subgradatimque hebeti-acuminato basi paulo (0.2-0.3 cm) cordata, firme membranacea et obscure serrulata, 1-1.5 mm ciliolata, supra modice appresso-setosa pilis laevibus ad basim paulo (0.2-0.3 mm) expansis, subtus in venulis modice setosis, 5-nervata nervis secundariis ca 2 mm inter se distantibus nervulis subtus planis obscuris areolis ca 1 mm latis. Panicula 4-6 cm longa lataque submultiflora; flores 5-meri, pedicellis 4-7 mm longis et ca 1 mm infra hypanthium articulatis, bracteolis ca 0.6 X 0.3 mm usque ad anthesim persistentibus. Hypanthium (ad torum) ca 1.5 mm longum, extus modice pilis patentibus laevibus gracilibus 1-2 mm longis ornatum intus glabrum et costulatum; calycis tubus 0.4 mm longus, lobis interioribus ca 0.5 mm longis ovato-orbicularibus hebetibus, dentibus exterioribus lobos interiores aequantibus. Petala 1.8-2 X 1.5-1.6 mm suborbicularia glabra. Stamina isomorphica glabra; filamenta 2 mm longa; antherarum thecae 0.3-0.4 X 0.2 X 0.3-0.35 mm usque ad basim rimosae; connectivum ventraliter crasse bilobulato-prolongatum 0.25 mm. Stigma non expansum; stylus glaber in ovarii collo 0.2 mm immersus; ovarium 3-loculare et fere (collo costulato excluso) omnino inferum glabrum.

Type Collection: F. C. Lehmann 5473 (K), from the "middle western slopes of the West Andes of Popayan," Depto. Cauca, Colombia, elev. 1600-2000 m.

Miconia hymenanthera has 3-nerved leaf blades which are sparsely strigulose above, as well as (as the branchlet internodes) only sparsely to moderately setulose with slightly roughened hairs 0.5-1 mm long on the primary leaf veins beneath; the hypanthia are glabrous except for sparse minute glands. Acosta Solís 5801 (F) from Saloya, Pichincha, Ecuador, elev. 1800 m, may represent a variant of M. popayanensis with larger (7-10 X 3.5-5.5 cm) leaf blades; the Ecuadorian collection shows only young fruit. Lehmann 5473 was evidently not studied by Gleason; the typescript translation of Lehmann's field notes (US) includes: "Miconia cf. M. atrosanguinea Cogn. Shrub, poorly ramified branches up to 1 m in length and partly lying on the ground. Leaves hairy on both sides, dark green. Flowers greenish yellow. Grows in dense damp forests. Flowers in June." Miconia melanotricha (Triana) Gleason (syn.: M. atrosanguinea) does not seem to be really closely related to M. popayanensis, having rather abundant gland-tipped inflorescence and hypanthial hairs, much larger flowers, large anthers with elongate thecae and simple connective, expanded stigma, sparsely glandular-puberulous style, and ovary only 2/3 inferior and crowned with glandular setae 1-1.2 mm long.

CLIDEMIA VARIIFOLIA Wurdack, sp. nov.

C. dimorphicae Macbride affinis, petalis latioribus staminum connectivis eglandulosis ovario plerumque 5-loculari fructu grandiore differt.

Ramuli teretes sicut foliorum subtus venae primariae inflorescentiaque pilis stellulato-pinoideis usque ad 0.3 mm longis et 0.4 mm diam. dense puberuli. Folia in quoque pari valde (10-20:1) dimorphica subsessilia (petiolis 0-0.3 cm longis) firme membranacea supra glabra subtus in venis secundariis modice decidueque arachnoideo-puberula et sparse pinoideo-puberula in superficie glabra venulis subtus planis areolis ca 0.4-0.5 mm latis. Folia maiora: lamina oblongo-lanceata vel elliptico-lanceata apice gradatim acuminato basi asymmetricae rotundata vel cordulata distanter hebeti-serrata dentibus plerumque 1.5-2.5 mm profundis, 8-11(-14) cm longa, 2.5-4.5(-6) cm lata trinervata (pari exteriori tenui excluso) nervis secundariis ca 4 mm inter se distantibus. Folia minora: lamina suborbicularis vel late ovata apice obtuso vel hebeti-acuto basi cordulata integra, 0.6-1.5 cm longa, 0.6-1 cm lata. Inflorescentiae plerumque in foliorum superiorum minorum axillis solitariae 1.5-3.5 cm longae ramulosae pauciflorae; flores 5-meri subsessiles, bracteolis 0.3-0.5 mm longis subpersistentibus. Hypanthium (ad torum) 1.5-1.6 mm longum dense puberulum pilis stellulato-pinoideis 0.1-0.15 mm latis; calycis tubus 0.4 mm altus, lobis interioribus 0.6-0.7 mm longis oblongis, dentibus exterioribus crassis inframarginalibus. Petala 1.9-2 X 1.1-1.2 mm oblongo-ovata glabra. Stamina essentialiter isomorphica glabra; filamenta 0.8-0.9 mm longa; antherarum thecae 1-1.2 X 0.15-0.2 X 0.2-0.3 mm oblongo-subulatae poro 0.05-0.1 mm diam. dorsaliter inclinato; connectivum non prolongatum dorsaliter ad basim dente hebeti 0.1-0.15 mm longo glabro descendenti armatum. Stigma non expansum; stylus 2.5 X 0.3 mm glaber in ovarii cono paulo immersus; ovarium (4-)5-loculare et 2/3 inferum cono 0.5 mm alto granuloso et sparse glanduloso; fructus i. s. 3.5-4 mm diam. costulatus interdum sparsissime glanduloso-setulosus.

Type Collection: H. Lugo 3246 (holotype US 2750865; isotype GB), collected near Río Aguarico ca 5 km south of Lago Agrio, Prov. Napo, Ecuador, 7 Nov. 1973. "Shrub ca 2 m high. Corolla white."

Paratypes: Ecuador: Napo: Heinrichs 294 (NY), from "Monte Ongota am Río Misahualli" near Tena, alt. 700 m, 30 Mar. 1933 ("Strauch 1.5 m hoch. Fruchte grünlich."); H. Lugo 3273 (GB, US), from Shushufindi (Nueva Loja) on road from Coca to Lago Agrio, 10 Nov. 1973 ("Shrub ca 3 m high. Corolla white."); H. Lugo 3461 (GB, US), from Guamanyacu ca 40 km NE of Coca, 18 Nov. 1973 ("Shrub ca 2 m high. Corolla white."). Pastaza: Ynes Mexia 6883 (US), from near Canelos, alt. 300 m, 8 Feb. 1935 ("Bush 0.5 m. Fl. pinkish."). Morona-Santiago: Camp E-971 (NY), from above Río Upano near Paute, elev. 670 m, 13 Nov. 1944 ("Sprawling shrub 0.3 m. Fruit red."); Camp E-1041 (NY), from Cordillera Cutucú opposite Chupiantza, elev. 600-700 m, 17 Nov. 1944 ("Sprawling shrub to 0.3 m. Fruit reddish purple."); Harling 253 (S), from virgin forest near Méndez, alt. 700 m, 28 May 1947 ("Bush; fruit violet."); Harling & Andersson 12860 (GB, US), from Limón-Macas road ca 20 km from Limon, elev. 700-900 m, 26 Mar. 1974 ("Shrub ca 2.5 m. Corolla white."). Peru: Amazonas:



B. Berlin 1846 (MO, US), from north of Huampami, elev. 180-250 m, 29 July 1974 ("Shrub 40 cm; fruit light orange to red."). Loreto: Killip & Smith 28443 (US) and 28591 (US), from Balsa-puerto, alt. 150-350 m, 28-30 Aug. 1929 ("Shrub 3-5 ft.").

Clidemia dimorphica, which is sympatric at least in part of its range with C. variifolia, has somewhat finer vegetative pubescence, less prominent leaf blade teeth only 0.3-1 mm deep, petals only 0.5-0.6 mm wide, stamen connective appendages glandular, 3-4-celled ovary, and essentially glabrous fruit 2.5-3 mm diam. (dry). Gleason had earlier alluded to some of the Peruvian material as probably distinct (Bull. Torrey Club 58: 253. 1931).

OSSAEA BOEKEI Wurdack, sp. nov.

O. robustae (Triana) Cogn. affinis, foliorum subtus venulis laxe reticulatis ramulis primum setulosis floribus paulo maioribus ovario 7-loculari differt.

Ramuli primum obtuse sulcato-quadrangulati demum teretes sicut laminarum venae primariae subtus petiolique sparsiuscule pilis clavulatis ad apicem paulo asperis usque ad 1 mm longis subpersistentibus setulosi. Petioli 2-3 cm longi; lamina 18-30 X 7-13 cm elliptica apice breviter (1-1.5 cm) subgradatimque acuminato basi acuta, membranacea et obscure undulato-serrulata eciliata, utrinque primum sparse pinoideo-puberula (pilis ca 0.1 mm longis) in venulis superficieque mox glabrata, 5-plinervata pari interiore 1.5-3 cm supra basim subalternatim divergenti nervis secundariis 5-10 mm inter se distantibus venulis subtus planis laxiuscule (0.5-0.7 mm) reticulatis. Panicula 5-8 cm longa submultiflora; flores 5-meri, pedicellis 0.3-2 mm longis et ca 0.3 mm infra hypanthium articulatis, bracteolis 1-1.5 mm longis late ovatis persistentibus. Hypanthium (ad torum) 2.2-2.8 mm longum obtuse 10-costulatum dense pilis crassis ca 0.2 mm longis asperis puberulum; calycis tubus 0.5 mm longus, lobis interioribus 0.5 mm longis oblongis, dentibus exterioribus crassis non eminentibus; torus intus sparsissime glandulosus. Petala 5-5.8 X 1.7-2.1 mm oblongo-lanceata intus glabra extus modice pinoideo-puberula. Stamina isomorphica; filamenta 2-2.2 mm longa glabra; antherarum thecae 1.4-1.5 X 0.5 X 0.4 mm oblongae, poro 0.25 mm diam. dorsaliter inclinato; connectivum vix (0-0.1 mm) prolongatum dorsaliter ad basim dente 0.3-0.35 mm longo glanduloso armatum. Stigma non expansum; stylus glaber; ovarium (6-)7-loculare et omnino inferum apice sparse granuloso-glanduloso; fructus i. s. paulo 10-costato.

Type Collection: J. D. Boeke & H. Loyola 2171 (holotype US 2830250; isotype NY), collected in primary forest between Jesús María and Molleturo about 10 km from Guayas border, Prov. Azuay, Ecuador, elev. ca 1100 m, 16 July 1977. "Shrub to 5 m. Corolla white; berry yellow."

Paratype: Dennis H. Knight 643 (US), from wet secondary forest near Buena Ventura below Piñas toward Santa Rosa, Prov. El Oro, Ecuador, elev. ca 900 m, 8 Dec. 1965. "Small tree 7 m."

Ossaea robusta has leaf venule areoles 0.2-0.3 mm wide, branchlets and primary leaf veins beneath with hairs only

0.1 mm long, hypanthium ca 1.4 mm long, petals 3-4.5 X 0.8-1 mm, and ovary usually 5-celled. Ossaea brenesii Standley has shorter cauline and primary leaf vein pubescence, denser leaf venule areoles, and external calyx teeth projecting 0.5-1 mm (but ovary 6-7-celled). Of the 5 ovaries examined in the material of O. boekei, 4 were 7-celled and 1 6-celled.

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NOTES ON NEW AND NOTEWORTHY PLANTS. CXVIII

Harold N. Moldenke

CLERODENDRUM PHILIPPINUM f. MULTIPLEX (Sweet) Moldenke, comb. nov.  
Clerodendrum fragrans  $\beta$  multiplex Sweet, Hort. Brit., ed. 1,  
 1: 32. 1826.

CORNUTIA GRANDIFOLIA f. QUADRANGULARIS (Ørst. & Moldenke) Moldenke, stat. nov.

Cornutia grandifolia var. quadrangularis Ørst. & Moldenke,  
 Feddes Repert. Spec. Nov. 40: 168. 1936.

SYNGONANTHUS FERTILIS var. FUSCUS Moldenke, var. nov.

Haec varietas a forma typica speciei bractiis involucrentibus atrofuscis vel atrobrunneis recedit.

This variety differs from the typical form of the species in having the involucrel bracts dark-fuscous or dark-brown instead of light-stramineous.

The type of the variety was collected by J. Murça Pires, N. T. Silva, and R. Souza (no. 9843a) in the cerrado at Fazenda Lopo Botelho, Cristalina, Goiás, Brazil, on July 7, 1963, and is deposited in the Britton Herbarium at the New York Botanical Garden.

SYNGONANTHUS LEPRIEURI f. VIVIPARUS Moldenke, f. nov.

Haec forma a forma typica speciei capitulis distincte viviparis recedit.

This form differs from the typical form of the species in having its fruiting heads distinctly viviparous.

The type of the form was collected by G. T. Prance, A. S. Silva, C. C. Berg, A. J. Henderson, B. W. Nelson, M. Balick, R. P. Bahia, and M. Reis dos Santos (no. P.24837) on a moist cliff in the spray of falls, 300 meters altitude, Cachoeira de Curuá, north slope of the Serra Cachimbo, BR 163, Cuiabá to Santarém highway, Pará, Brazil, on November 4, 1977, and deposited in the Britton Herbarium at the New York Botanical Garden.

SVIDA ALBA var. ARGENTEO-MARGINATA (Rehd.) Moldenke, comb. nov.

Cornus alba var. argenteo-marginata Rehd., Man. Cult. Trees, ed. 2. 684. 1940.

NEW COMBINATIONS IN DIDYMODON (MUSCI) AND  
A KEY TO THE TAXA IN NORTH AMERICA NORTH OF MEXICO

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In the course of studies on the Pottiaceae, I have become convinced that the distinctions made by Saito (1975) between the genera Barbula Hedw. and Didymodon Hedw. are valid. As was discussed by Crundwell and Nyholm (1965), taxonomic differences between the two genera have been based largely on peristome characters, the former having long, twisted teeth, the latter with short, straight to weakly twisted teeth. These distinctions have never been totally satisfactory as species that are gametophytically closely related to some Barbula species have short, nearly straight peristome teeth while others with close relationship to Didymodon species have elongate, twisted peristomes. As the genera are closely related, many authors (e.g. Chen 1941, Dixon 1924, Nyholm 1956, Savicz-Ljubitzkaja & Smirnova 1970) have simply treated all species as Barbula. Saito (1975) proposed several distinctions between the two genera based largely on gametophytic characters, some of which had been previously discussed by Hilpert (1933), that serve to separate easily the species into two natural groups. Table 1 compares the major distinguishing features of Barbula and Didymodon. I agree with Hilpert (1933) that the species now recognized in Bryoerythrophyllum Chen (= Didymodon subg. Erythrophyllum Limpr.) are more closely related to Barbula than to Didymodon. Trichostomopsis Card. and Geheebia Schimp. are here treated as synonyms of Didymodon.

Many taxa now recognized in Barbula are better placed in Didymodon. Saito (1975) made several transfers involving Asiatic taxa that reflect his generic concepts but certain American and European taxa remain without appropriate combinations. Based on studies of specimens from ALA, ALTA, BUF, CANM, FH, MICH, NY, PC, S-PA, TENN, UBC, US and other herbaria, the following key, new combinations and discussion is presented hopefully as a coherent concept of Didymodon in North America north of Mexico.

All of the species of Didymodon that are represented by more than a few collections show a degree of variation in characters here considered critical for identification. Regionality of the species supports an assumption of genetic differentiation; however, this may turn out to be best recognized as race formation within widely distributed polymorphic species. To alert plant geographers as to which species are relatively well known and which are possibly artifacts, the following terms are used here. Species

Table 1. Summary of important distinctions between the genera Didymodon and Barbula in North America north of Mexico.

	<u>Didymodon</u>	<u>Barbula</u>
Leaf shape	usually lanceolate to long-lanceolate	usually ovate to long-elliptical
Cells of axillary hairs	hyaline except a yellow-brown basal cell	all cells often hyaline
Basal laminal cells	usually little differentiated, green and short-rectangular	usually strongly differentiated, hyaline and elongate
Abaxial superficial cells of costa above mid-leaf	quadrate to occasionally elongate	short-rectangular to elongate, rarely quadrate
Laminal papillae	absent or simple or rarely multiplex; solid	usually multiplex, rarely C-shaped, simple or absent; often hollow
Propagula, when present	green, thin-walled, of 1-10 cells	green to yellow- or red-brown, thin- to thick-walled, of 1-50 or more cells
Peristome teeth	absent or rudimentary to long and twisted	short and weakly twisted to long and twisted

that are suspected to be "pigeonhole" taxonomic concepts (Grout 1938), that is, segregates from a continuum of morphological variation, e.g. on a stature gradient (Zander 1977), have their names followed by the annotation "columb." for "columbarium," a dove cote. Some species have been studied only in limited geographic areas and are suspected to be the same as other species elsewhere in the world. The names of these narrowly conceived species are followed by "paroch." for "parochialis." Most species of Pottiaceae that are known only from local floristic studies are parochial species and should not be cited in studies of plant geography without much reservation. I find that only study of intraspecific variation of a species and of related species on a worldwide basis can provide a sense of proportion that allows the kind of taxonomic appraisal that satisfactorily reflects evolutionary and migratory history. Until a taxonomic study is made at the world level, preferably with ancillary experimental culture work, difficulties in routine identification of Didymodon species

Table 2. Suggested parallel trends in speciation in three sections of Didymodon.

	sect. <u>Didymodon</u>	sect. <u>Vineales</u>	sect. <u>Graciles</u>
Plants red-brown	<u>D. nigrescens</u>	<u>D. asperifolius</u>	<u>D. laevigatus</u>
Leaves short-lanceolate	<u>D. acutus</u>	<u>D. brachyphyllus</u>	<u>D. michiganensis</u>
Leaves long-lanceolate	<u>D. umbrosus</u>	<u>D. vinealis</u> var. <u>D. giganteus flaccidus</u>	
Leaf apex differentiated as a propagulum	<u>D. johansenii</u>	<u>D. sinuosus</u>	—
Leaf cells porose	<u>D. johansenii</u>	—	<u>D. giganteus</u>
Propagula present in leaf axils	<u>D. rigidulus</u>	<u>D. reedii</u>	<u>D. michiganensis</u>
Hygrophilic species	<u>D. luridus</u>	—	<u>D. tophaceus</u>

must be expected when using this key and those of other authors due to unusual combinations of character states or to intermediate states.

Variation in degree of peristome development is common in Didymodon and has led to confusion in generic limits. Qualitative characters of the peristome are relatively conservative and are appropriately emphasized at the family level in moss taxonomy (Crosby 1974). However, peristome morphology and other sporophyte characters may be variable in a quantitative sense. The few phenological survey studies that have been done show that the sporophytes of common, temperate zone species of Pottiaceae (and of other families) take 5-12 months to mature (Grimme 1903, Krieger 1915). Also, the capsule anatomy differentiates throughout much of the period of seta elongation (Wijk 1932) although final stages happen very quickly (Kreulen 1975). Surely developmental processes of the sporophyte should be commonly affected, especially in species of Pottiaceae growing in environmentally variable habitats, in regard to relative size and size-dependent elaboration of the peristome, perhaps in response to varying amounts of available photosynthate. Hilpert (1933) asserted that peristome ornamentation is never quantitatively exactly alike between individuals of the same species in the Pottiaceae and considered variation between species in peristome development to be related to environmental influences of the habitat. In both Didymodon and

Barbula, long peristomes usually have well developed basal membranes and sharply differentiated, filamentuous, spiculose peristome teeth. Short peristomes have poorly differentiated basal membranes and long-subulate, spiculose to papillose teeth. In most species, peristomes are rather fragile and are often broken off in old capsules. Didymodon vinealis var. vinealis has perhaps the best developed peristome in the genus, twisted occasionally to 2.5 turns. Barbula species may have rather short, nearly straight teeth grading to long and twisted to 2.5 turns. Great variation in peristome development within species is common in both Didymodon and Barbula and may be correlated with control of spore dispersal appropriate for various environments. Also, Lazarenko (1957) has emphasized the importance in spore liberation of fragile peristome teeth in the genus Callicladium (Hypnaceae).

Variation in presence and in degree of differentiation of the adaxial stereid band has also been a source of confusion, as noted by Saito (1975). The long-held importance of costal anatomy as a character distinguishing the tribes Pottieae and Barbuleae is not to be denied, but has led to misplaced emphasis on this character in the Barbuleae in which great variation of costal anatomy occurs between species and even within species. In many species of Didymodon, there may be either one or two stereid bands present in the costa. In D. vinealis, the adaxial stereid band is usually represented by 2-4 widely lumened, slightly thick-walled cells of about the same diameter as the cells of the costal epidermis and only slightly smaller than the guide cells. The genera Trichostomopsis Card. and Husnotiella Card. were both placed in the Pottieae by Grout (1939) as they characteristically have only one stereid band in the costa. However, Robinson (1970) recognized the relationship of Trichostomopsis near Barbula, and I here place it in synonymy with Didymodon; Husnotiella is actually very close in relationship to Didymodon and should be treated in the Barbuleae.

Illustrations, descriptions, further discussion of variation, and additional synonymy for most of the species dealt with here are given by Chen (1941), Dixon (1924), Nyholm (1956), Podpěra (1954), Saito (1975) and Steere (1938a, 1938b) inter alios.

KEY TO DIDYMODON TAXA IN NORTH AMERICA NORTH OF MEXICO

1. Leaf tips caducous or very fragile..... 2.
1. Leaf tips with intact apices or these merely occasionally broken..... 5.
  2. All leaf apices absent in mature leaves, deciduous early, apical cells near leaf apex weakly conic-mamillose; U.S.A. (Alaska), Europe, U.S.S.R.....
    - ..... 14. D. sinuosus (Mitt.) Delogn.
  2. Leaf apices mostly present in mature leaves, merely fragile or deciduous late, upper laminal cells smooth to papillose..... 3.
3. Leaves long-triangular, usually deeply grooved along the costa adaxially, costa percurrent to short-excurrent, laminal papillae irregular to multiplex; western North America.....
  - ..... 13. D. occidentalis Zander
3. Leaves ovate- to long-lanceolate, broadly and weakly concave, not medially grooved, costa long-excurrent, laminal papillae absent to low and mostly simple..... 4.
  4. Leaf apices swollen and notched, upper laminal cells usually with porose walls and angular lumina; U.S.A. (Alaska), Canada (Yukon, Northwest Territories), U.S.S.R.....
    - ..... 4. D. johansenii (Williams) Crum
  4. Leaf apices narrow, entire, upper laminal cells usually evenly thickened and with rounded-quadrate or oval lumina; northern areas and at high elevations in North America, Europe, Asia.....
    - lb. D. acutus var. icmadophilus (Schimp. ex C.M.) Zander
5. Plants red- to black-brown, leaves not keeled or highly recurved, margins finely crenulate by bulging cell walls, usually plane above midleaf, costae thin, 2-3 cells wide above midleaf, laminal papillae absent to massive and lens-shaped..6.
5. Plants without this exact combination of characters..... 8.
  6. Leaves dimorphic: cochleariform, epapillose leaves present on fragile branchlets or portions of some stems; U.S.A. (Alaska, Colorado), Canada (Yukon, Northwest Territories, British Columbia, Alberta).....
    - ..... 9. D. subandreaeoides (Kindb.) Zander
  6. Leaves monomorphic..... 7.

7. Plants often fruiting, leaf apices acute, propagula absent; northwestern North America, Guatemala, India, China.....  
..... 7. D. nigrescens (Mitt.) K. Saito
7. Plants sterile, leaf apices obtuse, unicellular propagula present in clusters in the leaf axils; Canada (Yukon, Northwest Territories), U.S.S.R.....  
..... 8. D. perobtusus Broth.
8. Costa with elongate superficial adaxial cells, upper laminal cells unistratose..... 9.
8. Costa with quadrate superficial adaxial cells, or, if elongate, then upper leaf margins bistratose..... 14.
9. Leaf base auriculate or weakly winged at insertion, apex often whip-like, long-acuminate; Canada (Northwest Territories), India, Japan... 20. D. leskeoides K. Saito
9. Leaf base not sharply flaring, apex obtuse to short-acuminate..... 10.
10. Leaves ovate to long-elliptical, apex often obtuse, costa often ending before the apex; widely distributed  
..... 21. D. tophaceus (Brid.) Lisa
10. Leaves short- to long-lanceolate, apex acute, costa subpercurrent to short-excurrent..... 11.
11. Plants usually propaguliferous, leaves catenulate when dry, laminal cells in obvious longitudinal rows; U.S.A. (Michigan), Canada (Northwest Territories), Mexico, India (Assam), Japan..  
..... 16. D. michiganensis (Steere) K. Saito
11. Plants lacking propagula, leaves appressed-incurved to weakly spreading when dry, laminal cells somewhat staggered..... 12.
12. Plants small, leaves to 2.5 mm long, laminal cells usually 8-10  $\mu$ m wide; widely distributed.....  
..... 17. D. fallax (Hedw.) Zander
12. Plants large, leaves to 5.0 mm long, laminal cells usually 10-14  $\mu$ m wide..... 13.



13. Leaf margins usually edentate, upper laminal cells with thick, porose cell walls; U.S.A. (Alaska), Canada (Northwest Territories, British Columbia), Europe, U.S.S.R., China, Japan..... 19. D. giganteus (Funck) Jur.
13. Leaf margins occasionally weakly dentate, upper laminal cells with angular lumina but walls not or little porose; widely distributed.....  
..... 18. D. rigidicaulis (C. Muell.) K. Saito
14. Leaves with a narrow, adaxial, medial channel, apex often apiculate by a conical cell, margins usually recurved, often to near the apex..... 15.
14. Leaves lacking an adaxial, medial channel, apex seldom apiculate by a conical cell, margins plane to recurved below midleaf..... 19.
15. Leaves red-brown, strongly recurved and keeled when moist, papillae when present simple, stem central strand usually absent; subalpine and subarctic areas of the Northern Hemisphere... 15. D. asperifolius (Mitt.) Crum, Steere & Anders.
15. Leaves green to yellow- or red-brown, spreading to weakly recurved and weakly keeled when moist, papillae when present bifid to multiplex, stem central strand present..... 16.
16. Leaves deltoid to short-lanceolate, margins recurved to near the apex, apices of some leaves obtuse; western U.S.A.....  
..... 10. D. brachyphyllus (Sull. in Whipple) Zander
16. Leaves short- to long-lanceolate or long-triangular, margins recurved near base to lower 2/3 of leaf, apices of all leaves acute..... 17.
17. Leaves long-triangular, apices often fragile and bistratose at least in patches, basal cells quadrate to short-rectangular, peristome absent or rudimentary; range: see 3a.....  
..... 13. D. occidentalis Zander
17. Leaves lanceolate, apices little thickened or fragile, basal cells short- to long-rectangular, peristome weakly to strongly developed..... 18.

18. Leaves to 2.5 mm long, straight to curved; widely distributed in western North America, Europe, Asia, Africa... 12a. D. vinealis (Brid.) Zander var. vinealis
18. Leaves to 5 mm long, flexuous; western North America, Europe, Asia, Africa.....  
..... 12b. D. vinealis var. flaccidus (B.S.G.) Zander
19. Axillary propagula present..... 20.
19. Axillary propagula absent..... 21.
20. Propagula all multicellular, leaf apex acute; widely distributed..... 2. D. rigidulus Hedw.
20. Propagula mostly unicellular, leaf apex broadly obtuse; range: see 7b... 8. D. perobtus Broth.
21. Upper leaf lamina bistratose..... 22.
21. Upper leaf lamina unistratose..... 25.
22. Upper leaf lamina entirely bistratose; U.S.A. (Arizona), Mexico.....  
3. D. mexicanus var. subulatus Thér. & Bartr. ex Bartr.
22. Upper leaf lamina bistratose along margins..... 23.
23. Basal laminal cells with firm, weakly to strongly thickened walls, differentiated usually only medially; range: see 20a...  
..... 2. D. rigidulus Hedw.
23. Basal laminal cells thin-walled and usually somewhat inflated, often bulging-rectangular, differentiated across leaf base....  
..... 24.
24. Leaves long-lanceolate, usually smooth or weakly papillose, marginal basal cells narrowly rectangular in 2-4 rows, adaxial superficial cells of costa usually elongate, stem with hyalodermis; U.S.A. (California), Mexico, Uruguay, Argentina... 6. D. umbrosus (C. Muell.) Zander
24. Leaves short-lanceolate, smooth to strongly papillose, marginal basal cells not or weakly differentiated from the medial, adaxial superficial cells of costa quadrate, stem lacking hyalodermis or this weakly differentiated; western U.S.A., Mexico, Andes of South America, Australasia, South Africa.....  
..... 5. D. australasi (Hook. & Grev.) Zander

25. Plants flagellate, leaves strongly appressed when dry, linear-lanceolate, costa long-excurrent; Canada (Northwest Territories), China.....  
 ..... lc. D. acutus var. ditrichoides (Broth.) Zander
25. Plants not flagellate, leaves appressed-incurved to weakly twisted and weakly spreading when dry, short- to long-lanceolate, costa short- to long-excurrent..... 27.
26. Costa short-excurrent, entire; widely distributed.....  
 ..... la. D. acutus (Brid.) K. Saito var. acutus
26. Costa long-excurrent, often fragile; northern areas and at high elevations in North America, Europe, Asia.....  
 lb. D. acutus var. icmadophilus (Schimp. ex C.M.) Zander

The taxa in Didymodon are here placed in three sections. Each section has what appear to be parallel trends in morphological variation among the species as summarized in Table 2.

DIDYMODON Hedw. sect. DIDYMODON, Spec. Musc. 104. 1801.

Type: D. rigidulus Hedw.

Synonyms: Barbula sect. Asteriscium C. Muell., Linnaea 42: 342. 1872, syn. nov. Type: Barbula umbrosa C. Muell.

Trichostomopsis Card., Rev. Bryol. 36: 73. 1909, syn. nov.

Type: T. crispifolia Card.

Asteriscium (C. Muell.) Hilp., Beih. Bot. Centralbl.

50(3): 618. 1935, hom. illeg. non Cham. & Schlecht.

Linnaea 1: 254. 1826.

For additional synonymy see Saito (1975).

This group is essentially that which Steere (1938a) discussed as Barbula sect. Acutae Steere, nom. illeg. (fide Index Muscorum, Wijk et al. 1959-1969), but with the addition of several species including two previously placed in Trichostomopsis. The section is characterized by the leaves appressed to spreading when moist, weakly concave, margins not or weakly decurrent, plane to recurved below, seldom apiculate, the costa percurrent to more usually excurrent, the upper laminal cells often bistratose, seldom papillose but if so then papillae usually simple to bifid, irregular to hemispherical, 1-4 over each lumen, the adaxial superficial cells of the costa quadrate above midleaf in at least some plants of all species, and the adaxial stereid band usually absent. The peristome is usually rather short and little twisted, occasionally to 1.5 or 2.0 turns. Spores mature in various seasons depending on the species.

1a. Didymodon acutus (Brid.) K. Saito var. acutus [columb.]

This taxon, while common in Mexico, is only occasional although widely distributed in the United States. Barbula bescherellei Sauerb. in Jaeg., considered "...scarcely more than a vigorous form of B. acuta..." by Crum (1969), is a synonym.

1b. Didymodon acutus var. icmadophilus (Schimp. ex C. Muell.) Zander, comb. nov. [columb.]

Basionym: Barbula icmadophila Schimp. ex C. Muell., Synop. Musc. 1: 614. 1849.

Synonym: Barbula acuta var. icmadophila (Schimp. ex C. Muell.) Crum, Bryologist 72: 241. 1969.

This is an often robust, northern and western-montane expression of D. acutus. I agree with Crum (1969) that it should be treated at the varietal level.

1c. Didymodon acutus var. ditrichoides (Broth.) Zander, comb. & stat. nov. [columb.]

Basionym: Barbula ditrichoides Broth., Sitzungsab. Akad. Wiss. Wien Math. Nat. Kl. 133: 566. 1924.

This appears to be a highly reduced, flagellate version of the var. icmadophilus but it has an easily recognized, distinctive appearance. It is known from montane China (Chen 1941) and was recently collected in Canada: Northwest Territories, Nahanni Range, just N of Peak, 61° 43'N, 123° 20'W, dry, N-facing alpine tundra with limestone rock outcrops, 1090 m elev., Vitt 20294 (ALTA).

2. Didymodon rigidulus Hedw.

This species is quite close in relationship to D. acutus, differing in most collections in the broader leaf apex, which is bistratose at least marginally, and in the presence of axillary propagula. However, some specimens are intermediate in character state combinations and may be interpreted as either D. acutus with propagula or as D. rigidulus lacking propagula. The axillary propagula are said by Steere (1938b) to be a constant feature of D. rigidulus; however, western collections often lack them, as attested by Flowers (1973) and Weber (1973). There are two specimens labeled as D. rigidulus in the Hedwig-Schwaegrichen herbarium at G. One of these is apparently the type from Germany: "Lipsiae in ponte ad Kuhthurum lect.," and is good material of D. rigidulus with propagula present. The collection from U.S.A.: "specimen e Pennsylvaniae a. repta," is D. fallax.

3. Didymodon mexicanus var. subulatus Thér. & Bartr. ex Bartr.  
[columb. & paroch.]

This may be viewed as an expression of D. acutus var. icmadophilus with bistratose upper leaf laminae. Collections intermediate in character between these two taxa are easily referred to D. rigidulus (without propagula).

4. Didymodon johansenii (Williams) Crum

This is an essentially boreal, circumarctic species. The distribution is summarized by Packer and Vitt (1974) and Steere (1978). Didymodon acutus var. icmadophilus may be confused with this species as the leaf apices are often quite fragile; Steere (1938b) remarked on the fragility of the leaf tips of D. rigidulus, another possible source of confusion. However, D. johansenii differs from both species in that the leaf apices are swollen, constricted or notched and the laminal cell walls are often thickened-porose above midleaf.

5. Didymodon australasii (Hook. & Grev.) Zander, comb. nov.

Basionym: Tortula australasiae Hook. & Grev., Edinburgh Jour. Sci. 1: 301. 1824.

Synonyms: Didymodon diaphanobasis Card., Rev. Bryol. 37: 125. 1910.

Barbula australasiae (Hook. & Grev.) Brid., Bryol. Univ. 1: 828. 1827.

Trichostomopsis brevifolia Bartr., Bryologist 34: 61. 1932.

Trichostomopsis diaphanobasis (Card.) Grout, Moss Fl. N. Amer. 1: 228. 1939.

Trichostomopsis fayae Grout, Moss Fl. N. Amer. 1: 228. 1939, syn. nov.

Trichostomopsis australasiae (Hook. & Grev.) H. Robins., Phytologia 20: 187. 1970.

Robinson (1970) gave a long list of additional synonyms for this species in his revision of Trichostomopsis. This species is similar and probably closely related to D. rigidulus by the areolation and laminal papillae, the bistratose upper laminal margins, and the transverse section of the costa showing only an abaxial stereid band (the adaxial stereid band is only occasionally present in D. rigidulus) and 2-3 adaxial layers of wide-lumened, isodiametric adaxial cells. Comparison of the illustrations of the transverse sections given by Flowers (1973) for D. rigidulus and by Grout (1939) and Lawton (1971) for synonyms of D. australasii demonstrates this. Didymodon australasii differs from D. rigidulus in the dry, often desert habitat, the leaves usually with broadly acute and somewhat cucullate apices, the costa seldom excurrent, the basal laminal cells usually thin-walled and hyaline, and propagula absent.

As is common in desert species of Pottiaceae, the costa often bulges adaxially. Didymodon umbrosus is closely related and occasionally intergrades with D. australasii. Although it has bistratose upper laminal margins, D. umbrosus usually may be distinguished from the above two species by the long-subulate leaf shape, the usually elongate adaxial superficial costal cells, the inflated basal cells, and the distinct hyalodermis of the stem. The few specimens of Trichostomopsis aaronis (Lor.) Agnew & Towns. and T. haussknechtii (Jur. & Milde) Agnew & Towns. from Iraq that I have examined (at MO) are apparently the same as D. australasii though further study is needed before synonymy is justified.

6. Didymodon umbrosus (C. Muell.) Zander, comb. nov. [columb.]

Basionym: Barbula (Asteriscium) umbrosa C. Muell.,  
Linnaea 42: 340. 1879.

Synonyms: Trichostomopsis crispifolia Card.,  
Rev. Bryol. 36: 74. 1909.

Trichostomopsis umbrosa (C. Muell.) H. Robins.,  
Phytologia 20: 185. 1970.

Further synonymy is given by Robinson (1970). Trichostomopsis crispifolia Card. (isotype!—NY), the generitype of Trichostomopsis Card., is included and Trichostomopsis thus becomes a synonym of Didymodon. Didymodon umbrosus is unusual in the sect. Didymodon in having usually rather large, 10–13  $\mu\text{m}$  wide, short-rectangular, porose upper leaf cells (approached by those of D. johansenii), the elongate adaxial superficial costal cells, and in the distinct hyalodermis of the stem. It appears to intergrade in these characters, however, with D. australasii (q.v.). It is the largest of the species of sect. Didymodon, but is apparently lacking in the Pacific Northwest where the most robust species of sect. Vineales and sect. Graciles are found. This may be due to different climatic factors needed to induce or allow selection for large size in sect. Didymodon. Didymodon incrassato-limbatus Card. of Mexico (probably a synonym of D. nicholsonii Culm. of Europe) also has long-lanceolate leaves but the laminal cells are usually small, 7–9  $\mu\text{m}$  wide, quadrate to hexagonal and thin-walled, often bistratose in medial patches, the adaxial costal cells are quadrate, the basal laminal cells are not distinctly inflated and the hyalodermis is not or only poorly differentiated.

7. Didymodon nigrescens (Mitt.) K. Saito

This species is discussed and illustrated by Saito (1975). Steere (1978) reported it from Alaska and British Columbia as new to North America. American synonyms that may be added to the list of Saito (1975) are Barbula rufofusca Lawt. & Herm. (holotype!—US) from Alaska and B. bunneola C. Muell. (isotype!—NY) of Guatemala. It is now known in the New World from Central America and from

many collections from hyperoceanic and montane areas of northwestern North America. This and the following two species are closely related by the red coloration of the plants, the upper leaf margins crenulate by bulging cell walls, and the costa very thin, often with elongate adaxial cells. A paper dealing with these three species giving descriptions and details of geographic range and ecology is being prepared with Dr. W.C. Steere. Although in the sect. Vineales, D. asperifolius is similar in many characters, but may be easily distinguished by its recurved leaves with margins usually recurved to near the apex.

#### 8. Didymodon perobtusus Broth.

This species is similar to D. tophaceus in the costa ending often 4-6 cells below a broadly obtuse apex, but is closely related to D. nigrescens and D. subandreaeoides by the reddish coloration, crenulate leaf apices and the thin costa that may have elongate adaxial cells. Its known range includes U.S.S.R.: Mongolia (holotype!—H), and Canada: Yukon, Firth River basin, near mouth of Mancha Creek, calcareous bluff, Sharp MC-58152a (NY); Northwest Territories, Mackenzie Distr., Nahanni National Park, Virginia Falls, mist zone, Scotter 22433 (NY). The former Canadian collection has been reported previously by Steere (1978). This species may have a close relationship with Husnotiella revoluta Card. of Middle America, which has similarly shaped but marginally revolute leaves, and, as noted by Bartram (1926) and Zander (1968), may also produce unicellular propagula in axillary clusters. Didymodon perobtusus is very similar to Barbula uruguayensis Broth. (isotype!—NY) of Uruguay, which has similar propagula but differs mainly in the green coloration and the areolation being nearer that of D. tophaceus in the unistratose lamina and the weakly colored cell walls that do not bulge along the upper leaf margin.

#### 9. Didymodon subandreaeoides (Kindb.) Zander, comb. nov.

Basionym: Barbula subandreaeoides Kindb., Rev. Bryol.  
32: 36. 1905.

Synonym: Barbula andreaeoides Kindb., Rev. Bryol.  
32: 36. 1905.

As Steere (1978) has noted, Barbula andreaeoides represents a good species, and is not a synonym of Andraea rothii Web. & Mohr as once thought (Steere 1938a). Because the combination in Didymodon is occupied by an earlier name, the synonym B. subandreaeoides, published at the same time, is here transferred to Didymodon rather than provide a new name for B. andreaeoides. Sporophytes are not known for this species and reproduction is apparently asexual by fragile branches with cochleariform leaves. The heteromorphic leaves are quite distinctive, showing often on the same branch a sharp change from a series of ovoid, weakly

concave, strongly papillose leaves to a series of cochleariform, deeply concave, non-papillose, smaller leaves. The developmental switching mechanism that determines leaf morphology may be similar in sharp response to that governing heterophylly in amphibious Ranunculus species.

DIDYMODON sect. VINEALES (Steere) Zander, comb. nov.

Basionym: Barbula sect. Vineales Steere in Grout, Moss  
Fl. N. Amer. 1: 174. 1938.

Synonym: Barbula sect. Rubiginosae Steere in Grout, Moss  
Fl. N. Amer. 1: 174. 1938.

This section is characterized by the leaves spreading to wide-spreading and occasionally recurved when moist, concave across the leaf to keeled and narrowly channeled along the adaxial surface of the costa, margins weakly decurrent to strongly so in robust plants, weakly recurved below to recurved or revolute to near the apex, often apiculate by a conical cell, the costa usually percurrent to shortly excurrent in a broad mucro, the upper laminal cells occasionally bistratose along the leaf margins, epapillose to papillae simple, irregular to spiculose-multiplex, 1-4 over each lumen, the adaxial superficial cells of the costa quadrate in the upper half of the leaf and the adaxial stereid band often absent. The peristome is absent or rudimentary to well developed and twisted to 2.5 turns. Spores mature usually in spring, also summer.

10. Didymodon brachyphyllus (Sull. in Whipl.) Zander, comb. nov.  
[columb.]

Basionym: Barbula brachyphylla Sull. in Whipl., Rep. Pacif.  
Railr. Route Surv. Bot. 4: 186. 1856.

I agree with Steere (1938a) that this species "...is apparently the most reduced form of the extremely variable B. vinealis-B. cylindrica complex..." The leaf apex is often broadly obtuse in some leaves of a collection. Flowers (1973) appears to have included this species within his concept of D. vinealis.

11. Didymodon reedii H. Robins. [columb. & paroch.]

This species was described from material from Maryland (holotype!—US), which matches very nearly specimens of the western D. brachyphyllus. The eastern material differs mainly in being propaguliferous. Recent collections from Colorado (Larimer Co., 6.5 km NNW of Livermore, Hermann 26986—USFS; Yuma Co., 3.2 km S of Bonny Reservoir, Hermann 23531—MICH, USFS) also prove to be D. reedii. Synonymy of the two names is probable, although the



presence in Maryland of a species from this western North American section of Didymodon is surprising. Additionally, the Asiatic D. tectorum (C. Muell.) K. Saito, illustrated by Saito (1975), is probably synonymous with D. reedii, antedating it, but is itself antedated by D. brachyphyllus. Didymodon cordatus Jur. of Europe is related but may be distinguished by the massive costa. More satisfactory resolution of these taxa awaits revisionary study.

12a. Didymodon vinealis (Brid.) Zander, comb. nov., var. vinealis

Basionym: Barbula vinealis Brid., Bryol. Univ. 1: 830. 1827.

Some specimens with bistratose margins are confused in herbaria with D. rigidulus; however, the leaves narrowly channeled along the costa, the highly recurved leaf margins and the percurrent or shortly excurrent costa are diagnostic. Saito (1975) may have recognized D. vinealis under the name D. constrictus (Mitt.) K. Saito, judging from his key, description and illustrations. Specimens with rather thin cell walls are easily recognized by the usually papillose upper laminal cells, and the costa with a crescent-shaped abaxial stereid band, the adaxial stereid band usually lacking and represented by 1(-2) layers of wide lumened cells of about the same diameter as those of the adaxial costal epidermis. Of the species of Didymodon studied, D. vinealis is most closely related to Barbula in the often relatively long and twisted peristome, the distinctive adaxial medial laminal groove along the costa in well developed plants, and the laminal papillae being often multiplex.

12b. Didymodon vinealis var. flaccidus (B.S.G.) Zander, comb. nov.  
[columb.]

Basionym: Barbula vinealis var. flaccida B.S.G., Bryol. Eur. 2: 86. 1842 (fasc. 13-15 Mon. 24).

Synonym: Barbula cylindrica (Tayl.) Schimp. in Boul., Fl. Crypt. Est Muscin. 430. 1872.

Steere (1938a) treated this taxon as Barbula cylindrica and noted that some robust collections from British Columbia were much larger than any European specimens he had seen. Regional climate is probably a deciding factor in selection or expression of degree of robustness, as is also likely with robust forms of D. rigidicaulis.

13. Didymodon occidentalis Zander, nom. nov. [columb.]

Name replaced: Barbula rubiginosa Mitt., Jour. Linn. Soc. Bot. 8: 27. 1864 (non Didymodon rubiginosus (C. Muell.) Broth., Nat. Pfl. 1(3): 405. 1902).

I have seen specimens of D. occidentalis from British Columbia, Oregon and California. The apex of the leaf is fragile, often broken or knobby, the costa is evenly stout to near the apex and is in a rather deep adaxial laminal groove, and the lamina near the leaf apex is bistratose, at least in patches. This species is closely related to and transitional between D. vinealis and D. sinuosus. Although the few capsules of D. occidentalis that I have seen lack peristomes and Steere (1938a) described the species as eperistomate, Lawton (1971) notes that a rudimentary peristome may be present.

14. Didymodon sinuosus (Mitt.) Delogn.

Under the synonym Barbula sinuosa (Mitt.) Grav., several European authors (Demaret & Castagne 1964, Husnot 1884-1894, Moenkemeyer 1927, Podpěra 1954) have indicated, at least by juxtaposition of names in manuals, that D. sinuosus is closely related to D. vinealis. Although Dixon (1924) could find no definite alliance, I agree with the former authors. This obligate apomict is related to D. vinealis through D. occidentalis, which may have sporophytes and has merely fragile leaf apices. Didymodon sinuosus has been found in North America only in Alaska (Zander 1978b) and may be easily confused with D. johansenii from which it may be distinguished by the characters cited in the key.

15. Didymodon asperifolius (Mitt.) Crum, Steere & Anderson

This species was discussed by Steere (1938b) under the synonym D. rufus Lor. Contrary to Saito's (1975) key and description, the central strand of the stem is occasionally present, although weak. This is an arctic-alpine species paralleling similar reddish-brown northern or montane expressions in the other sections of Didymodon. Didymodon asperifolius may possibly be better placed in sect. Graciles because of the recurved leaves and simple laminal papillae.

DIDYMODON sect. GRACILES (Milde) K. Saito, Jour. Hattori Bot. Lab. 39: 504. 1975. Type: D. rigidicaulis (C. Muell.) Saito

Synonym: Barbula sect. Fallaces Steere in Grout, Moss Fl. N. Amer. 1: 174. 1938, syn. nov.

For additional synonymy, see Saito's (1975) treatment.

This section is characterized by the leaves spreading to often strongly recurved when moist, concave to keeled, margins weakly to strongly decurrent, plane to recurved in lower 2/3, not apiculate, the costa ending below the apex to shortly excurrent, the upper laminal cells unistratose, epipillose to papillae simple, hemispherical or occasionally conic-spiculate, usually 1-2 over each lumen, the adaxial superficial cells of the costa short-rectangular to elongate in the upper half of the leaf and the adaxial stereid band usually present. The peristome is rudimentary to well developed and twisted to 2 turns. Spores mature usually in winter or spring. Unlike sect. Didymodon and sect. Vineales, there is no tendency toward bistratose upper laminal cells or very fragile or caducous leaf apices. Saito (1975) recognized only two sections of Didymodon in Japan, this and sect. Didymodon. The latter included species that I here place in sect. Vineales. Admittedly, the sect. Graciles is more distinctive in character than the sect. Vineales.

16. Didymodon michiganensis (Steere) K. Saito [columb.]

In addition to the type locality in Michigan, this species has been reported from a very few scattered localities worldwide: Mexico (Bowers & Sharp 1975), Assam (Robinson 1968) and Japan (Saito 1975). Polytopic origin due to unusual environmental conditions that may have evoked, from the related widespread species D. fallax, both a usually repressed potential to form propagula and to produce the characteristic gametophore morphology would be a hypothesis that might explain the spotty distribution. However, a specimen that has the gametophore characters of D. michiganensis that are described in the key but lacking propagula has been collected in Canada: Northwest Territories, Mackenzie District, Virginia Falls, spray zone, Scotter 22277 (NY). Thus, propagula production and gametophore morphology are not necessarily tied and the situation may not have a simple explanation. The relationship of propaguliferous and non-propaguliferous expressions of D. michiganensis with D. fallax may be similar in evolutionary origin to the relationship of D. brachyphyllus and D. reedii with D. vinealis.

17. Didymodon fallax (Hedw.) Zander, comb. nov.

Basionym: Barbula fallax Hedw., Spec. Musc. 120. 1801.

There are three specimens named as Barbula fallax in the Hedwig-Schwaegrichen herbarium at G. The lectotype, labeled "Barbula fallase Hedw. St. Crypt. Vol. 1. p. 62. t. 24. Chemmitis lecta," is of operculate, fruiting plants of B. fallax that are well within the concept of the species described by Steere (1938a) and which is recognized in the present study. Another specimen, labeled "Barbula fallase Hedw. St. Crypt. Bryum Delen. 46 ese ipso cryptg. Herbario," is of deoperculate plants of D. rigidulus that lack propagula. A third, labeled "Barbula fallax e Brid. Br. imberbe... Ehrhardt," consists of dioicous (!) plants of Bryoerythrophyllum recurvirostrum (Hedw.) Chen (not B. rubrum (Jur.) Chen cf. Zander 1978a). Following recommendation 7B of the 1969 I.C.B.N., my choice of the first specimen as lectotype preserves current usage, is in consonance with the protologue, and, of the three specimens, in fact fits the protologue best. The species D. fallax, D. rigidicaulis and D. giganteus in North America are possibly better recognized as a single polymorphic species because of the large number of plants that are intermediate in character.

18. Didymodon rigidicaulis (C. Muell.) K. Saito [columb.]

This taxon has been treated as the synonym (see Saito 1975) Barbula reflexa (Brid.) Brid. in most American manuals. It is a species intermediate in character between D. fallax and D. giganteus. Very large forms in the Pacific Northwest occasionally grade into D. giganteus or have margins weakly dentate above midleaf, approaching the Asiatic D. erosodenticulatus (C. Muell.) K. Saito. Similar large forms described as Barbula maxima Syed & Crundw. (Ireland: Sligo Co., Crundwell & Warburg, 1962—NY), occur in western Ireland. The disjunction of these unusually robust expressions parallels an East-West intercontinental disjunction of the Andean species Bryoerythrophyllum jamesonii (Tayl.) Crum, which has been collected in the Queen Charlotte Islands of British Columbia and in Scotland (Zander 1978a), being one of many examples of species disjunctive in range between northern areas of marine or hyperoceanic climate with precipitation maxima in winter. Regional climate probably has allowed expression or selection for large size, which has reached an end point in the B. fallax complex in D. giganteus. Didymodon rigidicaulis is often reddish in coloration, paralleling reddish forms in other sections of the genus.

Another, more consistently reddish species of the sect. Graciles is:

Didymodon laevigatus (Mitt.) Zander, comb. nov.

Basionym: Tortula laevigata Mitt., Jour. Linn. Soc. Bot. 12: 160. 1869.

This species is Andean, Middle American montane and West Indian in range and differs from D. rigidicaulis by the long-lanceolate leaves, acuminate from a broad leaf base, spreading but not or only weakly recurved when moist, upper laminal cells 8-10  $\mu$ m wide, very thick-walled and lumina round to oval or rounded-trapezoidal, epapillose. The lectotype (by Steere 1948) and syntype specimens at NY(!) are far more robust—the plants reaching to 8 cm long—than specimens I have seen from Costa Rica: Cartago Prov., Cerro de la Muerte, King C-1276 (US) or Jamaica: Morce's Gap, Britton 161 (NY), which do not exceed 2.5 cm in length. A combination in Didymodon is made here as the species is apparently rather widely distributed and may well occur north of Mexico. It may be distinguished from specimens of the reddish species D. nigrescens that have elongate adaxial costal cells by the entire leaf margins and the strong costa, which is usually 3-5 cells wide adaxially above midleaf.

19. Didymodon giganteus (Funck) Jur. [columb.]

Collections of this species from Alaska intergrade somewhat with D. rigidicaulis and also have occasional denticulations on the upper leaf margins. Mainly on account of the highly porose or trigonous upper leaf cells, some authors recognize this species in the monotypic genus Geheebia Schimp. but it certainly belongs in the D. fallax complex. Both D. giganteus and D. rigidicaulis have leaf cells usually somewhat larger (10-14  $\mu$ m wide) than those of D. fallax (8-10  $\mu$ m wide).

20. Didymodon leskeoides K. Saito

This boreal-montane species differs from D. fallax by the often flagellate stem apices, the auricled basal leaf margins and the often long, whip-like acumination of the leaf apex (illustrated by Saito 1975). It was described only recently by Saito (1975) from Japan, and I have seen collections from India: N. Uttar Pradesh, above Almora, Pindari Glacier, Srivastava 2839 (BUF) and Canada: Northwest Territories, South Nahanni R., Virginia Falls, spray zone, Scotter 22439 (NY); Nahanni Mtns., N slope, alpine tundra, Vitt 20251 (ALTA).

21. Didymodon tophaceus (Brid.) Lisa

This is a polymorphic species usually found on calcareous rock in seepage or in other wet sites. Variation in peristome development is considerable and is discussed by Andrews (1941). All American specimens that I have seen may be referred to the sect. Graciles in possessing leaves often apically denticulate when robust, the elongate adaxial costal cells, the often strong adaxial stereid band, the large leaf cells often 12-14  $\mu\text{m}$  wide with rounded lumina and simple, hemispherical to rounded-conic papillae that often occur singly over each lumen. Also, authors of major identification manuals have reported that the spores mature usually in winter, or occasionally spring, in the north temperate zone. The large decurrencies emphasized as a taxonomic character for D. tophaceus by Conard (1945) are described as characteristic for sect. Graciles by Saito (1975); however, as Conard notes (1951) such decurrencies are often present in species placed here in sect. Vineales, namely D. occidentalis and D. vinealis. Some American authors recognize D. luridus Hornsch. in Spreng. (= D. trifarius of most authors but not Hedwig, fide Zander 1978c) as a good species, placing it close to D. tophaceus in relationship. I agree with Crum, Steere and Anderson (1973) that true D. luridus has not been found in North America north of Mexico. Judging from European collections at BUF, D. luridus is unrelated to D. tophaceus, being in sect. Didymodon very near D. acutus. Its spores mature at the same time as those of D. tophaceus but this is perhaps an adaptation to the similar, nearly constantly moist habitat. Some collections of small plants of D. tophaceus may be similar to D. luridus in bearing leaves appressed when dry, little recurved when moist, short-ovate and acute, costa short-excurrent or percurrent; however, D. luridus differs in the leaf cells being very small, 7-9  $\mu\text{m}$  wide, evenly quadrate (to hexagonal), and the superficial cells of both adaxial and abaxial sides of the costa being similar to the laminal cells, quadrate at least in the upper 1/2 of the costa. Most plants of D. tophaceus can be readily distinguished from D. luridus under the dissecting microscope by the often blackish color of some leaves, the leaves spreading and curled when dry and often recurved when moist, with strong, often reddish costae and blunt leaf apices.

## EXCLUDED SPECIES

Didymodon columbianus Herm. & Lawt. is now treated as a species in the genus Bryoerythrophyllum (Zander 1978a). I agree with Crum, Steere and Anderson (1973) that the Florida collection of D. fuscoviridus Card. reported by Reese (1956) is D. rigidulus. Didymodon parvulus (Kindb.) E.G. Britt. is Distichium inclinatum (Hedw.) B.S.G. (fide Steere & Crum 1977).

## ACKNOWLEDGMENTS

I thank H.A. Crum, W.J. Hoe, W.B. Schofield, W.C. Steere, D.H. Vitt and I.A. Worley for comments, suggestions and criticism. I am grateful to the curators of the herbaria mentioned in the text for loan of specimens. P.M. Eckel checked the Latin.

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STUDIES IN THE HELIANTHEAE (ASTERACEAE). XV.

VARIOUS NEW SPECIES AND NEW COMBINATIONS.

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The following new combinations and new species result from various studies involving the tribe Heliantheae.

Alloispermum colimense (McVaugh) H. Robinson, comb. nov.  
Calea colimensis McVaugh, Contr. Univ. Mich. Herb. 9 (4): 410. 1972.

Alloispermum steyermarkii H. Robinson, sp. nov.  
Plantae scandentes. Caules teretes dense fulvo-hirsuti. Folia opposita, petiolis 7-8 mm longis; laminae ovato-lanceolatae plerumque 7-8 cm longae et 2.5-3.2 cm latae base obtusae valde trinervatae margine remotae serratae apice caudato-acuminatae supra sparse pilosae subtus dense pilosae in nervis perdense pilosae. Inflorescentiae in ramis terminales in paniculis brevibus foliosae, pedicellis 5-7 mm longis dense hirsutis. Capitula 7-8 mm alta et 5-6 mm lata; squamae involucri ca. 12 lanceolatae 5-6 mm longae inferne ca. 2 mm latae inferne pallide induratae apice longe acuminatae intus glabrae exteriores extus dense hirsutae; paleae lineares 6-7 mm longae. Flores radii 5; corollae albae, tubis ca. 2.7 mm longis dense pilosulis, limbis oblongis 7 mm longis et 3.5 mm latis apice valde trilobatis. Achaenia radii ca. 1.8 mm longa glabra; pappus nullus. Flores disci ca. 15; corollae flavae 5.0-5.5 mm longae extus ubique dense pilosulae, tubis ca. 1.8 mm longis, faucis subcylindricis vix infundibularibus ca. 2.8 mm longis, lobis ca. 0.7 mm longis et 0.45 mm latis, ductis longitudinalibus medianis plerumque praesentibus. Achaenia disci 2.0-2.3 mm longa pilosula; squamae pappi ca. 20 plerumque ca. 5 mm longae. Grana pollinis ca. 30  $\mu$  in diametro.

TYPE: VENEZUELA: Tachira: entre Las Delicias y Villa Páez, arriba del Río Táchira, a lo largo de la frontera Colombo-Venezolana, alt. 1500-1920 m. 16-26 Mayo 1967. Steyermark, Dunsterville & Dunsterville 98862 (Holotype, US).

Alloispermum steyermarkii is closely related to the common and variable A. caracasenum (HBK) H. Robinson of northern South America which it resembles in most characters. The new species is unique in the genus, however, in the extremely long tips of the involucre bracts. Though only one specimen has been seen, there is no approach to the condition in any of the innumerable specimens of A. caracasenum that have been seen.

Another less distinctive entity in the A. caracasenum relationship has not seemed worthy of species level recognition, but is represented by a few specimens from the NE Colombia - Western Venezuela area. The specimens are distinctive in the rather slender petioles and the acute bases of the leaf blades. The leaf shape and the more sparsely pubescent stems suggest a somewhat intermediate status between A. caracasenum and A. lindenii (Sch. Bip. ex Wedd.) H. Robinson. The specimens tend to have smaller heads than usual in either species. The three specimens seen are as follows.

COLOMBIA: Santander: este de Bucaramanga, Araque Molina & Barkley 18 S.416 (US). VENEZUELA: Trujillo: Alrededores de La Morita, arriba de Jajó, Aristeguieta 3442 (US); Zulia: Sierra de Perijá, entre el pie de la Loma que conduce hacia el Pishikakao y el Campamento Base, a lo largo del Río Omira-kuná (Tumurisasa), cerca de la frontera Colombo-Venezolana. Steyermark, Dunsterville & Dunsterville 105742 (US).

Calyptocarpus biaristatus (DC.) H. Robinson, comb. nov.

Blainvillea biaristata DC., Prodr. 5: 492. 1836.

The new combination reflects the transfer of all of the subgenus Oligogyne from Blainvillea to Calyptocarpus. A second South American species, C. bahiensis (DC.) Sch. Bip. has previously been placed in the genus.

Kingianthus paniculatus (Turcz.) H. Robinson, comb. nov.

Wedelia paniculata Turcz., Bul. Soc. Nat. Mosc.

24 (2): 69. 1851. Examination of the original description and a photograph of the type show this name represents the same entity described by Hieronymus as Zaluzania sodiroi.

Zexmenia kingii H. Robinson, sp. nov.

Plantae frutescentes ad 4 m altae. Caules pallide fulvescentes leniter sexangulares appresse antrorse strigosi. Folia opposita, petiolis 5-11 mm longis; laminae ovatae 4-6 cm longae et 2.0-3.3 cm latae base obtusae valde trinervatae margine serrulatae apice anguste breviter acuminatae supra leniter bullatae

antrorse strigosae subtus dense strigulosae. Inflorescentiae dense cymoso-paniculatae, pedicellis plerumque 1.5-2.5 cm longis dense appresse antrorse strigosis. Capitula late campanulata ca. 15 mm alta et 10 mm lata praeter flores radii squamae involucri ca. 12 oblongae vel obovatae 9-11 mm longae et 2.5-3.5 mm latae superne herbaceae apice obtusae utrinque scabridae; paleae anguste oblongae ca. 10 mm longae ad medio trilobatae apice anguste acutae. Flores radii ca. 14; corollae flavae, tubis 2.0-2.5 mm longis glabris, limbis 13-15 mm longis et 3 mm latis apice bidentatis extus minute scabridae et puberulae. Flores disci ca. 45; corollae flavae ca. 8 mm longae, tubis 2.0-2.5 mm longis glabris, faucis ca. 5 mm longis cylindricis glabris in nervis fibrosis, lobis ca. 0.8 mm longis et 0.5 mm latis intus margine et superne valde papillois extus dense scabridae; filamenta in parte superiore 0.3-0.4 mm longa; thecae 2.5-2.8 mm longae; appendices antherarum flavae ovatae ca. 0.7 mm longae et 0.4 mm latae extus glabrae. Achaenia 4.5-5.0 mm longa albescentia scabrida late alata biaristata (triaristata in achaeniis radii), aristis 1-3 mm longis plerumque inaequalibus, squamellis ad 0.3 mm longis. Grana pollinis ca. 30  $\mu$  in diametro.

TYPE: GUATEMALA: Baja Verapaz: along the road to San Jeronimo, ca 4 kms generally E of Salama. El. ca 3400 ft. Shrubs to 4 meters tall, flowers yellow. 23 June 1976. King & Renner 7093 (Holotype, US).

Zexmenia kingii is apparently closely related to Z. salvinii Hemsl. of Mexico and northern Central America, and specimens were originally distributed under that name. The latter differs by the densely somewhat retrorsely hispid stems, the generally shorter and stouter petioles, the more erect pubescence on the leaves and involucre bracts, and the black appendages on the anthers. The whitish color and scabrous surface of the mature achenes in the new species seem normal but more specimens should be checked for confirmation.



HERBARIUM NACIONAL DE COLOMBIA  
Bogotá, Colombia  
See also the herbarium of the Department of Agriculture

MINISTERIO DE AGRICULTURA Y GRIA  
HERBARIUM NACIONAL DE COLOMBIA

1952  
Colección Científica (Herbario) No. 107  
Herb. Bogotense (1952)

Shrub, 10 m. tall; leaves membranous, rich green and glabrous above, paler green below; rays white; fruit 1.5 cm. diam.

Collected by J. A. Steyermark, G. C. K. & E. Dunsterville

Julian A. Steyermark, G. C. K. & E. Dunsterville

UNITED STATES

2622522

NATIONAL HERBARIUM

Alloispermum steyermarkii H. Robinspn, Holotype, United States National Herbarium. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.



B.M.K.  
2005

*Zexmenia kingii* Robinson  
 Specimen deposited in the Herbarium of the University of California, Berkeley  
 Holotype

PLANTS OF GUATEMALA

*Zexmenia kingii* Robinson  
 Holotype, Guatemala, Dept. of Guatemala, near Guatemala City, 1978  
 No. 2799522

UNITED STATES

2799522

NATIONAL HERBARIUM

Specimen loaned to the United States National Herbarium

*Zexmenia kingii* H. Robinson, Holotype, United States National Herbarium.



Enlargements of heads. Top: Alloispermum steyermarkii. Bottom: Zexmenia kingii.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XIV.

VALIDATION OF SUBTRIBES.

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The following subtribes require validation for inclusion in a review of the tribe Heliantheae. The complete descriptions and discussions of all the subtribes will be published separately.

Clappiinae H. Robinson, subtribus nov.

Plantae frutescentes glabrae leniter carnosae; folia alternata. Capitula epaleacea; receptacula interdum setifera; squamae involucri subimbricatae 2-3-seriatae; flores radii feminei, cellulis adaxialibus elongatis sublaevibus; flores disci numerosi hermaphroditi, lobis longioribus quam latioribus laevibus; thecae antherarum pallidae, cellulis endothecialibus oblongis in parietibus transversalibus 1-2-noduliferis; appendices antherarum non glanduliferae; rami stylorum abaxialiter superne papilloso, lineis stigmataceis duplicibus; canales resiniferi plerumque in parte rubrescentes saepe in faucis et interdum in stylis solitarii inter nervis binis. Achaenia prismatica costata nigrescentia indistincte striata regulariter nigro-nodulifera; carpodia externe distincta; cellulae superficiales ovarularum elongatae annulate ornatae; pappus radialis setiformis ca. 3-seriatus. Grana pollinis 35-40  $\mu$ m in diam.

Type genus: Clappia A.Gray

Clibadiinae H. Robinson, subtribus nov.

Plantae suffrutescentes vel frutescentes interdum arborescentes; folia opposita. Inflorescentiae valde cymosae saepe scorpioideae. Capitula interdum paleacea. Flores radii feminei 1-29, corollae minutae, lineis stigmataceis duplicibus. Flores disci 1-22 masculi non fibrosi, lobis intus leniter vel valde mammosis extus erecte setiferis, setis in cellulis penultimis longioribus papilloso in cellulis ultimis brevioribus argute apiculatis laevibus; thecae et appendices antherarum nigrescentes, cellulis endothecialibus in parietibus transversalibus 2-4-noduliferis, appendices interdum glanduliferis; styli indivisi non stigmatiferi; canales resiniferi in

faucis solitarii rubrescentes. Achaenia radii nigrescentia non striata; cellulae exteriores ovularum elongatae vel irregulares in parietibus ornatis; pappus nullus. Grana pollinis 23-30  $\mu\text{m}$  in diam.

Type genus: Clibadium L.

Coulterellinae H. Robinson, subtribus nov.

Plantae frutescentes glabrae carnosae; folia inferne opposita. Capitula in apicem ramorum umbellate aggregata; involucrium in cyatheo utriculiforme connatum; flores 1 (raro 2) in capitulo regulares hermaphroditi, corollae virido-flaves decemnervatae, faucis brevibus, lobis elongatis laevibus in medio valde nervatis; thecae antherarum pallidae, cellulis endothelialibus oblongis in parietibus transversalibus 1-2-noduliferis; appendices antherarum minute glanduliferae; rami stylo abaxialiter ubique papilloso, lineis stigmataceis duplicibus; canales resiniferi indistincti. Achaenia prismatica nigrescentia striata; cellulae superficiales ovularum elongatae in parietibus lateralibus leniter ornatae; pappus nullus. Grana pollinis ca. 40  $\mu\text{m}$  in diam.

Type genus: Coulterella Vasey & Rose

Desmanthodiinae H. Robinson, subtribus nov.

Folia opposita. Inflorescentiae scorpioideocymosae vel syncephalatae. Capitula pauciflora epaleacea; flores radii feminei; corollae elimbatae vel adaxialiter papillosae et trilobatae, lineis stigmataceis duplicibus; flores disci masculi, lobis et interdum faucis intus papillosis, lobis oblongo-ovatis extus setiferis, setis simplicibus; thecae pallidae, cellulis endothelialibus radialiter nodulifera vel in parietibus transversalibus 3-5-noduliferis; appendices antherarum interdum glanduliferae; styli indivisi non stigmatiferi; canales resiniferi flavescentes in faucis bini, ad marginem et interdum in medio loborum, in stylo interiores. Achaenia obovata complanata nigrescentia striata vel non striata; cellulae exteriores ovularum inornatae?; pappus nullus. Grana pollinis ca. 25  $\mu\text{m}$  in diam.

Type genus: Desmanthodium Benth.

Dimeresiinae H. Robinson, subtribus nov.

Plantae herbaceae; folia basilaria, petiolis subdistinctis. Capitula in glomerulis sessilibus aggregata; flores 2-3 in capitulo regulares masculi; corollae rubrescentes 5-lobatae, lobis ovatis intus valde papillosis extus glabrous; thecae antherarum pallidae, cellulis endothelialibus mediis elongatis



ellipticis in apices uni-noduliferis; appendices antherarum glanduliferae; basi stylorum valde noduliferi, ramis abaxialiter fere ad basem papillosis, lineis stigmataceis duplicibus; canales resiniferi indistincti non rubrescentes. Achaenia teretes castanea striata; cellulae superficiales ovularum in parietibus valde sinuosae leniter ornatae; pappus in monade facile deciduus base retrovolutus, segmentis supra basem distinctis latis longe fimbriatis. Grana pollinis ca. 30  $\mu\text{m}$  in diam.

Type genus: Dimeresia A.Gray

Guardiolinae H. Robinson, subtribus nov.

Plantae suffrutescentes glabrae vel subglabrae; folia opposita simplices. Capitula in inflorescentibus terminalibus aggregata paleacea; squamae involucri subaequilongae; flores radii feminei, limbis albis adaxialiter papillosis; rami stylorum magni, lineis stigmataceis duplicibus; flores disci masculi; corollae profunde 5-lobata, lobis intus inferne laevibus superne valde papillosis; filamenta in parte inferiore dense pilosa; thecae antherarum viridescens, cellulis endothecialibus medianis in parietibus lateralibus valde noduliferis; appendices antherarum glanduliferis, glandulis magnis 1-2 in appendice; rami stylorum elongati abaxialiter dense argute papilloso intus inferne in lineis stigmataceis duplicibus obsoletis saepe ornati; canales resiniferi rubrescentes in bracteis involucri numerosi, in faucis corollarum disci indistincti, in lobis distincti. Achaenia radii leniter planata valde indurata nigrescentia distincte striata; cellulae superficiales ovularum leniter irregulares et valde irregulariter ornatae; pappus nullus. Grana pollinis 30-35  $\mu\text{m}$  in diam.

Type genus: Guardiola Cerv, ex H. & B.

Heptanthinae H. Robinson, subtribus nov.

Plantae rosuliformes erectae; folia basilaria distincte petiolata. Capitula solitaria longe pedunculata pauca paleacea vel epaleacea; squamae involucri ca. 2-seriatae; flores radii feminei; corollae adaxialiter papillosae apice bilobatae; lineae stigmataceae duplices; flores disci masculi; corollae breviter lobatae, lobis intus subpapillosis; thecae antherarum leniter nigrescentes, cellulis endothecialibus brevibus subradialiter noduliferis in parietibus interioribus saepe valde ornatis; appendices antherarum non glanduliferae; rami stylorum distincti dense longe papilloso; canales resiniferi indistincti. Achaenia radii polygonalia vel teretia brunnescentia non

striata interdum alata; cellulae superficiales ovularum aliquantum subquadratae valde ornatis; squamellae aut subulae pappi radialiter dispositae; achaenia disci linearia inornata. Grana pollinis 25-35  $\mu\text{m}$  in diam.

Type genus: Heptanthus Griseb,

Marshalliinae H. Robinson, subtribus nov.

Plantae herbaceae; folia basilaria vel alternata. Capitula valde paleacea; flores radii nulli; flores disci vioscentes hermaphroditi, tubis linearibus dense puberulis, faucis perbrevis, lobis linearibus puberulis et glanduliferis; thecae antherarum leniter vioscentes, cellulis brevibus in parietibus transversalibus 2-4-noduliferis; appendices antherarum carinatae; rami stylorum reflexi fere ad apicem stigmatiferis, lineis stigmataceis duplicibus; canales resiniferi indistincti. Achaenia prismatica 5-costata setifera et glandulifera, nervis intercostalibus distinctis minoribus, parietibus non nigrescentibus, cellulis laxe quadratis vel oblongis, raphidibus minutis; carpodia symmetrica annuliformia, cellulis latioribus quam longioribus; squamae pappi 5 triangulare-ovatae acutae extus scabridae. Grana pollinis ca. 40  $\mu\text{m}$  in diam.

Type genus: Marshallia Schreb.

Montanoinae H. Robinson, subtribus nov.

Plantae frutescentes vel arborescentes; folia opposita. Inflorescentiae corymboso-paniculatae. Capitula paleacea, paleis veteribus accrescentibus; flores radii steriles; flores disci hermaphroditi; corollae omnes abaxialiter stomatifera adaxialiter papillosae; thecae antherarum nigrescentes, cellulis endothecialibus brevibus in parietibus transversalibus 2-3-noduliferis; appendices antherarum ovatae abaxialiter glanduliferae et setiferae; lineae stigmataceae duplices; canales resiniferi non rubrescentes. Achaenia disci teretia vel prismatica nigrescentia striata; cellulae superficiales ovularum leniter ornatae; pappus nullus. Grana pollinis ca. 25-35  $\mu\text{m}$  in diam.

Type genus: Montanoa Cerv. in Llave & Lex.

Pinillosinae H. Robinson, subtribus nov.

Plantae minute herbaceae repentes; folia opposita distincte petiolata, laminis suborbicularibus palmatinervis. Capitula longe pedunculata solitaria; squamae involucri 4; flores feminei et flores masculi uterque 2 collaterales; corollae feminae obsoletae; rami stylorum magni elongati, lineis stigmataceis

duplicibus; flores masculi bracteis involucri minora oppositi; corollae in tubis et lobis elongatis, faucis subnullis, lobis intus dense valde papillosis; thecae antherarum nigrescentes, cellulis endothecialibus latioribus quam longioribus vel subquadratis radialiter noduliferis; appendices antherarum subnullae; rami stylorum distincte non stigmatiferi apice patelliformes et dense papilloso; canales resiniferi indistincti. Achaenia prismatica quadrilobata nigrescentia non striata; cellulae superficiales ovularum planae; pappus nullus. Grana pollinis ca. 25  $\mu$ m in diam.

Type genus: Pinillosa Ossa ex DC.

Polymniinae H. Robinson, subtribus nov.

Plantae herbaceae vel frutescentes; folia opposita. Inflorescentiae diffusae vel terminales cymosae. Capitula paleacea; flores radii feminei; corollae minute limbatae adaxialiter sublaeves apice subtiliter bilobatae; styli prominentes, lineis stigmataceis duplicibus; flores disci masculi; corollae in lobis intus non papillosae, cellulis elongatis; thecae antherarum pallidae, cellulis endothecialibus brevibus in parietibus transversalibus 2-3-noduliferis, appendices antherarum glanduliferae vel non glanduliferae; styli indivisi vel breviter divisi non stigmatiferi; canales resiniferi saepe subrubrescentes in faucis solitarii in lobis marginales in stylis interioribus. Achaenia radii vix complanata aut vix compressa nigrescentia non striata; cellulae superficiales ovularum plerumque elongatis leniter ornatae; pappus nullus. Grana pollinis 25-27  $\mu$ m in diam.

Type genus: Polymnia L.

Rudbeckiinae H. Robinson, subtribus nov.

Plantae herbaceae; folia alternata. Capitula solitaria vel subsolitaria paleacea; receptacula alte conica vel columnaria; flores radii steriles; flores disci hermaphroditi, corollae adaxialiter distaliter papillosae; thecae antherarum nigrescentes, cellulis endothecialibus plerumque radialiter noduliferis; appendices antherarum abaxialiter glanduliferae; lineae stigmataceae duplices; canales resiniferi in faucis solitariis partialiter rubrescentes. Achaenia compressa vel subprismatica nigrescentia striata; cellulae superficiales ovularum non vel leniter ornatae; pappus nullus vel biaristatus. Grana pollinis ca. 23-27  $\mu$ m in diam.

Type genus: Rudbeckia L.

Varillinae Turner & Powell ex H. Robinson, subtribus nov.

Varillinae Turner & Powell, Biol. and Chem. Comp. 719. 1977 (1978), nom. nud., in part.

Plantae frutescentes in sicco perfragiles; folia alternata vel opposita. Capitula paleacea; squamae involucri ca. 3-seriatae inaequales in medio prominentiter rubro-striatae; paleae bracteiformes; flores radii nulli; flores disci hermaphroditi, lobis laevibus, nervis in faucis binis, canalis resiniferis in faucis solitariis inter nervos rubrescentibus; thecae antherarum pallide, cellulis endothelialibus breviter oblongis in parietibus transversalibus plerumque 2-noduliferis; appendices antherarum non glanduliferae; rami stylorum in lineis stigmataceis duplices. Achaenia prismatica costata nigrescentia pauce vel non striata; cellulae superficiales ovularum non ornatae; carpodia inter lobos costarum obsoleta; pappus verus nullus. Grana pollinis 30-35  $\mu$ m in diam.

Type genus: Varilla A. Gray

Turner and Powell failed to cite a definite type genus for the subtribe. A new latin description has been prepared because of the altered delimitation of the subtribe.

Zaluzaniinae H. Robinson, subtribus nov.

Plantae herbaceae vel frutescentes; folia alternata. Capitula paleacea; receptacula convexa vel breviter conica; flores radii feminei adaxialiter papilloso apice bilobatae vel obscure trilobatae; flores disci hermaphroditi; corollae base saepe retrorse productae extus dense pubescentes, pilis obtusis vel glanduliferis, lobis intus subabrupte papilloso; thecae antherarum nigrescentes, cellulis endothelialibus brevibus subradialiter noduliferis in parietibus transversalibus ca. 4-noduliferis; appendices antherarum glanduliferae; rami stylorum intus ubique stigmatiferis; canales resiniferi leniter vel non flavescentes, canales in faucis corollarum ad nervam solitarii plerumque distincti. Achaenia leniter compressa nigrescentia striata; cellulae superficiales ovularum non sinuosae in parietibus inornatae; pappus nullus. Grana pollinis 25  $\mu$ m in diam.

Type genus: Zaluzania Pers.

STUDIES IN THE LIABEAE (ASTERACEAE). XIII.

A NEW SPECIES OF LIABELLUM FROM

NAYARIT, MEXICO.

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Liabellum of southwestern Mexico has been represented in the literature by three species since 1927 when the genus was established by Rydberg. At that time the genus was known only from Jalisco. Subsequent collections have extended the range of the genus northward to Nayarit and eastward to the State of Mexico, but no additional species have been proposed. Now a fourth species has been encountered among specimens examined at the Duke University Herbarium. The 1951 collection by Howard Scott Gentry from Nayarit had been annotated as Liabum cf. palmeri A.Gray. The new species is named here after the collector.

The specimen of Liabellum gentryi is a low unbranched perennial herb as is typical for the genus. The type specimen lacks the characteristic tuber but it is mentioned in the label data. In the Rydberg key to the species the plant would run to L. palmeri (A.Gray) Rydberg by the leaves not being divided to the base and by the inflorescence bearing gland-tipped hairs. The scapose alternately branching inflorescence seems to confirm closest relation to that species.

The new species differs from L. palmeri by numerous characters including a few that are rather obvious. The leaves of L. gentryi are completely unlobed, a feature not seen elsewhere in the genus. In L. palmeri some leaves have short lobes but lobes are always present. The leaf undersurface shows prominent brown coloration along the veins and veinlets while L. palmeri has whitish coloration over the entire undersurface. Liabellum gentryi has generally smaller heads with fewer involucre bracts. The bracts are distinctly acuminate at the tip and have white arachnoid tomentum on the outer surface contrasting with the reddish stipitate glands. The involucre bracts of L. palmeri are nearly twice as numerous with evenly tapering tips or even narrowly obtuse tips. The outer surface is densely pilose but not tomentose. The

pappus setae of L. gentryi have rather truncated and sometimes slightly broadened tips and the short outer series consists of scarcely noticeable narrow squamellae. In L. palmeri the pappus setae have pointed tapering tips and the outer series consists of distinct rather broad squamellae. Additional specimens might show that the corollas of L. gentryi vary in pubescence, but the type specimen shows no glandular hairs. In L. palmeri a few long-stipitate glands are usually present on the tips of the corolla lobes.

Liabellum gentryi H. Robinson, sp. nov.

Plantae herbaceae perennes acaulescentes vel breviter caulescentes tuberosae. Folia basilaria opposita sessilia; laminae ovatae vel oblongo-ellipticae 9-12 cm longae et 3.0-6.2 cm latae base interdum abrupte constrictae et petioliformes margine minute irregulariter serrulatae apice obtusae supra dense sordido-pilosae et arachnoideo-tomentosae subtus dense albo-tomentosae in nervis et nervulis brunnescentes fere ad partem quartam inferiorem trinervatae vel subtrinervatae. Inflorescentiae scaposae subcorymbosae paucicapitatae; scapis albo-tomentosis, pilis rubescentibus, ramis alternatis 3.5-8.0 cm longis tomentosae et sparse stipitato-glanduliferis. Capitula late campanulata 10-13 mm alta et 12-16 mm lata; squamae involucri ca. 20 ca. 4-seriatae inaequales anguste ovatae vel anguste lanceolatae 6-12 mm longae et ca. 2 mm latae apice anguste acutae vel acuminatae extus albo-tomentosae et dense glanduliferae, glandulis longe stipitatis et rubescentibus. Flores ca. 25-30 in capitulo discoidei; corollae flavae anguste infundibulares ca. 12 mm longae extus ubique hirsutae superne sparse tomentosae, pilis non glanduliferis, pilis hirsutii in cellulis biseriatis interdum subclavatis, tubis 5-6 mm longis, faucis ca. 3 mm longis, lobis anguste oblongis 3.0-3.5 mm longis et ca. 0.8 mm latis; filamenta in parte superiore ca. 0.4 mm longa; thecae antherarum ca. 3.5 mm longae; appendices antherarum oblongo-ovatae ca. 0.5 mm longae et 0.3 mm latae. Achaenia immatura ca. 2 mm longa dense setifera; setae pappi ca. 50 plerumque 5-8 mm longae 2-3-seriatae exteriores breviores interdum 1-2 mm longis, setae interiores apice truncatae. Grana pollinis ca. 40-45  $\mu$ m in diam.

TYPE: MEXICO: Nayarit: Arroyo del Obispo, 31 miles southeast of Tepic. Canyon with running stream in Oak Woodland. On rocks. Perennial from tuberous root; leaves sericeous, tinged with purple; flowers yellow. August 2, 1951. H.S.Gentry 11030 (Holotype

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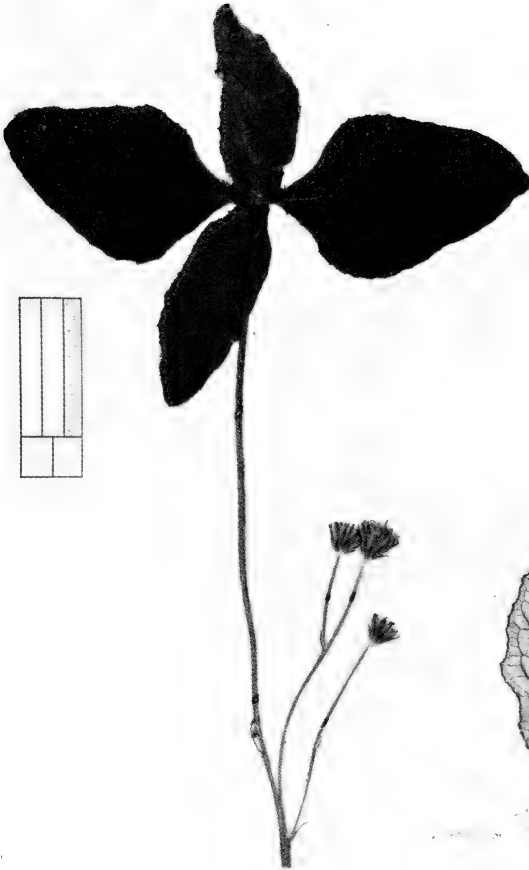
Rydberg, A. 1927. Tribe 13. Liabeae in (Carduales) Carduaceae. Liabeae, Neurolaeneae, Senecioneae (pars). North American Flora 34 (4): 289-301.

## Correction

Sinclairia broomeae H. Robinson

This species was published as S. broomei in Phytologia 33 (4): 287. 1976. The species honors Dr. Rose Broome and should be corrected to S. broomeae.

HERBARIUM  
202172



PLANTS OF NAYARIT, MEXICO

*Liabrum* cf. *palmeri* A. Gray

Arroyo del Obispo, 31 miles southeast of Tepic,  
August 2, 1961

Common with running stream in Oak Woodland

Epiphytic from toberas roots; leaves scabrous,  
tinged with purple; flowers yellow.  
On rocks.

Collected by Howard Scott Gentry No. 1477

Liabellum gentryi H. Robinson, Holotype, Duke University. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.





Enlargement of heads of Liabellum gentryi.

Chemosystematic Notes on the Asteraceae I  
New Correlations in Subtribes  
of the Heliantheae

H. Robinson<sup>1</sup>, F. Bohlmann<sup>2</sup> and R. M. King<sup>1</sup>

Abstract

Among the Heliantheae with paleaceous receptacles, Polyacetylenes of the dehydrofalcarinone type containing a ketone unit are correlated with the redelimited subtribes Helianthinae containing *Lagascea* and the Galinsoginae containing *Alloispermum*. The Neurolaeninae containing *Calea* lack such polyacetylenes but contain thymol derivatives. *Coulterella* with a thiophene type of polyacetylene and thymol derivatives is placed in a subtribe Coulterellinae near the epaleaceous subtribes Pectidinae and Flaveriinae.

Chemosystematics has enjoyed some important success in the tribe Heliantheae. In the sesquiterpene lactones Herz (1977) has shown that the Ambrosanolides are essentially restricted to the subtribe Ambrosiinae and the Helenolides are almost completely restricted to the subtribe Gaillardiiinae. One group of polyacetylenes, the epoxysulfones are found only in the Gaillardiiinae (Bohlmann, 1973; Swain & Williams, 1977). The correlations were possible because of the comparatively accurate concepts of the subtribes in the traditional classifications. Chaotic concepts of other subtribes in the Heliantheae has prevented meaningful interpretation of other chemical data, however.

The recent revisions of the tribes Heliantheae (Stuessy, 1977) and Helenieae (Turner & Powell, 1977) for the Reading Symposium provide a number of changes. The most significant was the reduction of the artificial subtribe Lagasceinae which had contained two genera, *Lagascea* and *Coulterella* having single-flowered heads. Unfortunately Stuessy's placement of *Lagascea* in the Verbesiniinae was already superceded by the time of publication by his correct though perhaps inadvertent placement of the genus

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in the subtribe Helianthinae (Stuessy, 1976). Stuessy in both treatments, following the suggestions of King & Robinson, removed the genus *Coulterella* to a position near the genus *Flaveria* which he placed in the Senecioneae.

The present paper accepts the position of *Lagascea* in the Helianthinae but utilizes more extensively new data from a survey of the complete tribe Heliantheae by H. Robinson (in press) which is based heavily on anatomical characters. Significant rearrangements correlated with chemistry include: the redelimitation of Helianthinae to exclude *Encelia* and its immediate relatives, transfer of *Schistocarpha* to the Galinsoginae where it resides with *Bebbia* and *Tridax*, the segregation of *Alloispermum* of the Galinsoginae from *Calea* which is transferred to the Neurolaeninae (Robinson, 1978), the positioning of the Pectidinae and Flaveriinae as subtribes of the Heliantheae, and the recognition of subtribe Coulterellinae for the monotypic genus *Coulterella*. The full discussion of the changes should be sought in the paper by H. Robinson (in press).

Chemical analyses provided by Bohlmann of *Lagascea* (1973, 1978a) and *Coulterella* (1978b in press) are of particular interest in view of the juxtaposition in older classifications and in view of the distinctive groups in which they have been placed recently. The Helianthinae have paleaceous receptacles representative of the traditional tribe Heliantheae. The Flaveriinae lack paleae on the receptacles and are representative of the once segregated tribe Helenieae. The character of the paleae is of primary importance in the tribe but cannot be determined in single flowered heads like those of *Lagascea* and *Coulterella*.

Chemical analysis of *Lagascea* has shown a polyacetylene of the dehydrofalcarnone type containing a ketone unit (fig. 1). The genus also contains various diterpenes, coumarins, flavanoids and sesquiterpenes. In contrast, *Coulterella* contains in addition to the widespread pentacyclic a polyacetylene of the thiophene type (fig. 5) and several phenolics of the thymol type. (figs. 7 & 8). All of these show some significant correlations with the revised subtribal classification of the Heliantheae (Robinson, in press).

The dehydrofalcarnones or similar compounds have been reported from *Galinsoga*, *Tridax*, *Bebbia*, *Jaegeria*, and *Alloispermum* of the Galinsoginae, *Lagascea*, *Helianthus*, *Viguiera*, *Tithonia*, and *Simsia* of the Helianthinae and *Iva* of the Ambrosiinae. With the exception of *Iva*, this polyacetylene in addition to other constituents seems a marker for the two subtribes Helianthinae and Galinsoginae. In the same two subtribes the thiophenes are notably absent. In *Iva* which is not closely related to the Helianthinae or the Galinsoginae a thiophene occurs with the dehydrofalcarnone.

*Encelia* and *Flourensia* which have been excluded from the Heliantheae on anatomical basis have been examined chemically. The results are limited but dehydrofalcarinone types of polyacetylenes have not been found. *Calea* which has been separated from *Alloispermum* and removed to the subtribe Neurolaeninae has been examined a number of times, and as in *Nuerolaena*, (Bohlmann 1978b in press) there are only polyacetylenes lacking ketone units (figs. 2, 3, & 4) and there are no thiophenes.

Thymol derivatives are common in the Eupatorieae, Astereae and Inuleae but appear to be uncommon in the Heliantheae. They are now known from *Coulterella*, *Calea*, *Neurolaena*, *Porophyllum*, *Helenium* and *Gaillardia*. Of these, *Galea* and *Neurolaena* are placed together in the Neurolaeninae in the paleaceous Heliantheae. *Porophyllum* is a member of the Pectidinae, a subtribe near the Flaveriinae among the epaleaceous Heliantheae. *Helenium* and *Gaillardia* are in the Gaillardinae which differs by uncarbonized achenes. Certain features of *Coulterella* such as the fused involucre and the lack of sesquiterpene-lactone-bearing capitate glands are seen also in the Pectidinae and Flaverinae. *Coulterella* contains only a simple thiophene while the Pectidinae and Flaveriinae are notable for their complex thiophenes (fig. 6). Anatomy would dictate a separate subtribal status for *Coulterella* but chemical and anatomical data place the subtribe close to the Pectidinae and the Flaveriinae.

1  $H_2C = CHCO \quad C \equiv C \quad 2CH_2CH = CH (CH_2)_5 CH = CH_2$   
 as in Alloispermum integrifolium and A. scabrum

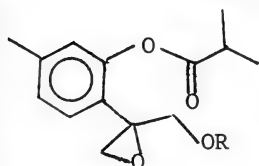
2  $H_3C (C \equiv C)_5 CH = CH_2$   
 as in Calea urticifolia

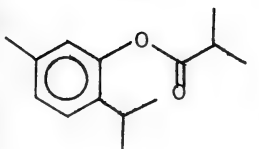
3  $H_3C CH = CH (C \equiv C)_2 (CH = CH)_2 (CH_2)_4 CH = CH_2$

4  $ROCH_2 CH = CH (C \equiv C)_2 (CH = CH)_2 (CH_2)_4 CH = CH_2$   
 R = H, Ac as in Calea zacatechichi

5  $H_3C \quad C \equiv C \quad \text{[thiophene ring]} \quad (C \equiv C)_2 \quad C = CH_2$   
 as in Coulterella

6  $\text{[thiophene ring]} \quad \text{[thiophene ring]} \quad C \equiv C \quad CH = CH_2$   
 as in Tagetes, Dyssodia & Flaveria

7  as in Coulterella  
 R = Ac, COCHMe<sub>2</sub>

8  as in Coulterella

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Keys to the Flora of Florida -- 8, Helianthus (Compositae) <sup>1</sup>

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**ABSTRACT:** An amplified key is presented to the 17 species of *Helianthus* (Compositae) recognized for Florida. Habitat, distribution, and synonymy are included. *Helianthus atrorubens*, *H. divaricatus*, *H. hirsutus*, *H. microcephalus*, *H. occidentalis*, and *H. resinusus* are northern species found sparingly in the Panhandle. *Helianthus heterophyllus*, *H. strumosus*, and *H. floridanus* occur in the northern part of the state, while *H. angustifolius*, *H. debilis* (with 3 native and one adventive subspecies), and *H. radula* are of wide distribution. *Helianthus agrestis* and *H. carnosus* are endemic to central and upper peninsular Florida, respectively. *Helianthus annuus*, *H. argophyllus*, and probably *H. simulans* are of cultivated origin. *Helianthus glaucus* and *H. tuberosus* are excluded.

Within the southeastern Compositae, *Helianthus* is among the largest genera, surpassed in number of species only by *Aster* and *Solidago*. Although many of the species are sharply distinguished, a series centering around *Helianthus strumosus* provides abundant interspecific hybrids, introgressants, and intraspecific variants. Fortunately for the Florida botanist, most of the populations in the state are peripheral to the continental centers of diversity of this group, and can readily be named.

No study of this genus may be made without extensive reliance on the excellent monograph of *Helianthus* by C. B. Heiser (Mem. Torrey Bot Club 22:1-218. 1969). Dr. Heiser has assisted further in providing commentary and herbarium documentation of critical Florida collections.

A special note is merited with regard to *Helianthus simulans*. This very tall slender plant which, at least in Florida, may be entirely derived from garden escapes, was confused by Small (1933) and others with the much smaller native *H. angustifolius*. Small's use of disc color as the principal criterion for separating these species has led to the naming of many peninsular Florida collections as *H. simulans*. Although that species is sparingly

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<sup>1</sup> This paper is Florida Agricultural Experiment Station Journal Series No. 1290.

cultivated in the Peninsula, most such plants are of *H. angustifolius* with a yellow disc. The following key is provided with a reticulation to compensate for the variable disc color of this species group.

Helianthus L.

## Sunflowers

1. Rays absent or very reduced; heads solitary, terminating a long naked scape; leaves usually 4 in a flat basal rosette, with smaller ones on the lower stem, none above; frequent perennial of moist acid sandy soils, open pine woodlands, and roadsides; throughout northern Florida (although uncommon between the Aucilla and Suwannee rivers), south to Hillsborough and Brevard counties, disjunct southward to Collier County. August - October.

H. radula (Pursh) T. & G.

1. Rays prominent; heads solitary to many; leaves cauline or, if basal, ascending.
2. Annual; discs dark, the disc corollas (at least the lobes) and anther-tubes purplish.
3. Leaves and stems densely covered with silvery-gray felty pubescence; discs 2 - 3 cm. wide; plants erect, to 2 m. tall; roadsides and waste areas, sparingly cultivated and very rarely escaped, persisting populations perhaps occurring only in east peninsular Florida (Volusia County). June - July.

SILVERLEAF SUNFLOWER

H. argophyllus T. & G.

3. Leaves and stems glabrous to variously pubescent, but not felty.
4. Phyllaries over 4 mm. wide at base; heads large, the disc usually exceeding 2 cm. in width; plants erect, over 1 m. tall; infrequent and sporadic, an escape from cultivation; waste places and roadsides, throughout the state. June - August.

COMMON SUNFLOWER

H. annuus L.

4. Phyllaries under 3 mm. wide; heads moderate, the disc 2 cm. across or smaller; plants erect or decumbent.
5. Leaf blades ovate-lanceolate to lanceolate; petioles and lower margins often with prominent stiff white hairs; plant erect, to 2 m. tall; frequent along upper St. Johns River marshes, occasional elsewhere in low pinelands, on pond margins, and along ditch-banks; endemic to central peninsular Florida, from



Volusia County to Lee County (also reported from Thomas County, Georgia). August - October (December).

H. agrestis Pollard

5. Leaf blades deltoid to broadly ovate; petioles and margins without prominent stiff hairs (softly hirsute in ssp. *vestitus*); plants erect or decumbent.
6. Plants decumbent or nearly so; peduncles usually less than 20 cm. long.

7. Stems glabrous to hispid; leaves serrulate or shallowly and regularly serrate; frequent on dunes, east coast of Florida (St. Johns County to the upper Keys). All year.

BEACH SUNFLOWER

H. debilis Nutt.  
ssp. debilis

7. Stems hirsute; leaves rather deeply and irregularly serrate; sandy shores, infrequent; west-central coast of Florida (Pinellas County to Charlotte County). March - October. [*H. vestitus* E. E. Wats.]

H. debilis Nutt.  
ssp. vestitus (E. E. Wats.) Heiser

6. Plants erect; peduncles usually over 20 cm. long.

8. Stems green or straw colored; rays usually less than 2 cm. long; on sands just back of beach, infrequent and local; Panhandle Florida (Bay, Franklin, and Wakulla counties), south along the coast (to Sarasota County). July - December.

H. debilis Nutt.  
ssp. tardiflorus Heiser

8. Stems conspicuously purple-mottled; rays usually 2 cm. or more long; cultivated, rarely escaping to waste areas and railroad banks (Madison, Lake counties). May - September. [*H. cucumerifolius* T. & G.; *H. debilis* var. *cucumerifolius* (T. & G.) Gray]

SPECKLED SUNFLOWER H. debilis Nutt.  
ssp. cucumerifolius (T. & G.) Heiser

2. Perennial; discs dark (both disc corollas and anther-tubes purplish), or mixed (disc corollas yellow, the protruding anther-tubes dark purple).

9. Disc corollas (at least the lobes) purplish.

10. Phyllaries 2 - 4 mm. wide; largest leaves basal, usually much broader than cauline leaves.

11. Cauline leaves linear or narrowly lanceolate, differing in shape (as well as size) from the broadly lanceolate to ovate basal leaves; heads usually solitary; frequent in moist open pinelands; Panhandle Florida (east to Jefferson County). July - October

H. heterophyllus Nutt.

11. Cauline leaves broadly ovate, reduced but otherwise similar to basal leaves; heads usually several; very rare; clay soil, at edge of upland woods; Panhandle Florida (Three Rivers State Park, Jackson County). [Florida range is based upon: A. Gholson, 22 Sept 1978, FLAS, FSU. Although this species is common in the Carolinas, its frequency rapidly thins southward and the Florida report by E. E. Watson (in Small, 1933) could not be confirmed by Heiser (1969).] September.

H. atrorubens L.

10. Phyllaries 1 - 2 mm. wide; largest leaves cauline, basal leaves usually withered or absent at flowering.

12. Leaves not conspicuously undulate-margined; outer phyllaries acute to slightly acuminate.

13. Leaves usually strongly revolute-margined, linear to lanceolate, usually more than 10 times as long as broad, seldom over 8 mm. wide; rhizomes poorly developed or lacking; stems seldom above 1 m. tall; moist ditch and stream banks, low meadows, prairies and pine flatwoods, common; throughout western and northern Florida (except perhaps the Suwannee drainage), south to Lee and St. Lucie counties. (June) September - December.

SWAMP SUNFLOWER

H. angustifolius L.

13. Leaves flat to weakly revolute-margined, narrowly to broadly lanceolate, usually over 8 mm. wide, about 5 times as long as broad; rhizomes well developed; very robust plant, to 2.5 m. and above; low thickets, edge of fresh and brackish marshes; local but conspicuous, at times apparently spreading from cultivation, Panhandle Florida (east to Madison County). [This species is the most frequently cultivated *Helianthus* in northern Florida, although

it is largely overlooked in formal horticultural literature. All feral populations in Florida may be of cultivated origin.] September - October.  
 GULF SUNFLOWER H. simulans E. E. Wats.

12. Leaves usually undulate-margined, lanceolate to ovate, rarely more than 5 times as long as broad; outer phyllaries often obtuse; infrequent in swampy pinelands and on pond margins; northeast Florida, south to Lake and Seminole counties. September - October.

H. floridanus Gray ex Chapm.

9. Disc corollas yellow (the protruding anther-tubes dark purple).
14. Leaves and stem entirely glabrous; leaves linear, somewhat thick and fleshy, mostly basal; heads solitary, on long leafless scape; local, but conspicuous when in flower, slash pine flatwoods, northeast Florida (Duval to Volusia counties); endemic. June - July  
H. carnosus Small
14. Leaves or stem pubescent or scabrous, at least in part; leaves more or less resinous-dotted below.
15. Phyllaries 3 - 5 mm. wide at base, those of mature heads recurved; leaves alternate above and usually opposite below; stem hispid, more so distally; edge of dry oak hammocks, very local; northwest Florida (Jackson and Gadsden counties). August - September.  
 [*H. tomentosus*, misapplied]  
H. resinosus Small
15. Phyllaries 1 - 3 mm. wide, appressed or spreading but not recurved; leaves alternate or opposite.
16. Leaves mostly alternate; stem scabrous to pubescent, at least toward base.  
Return to couplet #12, above.
16. Leaves opposite or the reduced upper ones alternate; if alternate, the stem wholly smooth.
17. Heads small (the disc 1 cm. across or less), frequently numerous; leaves with distinct non-winged petioles, opposite below, opposite or alternate above; stem glabrous; dry woods, rare; Panhandle Florida (Okaloosa, Washington, Gadsden counties). August - September.  
H. microcephalus T. & G.

17. Heads medium (the disc 1 - 2.5 cm. across), usually few; leaves uniformly opposite, at least below the inflorescence; stem glabrous or hirsute.
18. Leaves largely basal or low on the stem; petioles sharply defined, long (2 - 5 cm.); dry open pineland, rare; central Panhandle Florida (Walton, Holmes, Washington counties). July - September. [All Florida collections are of ssp. *occidentalis*, with scabrous leaves.]

H. occidentalis Riddell

18. Leaves cauline, mostly median on the stem; petioles indistinct and short, or absent.

19. Leaves usually petiolate, the petioles short (1 - 2 cm.) and gradating into cuneate base of blade.

20. Stems coarsely hirsute, at least at nodes; phyllaries strigose on back (as well as ciliate on margins); robust plant, to 2 m. tall; dry sandy oak ridges, rare; Panhandle Florida (Walton County); tending to intergrade with *H. strumosus*. September.

H. hirsutus Raf.

20. Stems essentially glabrous; phyllaries glabrous or nearly so on back (the margins ciliate); dry pinelands and clay hillsides, infrequent; north Florida (east from Jackson County, south to Marion County). July - September. [*H. montanus* E. E. Wats.]

H. strumosus L.

19. Leaves sessile, the base rounded to subcordate; stems essentially glabrous; dry oak woods, rare; north Florida (Jackson and Columbia counties). July - August.

H. divaricatus L.

#### Excluded Species

Helianthus glaucus Small This name was attributed to Florida by E. E. Watson (in Small, 1933) but is believed by Heiser (1969) to apply to a hybrid between *H. divaricatus* and *H. microcephalus*. These species have not been found together in Florida, and the hybrid seems not to occur in the state.

Helianthus tuberosus L. Jerusalem-artichoke. This northern plant is widely spread through cultivation and has been grown as far south as Gainesville, Alachua County. A record for Leon County (Heiser, 1969) is probably best taken as representing a momentary relic from cultivation since the species is not known to occur there at the present time. Jerusalem-artichoke is related to *H. hirsutus* and *H. strumosus*, although separated by the presence of tuber-bearing roots.

ADDITIONAL NOTES ON THE GENUS CITHAREXYLUM. XIII

Harold N. Moldenke

CITHAREXYLUM COOPERI Standl.

Additional bibliography: Moldenke, *Phytologia* 40: 492. 1978.

Recent collectors have found this plant growing on steep slopes with Montane Rainforest vegetation and on limestone-fissured ridges on the Lower Montane Rainforest with Quercus, Billia, Persea, Nectandra, Mirandaceltis, Turpinia, and Calatola, at 800—900 meters altitude, fruiting in September and October. Material has been misidentified and distributed in some herbaria as C. crassifolium Greenm., C. hexangulare Greenm., and C. hirtellum Standl.

The Dodson 6002, distributed as perhaps C. cooperi, actually is C. poeppigii Walp., while Breedlove 20250 appears better placed as C. hexangulare var. latifolium Moldenke.

Additional citations: MEXICO: Chiapas: Breedlove 28145 (Mi, N); Breedlove & Thorne 20954 (Mi).

CITHAREXYLUM CRASSIFOLIUM Greenm.

Additional bibliography: Moldenke, *Phytologia* 31: 338 & 348 (1975) and 32: 196 & 219. 1975.

Breedlove encountered this species in a montane rainforest with Hauya, Pinus, Clusia, Ficus, Persea, and Calatola, at 800 m. altitude, fruiting in February.

Material of C. crassifolium has been misidentified and distributed in some herbaria as C. donnell-smithii Greenm. On the other hand, the Breedlove 28145, distributed as C. crassifolium, actually is C. cooperi Standl., while Steyermark 43219 is C. donnell-smithii Greenm. and Steyermark 42840 & 42845 are C. steyermarkii Moldenke.

Additional citations: MEXICO: Chiapas: Breedlove 33023 (Mi, Mi).

CITHAREXYLUM DAWEI Moldenke

This taxon is now regarded as conspecific with C. karsteni Moldenke, which see.

CITHAREXYLUM DECORUM Moldenke

Additional bibliography: López-Palacios, *Bol. Soc. Venez. Cienc. Nat.* 31: 354—355, 358, 371, & 373—375. 1975; Moldenke, *Phytologia* 31: 348—350 & 449. 1975; López-Palacios, *Fl. Venez. Verb.* 224—227 & 647, fig. 50. 1977; R. F. Sm., *Act. Bot. Venez.* 13: 193, 205, & 264. 1978.

Illustrations: López-Palacios, *Fl. Venez. Verb.* [226], fig. 50. 1977; R. F. Sm., *Act. Bot. Venez.* 13: 264. 1978.

Blanco describes the fruit of this species as "reddish-green",

found it in fruit in August, and reports the vernacular name, "cazabito". Smith (1978) records the species from Lara, Venezuela, and list the name, "cuatro filas", for it.

López-Palacios (1977) cites from Venezuela: Falcón: Lasser & Foldats 3087. Federal District: López-Palacios 3087. Lara: R. T. Smith V.869. Trujillo: Pittier 10738, 10769, 12656. Yaracuy: Blanco 914.

Additional citations: VENEZUELA: Yaracuy: C. A. Blanco 914 (W-2777195).

#### CITHAREXYLUM DENTATUM D. Don

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 104. 1858; G. Don in Loud., Hort. Brit., ed. 1, 248 (1830), ed. 2, 248 (1832), and ed. 3, 248, 1839; Moldenke, Phytologia 31: 350 & 394 (1975) and 32: 63. 1975; Soukup, Biota 11: 9. 1976; Moldenke, Phytologia 36: 33. 1977.

Ellenberg encountered this plant in evergreen high montane bush-woods at 2825 meters altitude.

Additional citations: PERU: Junin: Ellenberg 3760 (Z).

#### CITHAREXYLUM DISCOLOR Turcz.

Additional bibliography: López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 386. 1975; Moldenke, Phytologia 31: 345 & 350-351. 1975.

Additional citations: HISPANIOLA: Dominican Republic: Ekman H.12773 (Ld).

#### CITHAREXYLUM DONNELL-SMITHII Donn. Sm.

Additional bibliography: Moldenke, Phytologia 31: 346, 348, & 351-352 (1975) and 32: 54 & 70. 1975; Molina R., Ceiba 19: 95. 1975; Anon., Biol. Abstr. 61: AC1.580. 1976.

Recent collectors describe this species as a tree, 20-40 feet tall, the leaves firmly membranous, rich-green and shiny above, lighter grass-green beneath, the inflorescences nodding, the flowers sweet-smelling, and the calyx pale-green. They encountered it in ravines, on and along rounded slopes, on steep, and on steep and heavily wooded slopes with Quercus and Drimys, in evergreen cloud-forests or montane rainforests, at altitudes of 800-2700 meters, fruiting in January and August. Taylor reports its use to produce shade in coffee plantations. The corollas are said to have been "white" on Breedlove & Thorne 21078 and on Steyermark 43219.

Material of this species has been misidentified and distributed in some herbaria as C. crassifolium Greenm. and C. hexangulare Greenm. On the other hand, the Dwyer & Coomes 12928, distributed as C. donnell-smithii, actually is C. hexangulare Greenm., while Mori & Dressler 7773 is C. macradenium Greenm. and Steyermark 42840 & 42845 are C. steyermarkii Moldenke.

Additional citations: MEXICO: Chiapas: Breedlove 26817 (Ld, Mi),

29207 (Ld, N), 41453 (N); Breedlove & Raven 13743 (Ld); Breedlove & Smith 32080 (Mi); Breedlove & Thorne 21078 (Mi); Laughlin 153 (Ld); Ton 3888 (Ld). GUATEMALA: Zacapa: J. A. Steyermark 43219 (N). COSTA RICA: Alajuela: Kupper 935 (Mu). San José: J. Taylor 17539 (N, W--2770968). PANAMA: Chiriquí: Croat 26974 (W--2788962); A. Gentry 6004 (Ld); Proctor 31956 (Ld).

**CITHAREXYLUM DRYANDERAE** Moldenke

Additional bibliography: López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 366. 1975; Moldenke, Phytologia 31: 353 (1975) and 32: 225. 1975.

**CITHAREXYLUM ELLIPTICUM** Sessé & Moc.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; Moldenke, Phytologia 32: 49 & 70. 1975.

The Davidse found this species growing on dunes with scattered low trees and shrubs and with grassy areas dominated by Sporobolus jacquemontii, at 40 meters altitude, and describe the fruit as "turning red". Others have found it among dense dune vegetation at sealevel and describe it as "bushy, 7 feet tall", flowering in November. The corollas are said to have been "white" on King 1143 & 2706, Lasseigne 4912, Thorne & Lathrop 40477, and Ventura A. 5395.

Linden 71 is a mixture of C. ellipticum and Iresine celosioides, Isachne ventricosa, and Pilea pubescens, while Paxson, Webster, & Barkley 17M626, distributed as C. ellipticum, is not verbenaceous.

Additional citations: MEXICO: Veracruz: Davidse & Davidse 9329 (Ld); R. M. King 1093 (Au--211646, Ld), 1143 (Au--211641, Ld), 2706 (Au--184959); Lasseigne 4912 (Mi, N); Linden 71 in part (Mi); Thorne & Lathrop 40477 (Ld); Troll 64 (Mu); Ventura A. 5395 (Au).

**CITHAREXYLUM FLABELLIFOLIUM** S. Wats.

Additional bibliography: Moldenke, Phytologia 31: 354. 1975; Felger & Lowe, Nat. Hist. Mus. Los Angeles Co. Contrib. Sci. 285: 7. 1976.

Moran describes this plant as a stiff shrub to 1.7 m. tall, with a spread of 4 m., stout spinose branches, and "purple" corollas with darker veins. It has been collected in fruit in September (in addition to the months previously reported).

Additional citations: MEXICO: Sonora: D. F. Howe s.n. [24 September 1967] (Sd--80737). GULF OF CALIFORNIA ISLANDS: Carmen: R. V. Moran 18185 (Sd--76747).

**CITHAREXYLUM FLEXUOSUM** (Ruiz & Pav.) D. Don

Additional synonymy: Citharexylum flexuosum D. Don apud Schau. in A. DC., Prodr. 11: 610, in syn. 1847.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 105 & 147. 1858; Moldenke, Phytologia 31: 338, 339, & 354--355 (1975)



and 32: 227. 1975; Anon., Biol. Abstr. 61: AC1.580. 1976; Soukup, Biota 11: 9. 1976; Moldenke, Phytologia 36: 41. 1977.

### CITHAREXYLUM FRUTICOSUM L.

Additional synonymy: Citharexylon arbor americana, etc. Pluk. apud López-Palacios, Fl. Venez. Verb. 228, in syn. 1977. Citharexylon arbor laurifolia, americana, etc. Pluk. apud López-Palacios, Fl. Venez. Verb. 228, in syn. 1977. Citharexylon caudatum Sagra apud López-Palacios, Fl. Venez. Verb. 228, in syn. 1977. Citharexylon cinereum Sessé & Moc. apud López-Palacios, Fl. Venez. Verb. 228, in syn. 1977. Citharexylon fruticosum, cortice cinereo, etc. P. Browne apud López-Palacios, Fl. Venez. Verb. 228, in syn. 1977. Citharexylon quadrangulare Griseb. apud López-Palacios, Fl. Venez. Verb. 228, in syn. 1977. Citharexylon villosum Champ. apud López-Palacios, Fl. Venez. Verb. 228, in syn. 1977. Citharexylon villosum Griseb. apud López-Palacios, Fl. Venez. Verb. 228, in syn. 1977. Citharexylon spicatum Ryam apud López-Palacios, Fl. Venez. Verb. 228, in syn. 1977. Citharexylon villosum var. glaberrimum C. Wright apud López-Palacios, Fl. Venez. Verb. 228, in syn. 1977. Citharexylon arbor americana [Pluk.] apud López-Palacios, Fl. Venez. Verb. 647. 1977. Citharexylon arbor laurifolia [Pluk.] apud López-Palacios, Fl. Venez. Verb. 647. 1977. Citharexylon fruticosum, cortice cinereo, etc. P. Browne apud López-Palacios, Fl. Venez. Verb. 228, in syn. 1977. Citharexylum fruticosum cortice cinereo [P. Browne] apud López-Palacios, Fl. Venez. Verb. 647, in syn. 1977. Citharexylum spicatum [Ryam] apud López-Palacios, Fl. Venez. Verb. 647, in syn. 1977.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 417. 1830; G. Don in Loud, Hort. Brit., ed. 1, 248 (1830) and ed. 2, 248. 1832; Loud., Hort. Brit., ed. 2, 551. 1832; G. Don in Loud., Hort. Brit., ed. 3, 248. 1839; Sweet, Hort. Brit., ed. 3, 551. 1839; Buak, Gen. Spec. Syn. Candoll. 3: 104. 1858; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 1, 190. 1938; Perez-Arbelaez, Fl. Util. Colomb., ed. 2, 741. 1956; R. W. Long, Fla. Sci. 37: 35. 1974; Dod & Fortuna, Bot. Jard. Bot. Moscoso 2 (3): 16. 1975; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: [353], 355—358, 361, 363, 364, 369, 370, 372, & 375—379. 1975; Zimmerm. & Ziegler in Zimmer. & Milburn, Transp. Pl. 1 [Pirson & Zimmer., Encycl. Pl. Physiol., ser. 2, 1]: 502. 1975; Moldenke, Phytologia 32: 49, 53, 57, 59, 62, 64, 65, 196, & 200 (1975) and 34: 248, 253, & 254. 1976; Anon., Biol. Abstr. 61: AC1: 580. 1976; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 2, 190. 1976; Crowell & Crowell, Nat. Hist. 85 (8): 53. 1976; Hocking, Excerpt. Bot. A.28: 258. 1976; Long & Lakela, Fl. Trop. Fla., ed. 2, 738, 934, & 939. 1976; Jiménez & Liogier, Moscosoa 1 (2): 19. 1977; Liogier, Bol. Jard. Bot. Raf. Mosc. 4: 5. 1977; López-Palacios, Fl. Venez. Verb. 220—222, 228—234, & 647, fig. 51. 1977; Moldenke, Biol. Abstr. 64: 6574. 1977; Moldenke, Phytologia 36: 31, 39, & 164.

1977; Poppeton, Shuey, & Sweet, Fla. Scient. 40: 384. 1977; Powell, Econ. Bot. 31: 419 & 422. 1977; Liogier, Moscosoa 1: 37. 1978; Moldenke, Phytologia 40: 488. 1978.

Additional illustrations: Crowell & Crowell, Nat. Hist. 85 (8): 53 [in color]. 1976; López-Palacios, Fl. Venez. Verb. [229], fig. 51. 1977.

Recent collectors describe this plant as a shrub, 2 meters tall, or a tree, 8 feet tall, the flowers with the scent of lilac (*Syringa vulgaris*), the fruit drupaceous, at first green, then turning orange or vermillion, finally black, fleshy, glossy. They have found it growing in open coppices and on ridge tops in brushy vegetation along roadsides, flowering in May and June. Adams erroneously refers to the fruit as "berries". Fosberg found the plant "occasional". The corollas are said to have been "white" on Austin & Conroy 4744, Correll & Proctor 48907, and J. J. Jiménez 8341.

Don (1830), Sweet (1830), and Loudon (1832) all list this species as cultivated in British gardens in their day, introduced from the West Indies in 1739 and known as the "ash-coloured fiddle-wood". Liogier (1978) cites Liogier 23033.

The Correll, Campbell, & Sprount 47248, Correll & Evans 44012, and Correll & Wasshausen 46717, distributed as typical *C. fruticosum*, are actually f. *bahamense* (Millsp. Moldenke, while J. A. Churchill s.n. [19 December 1968] and D. S. Correll 45477 are f. *subvillosum* (Moldenke) Moldenke, J. A. Churchill s.n. [8 May 1969] is var. *villosum* (Jacq.) O. E. Schulz, Correll & Hill 45337 is *C. caudatum* L., Thorne & Lathrop 40477 is *C. ellipticum* Sessé & Moc., C. D. Adams 11364 is *C. xhybridum* Moldenke, and Proctor 28135 and Wilbur, Dunn, Hespenheide, & Wiseman 8236 are *C. spinosum* L.

Jiménez encountered the species at 550 meters altitude in the Dominican Republic. Liogier (1978) records the vernacular name, "penda", while López-Palacios, in a personal communication to me, records "cajuaro" from Venezuela. This distinguished worker also (1977) cites from Venezuela the following: Falcón: Breteler 4314; Madriz 30; Ruiz-Terán 2080; Ruiz-Terán & López-Palacios 10231. Sucre: Aristeguieta & Agostini 4769; Broadway 118; Ruiz-Terán & López-Palacios 9891.

Additional citations: FLORIDA: Dade Co.: Meebold 27574 (Mu, Mu). BAHAMA ISLANDS: Crooked: D. S. Correll 44357 (N); Correll & Proctor 48907 (N). Inagua: Austin & Conroy 4744 (N). TURKS AND CAICOS ISLANDS: North Caicos: Buden 9 (Lv). JAMAICA: C. D. Adams 8884 (Mu). HISPANIOLA: Dominican Republic: J. J. Jiménez 8341 (N). Haiti: Ekman H.8340 (Ld). PUERTO RICO: Stimson 3025 (Ld). VIRGIN ISLANDS: St. Croix: Fosberg & Ogden 55329 (W-2743953).

CITHAREXYLUM FRUTICOSUM f. BAHAMENSE (Millsp.) Moldenke

Additional bibliography: Moldenke, Phytologia 31: 448-449 &

453 (1975), 34: 253 (1976), and 36: 31. 1977.

Recent collectors describe this plant as a shrub, tree, or sapling, 3 m. tall, growing "in a coppice on a rise above mangrove swamps", flowering in June, fruiting in February and December, the mature fruit black.

Additional citations: BAHAMA ISLANDS: Acklin: Correll, Campbell, & Sprunt 47248 (N). North Andros: Correll & Evans 44012 (N). San Salvador: Correll & Wasshausen 46717 (N, W—2797479). CULTIVATED: Morocco: Lewalle 8582 (Z).

**CITHAREXYLUM FRUTICOSUM** var. **BRITTONII** Moldenke

Additional synonymy: Citharexylum brittonii [Moldenke] apud López-Palacios, Fl. Venez. Verb. 647, in syn. 1977.

Additional bibliography: López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: [353], 357—358, 373, & 378—379. 1975; Moldenke, Phytologia 31: 449. 1975; López-Palacios, Fl. Venez. Verb. 224, 232—234, & 647, fig. 52. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [233], fig. 52. 1977.

Philcox and his associates call this plant a shrub, 1.5 m. tall, the fruit (in July) "ripening dull dark-orange", and found it growing on a beach, misidentifying it as var. subvillosum Moldenke.

López-Palacios (1977) cites from Venezuela the following collections: Anzoátegui: Karsten s.n. Bolívar: Steyermark 86556, 88236, 88829. Delta Amacuro: Curran & Haman 1309, 1316. Federal District: Delgado 421. In a personal communication to me he lists "coralito" as a vernacular name in Venezuela.

Additional citations: TRINIDAD AND TOBAGO: Trinidad: Philcox, Wood, & Kalbo 7452 (N).

**CITHAREXYLUM FRUTICOSUM** var. **SMALLII** Moldenke

Additional bibliography: Moldenke, Phytologia 31: 448 & 450 (1975) and 34: 253. 1976.

Recent collectors refer to this as a 4-meter tall sapling, very fructiferous, and found it growing in open coppices, fruiting in January.

Additional & emended citations: BAHAMA ISLANDS: North Andros: Correll, Sauleda, Stevenson, Miller, & Fehling 49343 (N). South Andros: D. S. Correll 43484 (Ld, Ld, N), 43516 (Ld, N, Z).

**CITHAREXYLUM FRUTICOSUM** f. **SUBSERRATUM** (Sw.) Moldenke, Phytologia 36: 164. 1977.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 417. 1830; G. Don in Loud., Hort. Brit., ed. 1, 248 (1830) and ed. 2, 248. 1832; Loud., Hort. Brit., ed. 2, 551. 1832; G. Don in Loud., Hort. Brit., ed. 3, 248. 1839; Sweet, Hort. Brit., ed. 3, 551. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; Moldenke, Phytologia 31: 450—451 (1975), 32: 198—200 (1975), and 36: 39 & 164. 1977; Moldenke, Biol. Abstr. 64: 6574. 1977.

Don (1830), Sweet (1830), and Loudon (1832) all list this plant

as growing in British gardens in their day, introduced from Hispaniola in 1819, and known as the "subserrate fiddle-wood". It seems most probable that this is merely a juvenile form of the species, since dentate leaves are seen on juvenile specimens and on watersprouts in other species of the genus. In line with current practice, it has seemed best to reduce the taxon from varietal to form rank. Its very limited distribution, however, as compared to the species as a whole, is perplexing and may possibly indicate something more than mere form rank. It has been encountered at altitudes of 375 to 1000 meters.

Additional citations: HISPANIOLA: Dominican Republic: Ekman H. 13025 (Ld). Haiti: Ekman H.1372 (Ld).

CITHAREXYLUM FRUTICOSUM f. SUBVILLOSUM (Moldenke) Moldenke, Phytologia 36: 164. 1977.

Additional bibliography: Moldenke, Phytologia 32: 49 (1975), 34: 253 & 254 (1976), and 36: 164. 1977; Moldenke, Biol. Abstr. 64: 6574. 1977.

In line with current taxonomic practice, it has been thought best to reduce this taxon from varietal to form rank.

The Philcox, Wood, & Kalbo 7452, distributed as var. subvillosum, is perhaps better regarded as representing var. brittonii Moldenke, although the thick leaf-blades seem unusual for that taxon.

Additional citations: FLORIDA: Dade Co.: J. A. Churchill s.n. [19 December 1968] (Ln--230004). BAHAMA ISLANDS: Walker's: D. S. Correll 45477 (N). PUERTO RICO: Sintenis 720b (Ac). VIRGIN ISLANDS: St. Croix: Fosberg & Ogden 55329 (N). CULTIVATED: Morocco: Lewalle 8581 (Z).

CITHAREXYLUM FRUTICOSUM var. VILLOSUM (Jacq.) O. E. Schulz

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 417. 1830; G. Don in Loud., Hort. Brit., ed. 1, 248 (1830), ed. 2, 248. 1832; Loud., Hort. Brit., ed. 2, 551. 1832; G. Don in Loud., Hort. Brit., ed. 3, 248. 1839; Sweet, Hort. Brit., ed. 3, 551. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; Coult., Contrib. U. S. Nat. Herb. 2: 330. 1892; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 375. 1975; Moldenke, Phytologia 32: 49, 57, & 69 (1975), 34: 248 (1976), and 36: 39. 1977.

Churchill found this plant growing in sandy scrubland. Don (1830), Sweet (1830), and Loudon (1832) all list this plant as growing in British gardens in their day, introduced from the West Indies in 1784 and known as the "hairy-leaved fiddle-wood".

The C. villosum recorded by Coulter (1892) as from "Southern Texas and Mexico" actually is C. berlandieri B. L. Robinson. The Ekman H.1372 & H.13025, distributed as var. villosum, actually represent f. subserratum (Sw.) Moldenke.

Additional citations: FLORIDA: Biscayne Key: J. A. Churchill s.n. [8 May 1969] (Ln--229696).

**CITHAREXYLUM GENTRYI** Moldenke, *Phytologia* 35: 276. 1977.

Bibliography: Moldenke, *Biol. Abstr.* 64: 2433. 1977; Moldenke, *Phytologia* 35: 276 (1977) and 36: 33. 1977; Dodson & Gentry, *Selbyana* 4: xiii, 576, 578, 579, 605, & 615, pl. 271B. 1978.

Illustrations: Dodson & Gentry, *Selbyana* 4: 579, pl. 271B. 1978.

Collectors describe this species as a large tree, to 20 m. tall, and have found it growing on riverbanks, at 150—300 m. altitude, flowering in October, fruiting in July. Dodson & Gentry (1978) cite Dodson & al. 6002, 6348, & 6575 from Los Ríos, Ecuador.

Citations: ECUADOR: Los Ríos: Dodson & Gentry 6348 (Ld), 6575 (Z-type). Napo: Grubb, Lloyd, Pennington, & Whitmore 176 (N).

**CITHAREXYLUM GLABRUM** (S. Wats.) Greenm.

Additional bibliography: Hinton & Rzedowski, *Anal. Esc. Nac. Cienc. Biol.* 21: 48. 1975; Moldenke, *Phytologia* 31: 453. 1975.

**CITHAREXYLUM GLAZIOVII** Moldenke

Additional bibliography: Moldenke, *Phytologia* 31: 453 (1975) and 32: 195. 1975.

**CITHAREXYLUM GLEASONIANUM** Moldenke

Additional bibliography: Moldenke, *Phytologia* 31: 453 (1975) and 40: 488. 1978.

Recent collectors describe this as a "regular" tree, 2 m. tall, with green fruit in July, and have encountered it in primary oak woods at 2300 m. altitude.

Material of *C. gleasonianum* has been misidentified and distributed in some herbaria as *C. affine* D. Don, a very closely related taxon. On the other hand, the *Rosas R.* 862, previously cited by me as *C. gleasonianum*, seems better placed as *C. ligustrinum* Van Houtte.

Additional citations: MEXICO: Veracruz: Kerber 258 (Mi); Nevling & Gomez-Pompa 2165 (N).

**CITHAREXYLUM HERRERAЕ** Mansf.

Additional bibliography: Moldenke, *Phytologia* 31: 454. 1975; Soukup 11: 9. 1976.

**CITHAREXYLUM HEXANGULARE** Greenm.

Additional bibliography: Schau. in A. DC., *Prodr.* 11: 613. 1847; Buek, *Gen. Spec. Syn. Candoll.* 3: 104. 1858; Moldenke, *Phytologia* 32: 49, 70, 226, & 227 (1975) and 40: 54. 1978.

Recent collectors describe this species as a tree, to 25 feet tall, and have found it in fruit in November on "a fissured limestone ridge in Lower Montane Rainforest with *Quercus*, *Billia*, *Persea*, *Nectandra*, *Mirandaceltis*, *Turpinia*, and *Calatola*". It has been encountered at 900—1000 meters altitude.

*Linden 11* is a mixture of *C. hexangulare*, *Pteris aculeata*, and *Salix bonplandiana*. Material of *C. hexangulare* has been misidentified and distributed in some herbaria as *C. donnell-smithii* Greenm.

On the other hand, the Breedlove & Thorne 21078, distributed as C. hexangulare, actually is C. donnell-smithii Greenm., while Lundell & Lundell 76709 is C. hexangulare var. brevifolium Moldenke and Breedlove 20250, Breedlove & Thorne 30775, and Molina R., Williams, Burger, & Wallenta 17478 are C. hexangulare var. latifolium Moldenke.

Additional citations: MEXICO: Chiapas: Breedlove & Smith 21661 (Ld, Mi, N). Jalisco: R. McVaugh 20632 (Au—235467). Oaxaca: Santos 3818 (Au—263165). Veracruz: Linden 11 in part (Mi); Venturi A. 3333 (Au—303677). GUATEMALA: El Petén: Contreras 1831 (Au—228049). BELIZE: Dwyer & Coomes 12928 (W—2787796); Peck 567 (N).

CITHAREXYLUM HEXANGULARE var. BREVIFOLIUM Moldenke, Phytologia 40: 54. 1978.

Bibliography: Moldenke, Phytologia 40: 54. 1978.

The type collection of this taxon was previously cited by me as typical C. hexangulare Greenm., but examination of a large series of recent collections indicates that it is sufficiently different to warrant nomenclatural recognition, albeit only on the varietal level.

Citations: MEXICO: Quintana Roo: Lundell & Lundell 7679 (Ld—isotype, Mi—isotype, Mi—isotype, N—type).

CITHAREXYLUM HEXANGULARE var. LATIFOLIUM Moldenke, Phytologia 40: 54. 1978.

Bibliography: Moldenke, Phytologia 40: 54. 1978.

The material cited below has been distributed as and in some cases previously cited by me as C. cooperi Standl., C. hexangulare Greenm., or C. viride Moldenke. Collectors describe the plant as a tree, 6.5—10 m. tall, and have found it growing in cutover forest areas, in barrancas, and on fissured limestone ridges with Lower Montane Rainforest vegetation of Quercus, Billia, Persea, Nectandra, Mirandaceltis, Turpinia, and Calatola, at 900—1000 meters altitude, flowering in February and fruiting in October and December. The corollas are said to have been "white" on Molina R. & al. 17478.

This taxon needs further study, especially in its relationships to C. cooperi, C. hirtellum, and C. viride, all of which it closely resembles.

Citations: MEXICO: Chiapas: Breedlove 20259 (Ld, Mi, N); Breedlove & Thorne 30775 (Mi, N). COSTA RICA: Alajuela: Molina R., Williams, Burger, & Wallenta 17478 (N—type).

CITHAREXYLUM HIDAIGENSE Moldenke

Additional bibliography: Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 48. 1975; Moldenke, Phytologia 31: 455 (1975) and 32: 63 & 200. 1975.

Recent collectors describe the fruits of this species as red and

translucent -- Moore & Wood erroneously refer to them as "berries". The plant has been encountered on "steep rocky slopes adjacent to streams" and "along streams at base of hillsides in forests below when Podocarpus reichii is abundant". It has been collected in fruit in August.

Additional citations: MEXICO: Hidalgo: Moore & Wood 4339 (Mi), 4500 (Mi); Pringle 8969 (Ln-69949--isotype). Puebla: Donoghue 28 (Ld); Gibson & Gibson 2587 (Ld); Reiche 717 (Mu).

#### CITHAREXYLUM HINTONI Moldenke

Additional bibliography: Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 31 & 48. 1975; Moldenke, Phytologia 31: 455. 1975.

#### CITHAREXYLUM HIRTELLUM Standl.

Additional bibliography: Moldenke, Phytologia 32: 49 & 226. 1975.

Recent collectors describe the flowers of this species as fragrant and have found it in anthesis in May. The corollas on Proctor 31976 are said to have been "white".

The Breedlove & Thorne 20954, distributed as C. hirtellum, seems better placed as C. cooperi Standl.

Additional citations: MEXICO: Chiapas: Breedlove & Raven 13625 (Ld). PANAMA: Chiriquí: Proctor 31976 (Ld).

#### CITHAREXYLUM xHYBRIDUM Moldenke

Additional bibliography: López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 357 & 358. 1975; Moldenke, Phytologia 31: 457 (1975), 32: 56 (1975), and 34: 254. 1976.

Adams describes this plant as a shrub, 8 feet tall, the stems brittle, with pithy centers, and the corollas white. He encountered it at the margin of mangrove association, at an altitude of 10 feet, flowering in July.

Additional citations: JAMAICA: C. D. Adams 11364 (Mu, Mu).

#### CITHAREXYLUM ILICIFOLIUM H.B.K.

Additional bibliography: Buek, Gen. Spec. Candoll. 3: 105 & 147. 1858; Moldenke, Phytologia 31: 457-458 (1975) and 32: 60, 63, & 68. 1975; Soukup, Biota 11: 9. 1976.

Recent collectors describe this species as a shrub, 2-3 meters tall, the leaves opposite or ternate, the fruit dark-purple to black or "castaño-verdoso", and have encountered it on riverbanks and in Eucalyptus forests, at 2900 meters altitude, flowering in February and December. The corollas are said to have been "white" on Hudson 1162, Humbles 6140, and López-Palacios 4167.

Additional citations: ECUADOR: Azuay: López-Palacios 4167 (Ld). Pichincha: Hudson 1162 (W-2788537); Humbles 6140 (N).

#### CITHAREXYLUM ILTISII Moldenke

Additional bibliography: Moldenke, Phytologia 31: 458-459. 1975; Soukup, Biota 11: 9. 1976.

**CITHAREXYLUM INTEGERRIMUM** (Kuntze) Moldenke

Additional bibliography: Moldenke, *Phytologia* 31: 459 (1975) and 32: 64 & 226. 1975.

The Kupper 1452, distributed as C. integerrimum, actually is C. schottii Greenm.

**CITHAREXYLUM xJAMAICENSE** Moldenke

Additional bibliography: Moldenke, *Phytologia* 31: 459 (1975) and 40: 491. 1978.

Recent collectors describe this plant as a slender tree, 18—20 feet tall, the flowers sweet-scented, the corollas white, and have found it growing at the edge of woods, at 2300—2750 feet, flowering in March and May, and fruiting in March.

Most of the collections cited below were previously cited by me as C. fruticosum L., but it seems to me now that they probably represent the present hybrid.

Additional citations: JAMAICA: C. D. Adams 10812 (Mu, Mu); Anderson & Sternberg 3094 (Ld, Mi); Harris 8874 (B, Bm, Bm, N), 11065 (Bm, N, W—699857); Hespenheide, Hespenheide, Calver, & Ricklefs 976 (Ld), 1391 (Ld); Shreve s.n. [Mt. Diablo, May 28, 1906] (N).

**CITHAREXYLUM JÖRGENSENII** (Lillo) Moldenke

Additional bibliography: Moldenke, *Phytologia* 31: 459—460. 1975.

Recent collectors describe this plant as a treelet, 4 meters tall, the immature fruit subglobose and green, and have encountered it on the dry slopes of quebradas, at 1650 meters altitude, fruiting in November.

Additional citations: ARGENTINA: Salta: Schiavono, Cuezso, Figueroa, & Legname 11628c (N).

**CITHAREXYLUM JURGENSENI** Briq.

Additional bibliography: Moldenke, *Phytologia* 31: 460. 1975.

Additional citations: MEXICO: Nayarit: R. McVaugh 18920 (Ld).

**CITHAREXYLUM KARSTENI** Moldenke

Additional synonymy: Citharexylum dawei Moldenke in Fedde, *Repert. Sp. Nov.* 37: 220—221. 1934.

Additional & emended bibliography: Moldenke in Fedde, *Repert. Sp. Nov.* 37: 220—221 & 227—228. 1934; A. W. Hill, *Ind. Kew. Suppl.* 9: 67. 1938; Moldenke, *Known Geogr. Distrib. Avicenn.* 19 & 20. 1939; Moldenke, *Alph. List Common Names* 2. 1939; Moldenke, *Known Geogr. Distrib. Verbenac.*, [ed. 1], 31, 32, & 88. 1942; Moldenke, *Phytologia* 2: 96. 1945; Moldenke, *Alph. List Cit.* 1: 10, 145, 169, 221, & 243 (1946) and 2: 337, 424, 603, & 643. 1948; A. L. & H. N. Moldenke, *Pl. Life* 2: 55 & 66. 1948; Moldenke, *Known Geogr. Distrib. Verbenac.*, [ed. 2], 59, 62, & 179. 1949; Moldenke, *Alph. List Cit.* 3: 694, 758, 805, & 885 (1949) and 4: 1005, 1006, 1043, 1062,



1069, 1070, & 1078. 1949; Moldenke, *Phytologia* 6: 317—319 & 420—422 (1958) and 13: 284, 294, & 316. 1966; Moldenke, *Résumé Suppl.* 13: 6. 1966; Moldenke, *Phytologia* 14: 431—432. 1967; Moldenke, *Fifth Summ.* 1: 115, 122, & 429 (1971) and 2: 774, 858, & 859. 1971; López-Palacios, *Revist. Fac. Farm. Univ. Los Andes* 14: 22 (1974) and 15: 10—11 & 14—16. 1975; López-Palacios, *Bol. Soc. Venez. Cienc. Nat.* 31: [353]—354, 357—359, 369, 370, 373, 374, & 379—381. 1975; Moldenke, *Phytologia* 31: 348—350, 382, 394, & 460—461. 1975; López-Palacios, *Revist. Fac. Farm. Univ. Los Andes* 17: 41—42. 1976; López-Palacios, *Fl. Venez. Verb.* 220, 221, 223, 224, 227, 234—237, & 647. 1977; Moldenke, *Phytologia* 41: 57. 1978.

I am grateful to López-Palacios for confirming my suspicions that C. dawei is conspecific with C. karsteni. In a personal communication to me he lists the vernacular names, "agracejo" and "negrito" for C. karsteni. Uribe describes it as an "arbolito de 3 metros; folleja verde claro; flores blancas".

Additional & emended citations: COLOMBIA: Antioquia: Dawe 373 (B—photo, K, K, N, N—photo, S—photo, W, Z—photo). Boyacá: Karsten s.n. [Sogamoso] (N—photo, V, Z—photo). Cundinamarca: Uribe Uribe 5250 (N). VENEZUELA: Anzoátegui: Karsten s.n. [Piritu] (V).

#### **CITHAREXYLUM KARSTENI** var. **LANCEOLATUM** Moldenke

Additional bibliography: López-Palacios, *Bol. Soc. Venez. Cienc. Nat.* 31: 354, 358—359, 369, 370, 373, & 379—381. 1975; Moldenke, *Phytologia* 31: 460—461. 1975; López-Palacios, *Fl. Venez. Verb.* 220, 221, 223, 224, 234—237, & 647, fig. 53. 1977.

Illustrations: López-Palacios, *Fl. Venez. Verb.* [235], fig. 53. 1977.

López-Palacios refers to this plant as an "arbusto de 2—3 m. Hojas más claras por el envés, algo velutinosas, las viejas caducas rojizo anaranjadas. Flores blanco cremosas. Fruto inmaduro verdoso anaranjado" and found it growing at 2500 m. altitude, in flower and fruit in October. In his 1977 work he cites from Venezuela the following collections: Mérida: López-Palacios 1077; Ruiz-Terán & López-Figueiras 1793; Ruiz-Terán & López-Palacios 6213. Táchira: López-Palacios 3573. These were collected at altitudes of 800—1500 meters and on the label accompanying no. 1793 it is noted that the "Especie muy escasa en la localidad, sin usos conocidos".

Additional citations: COLOMBIA: Cundinamarca: López-Palacios 3908 (Id, N). VENEZUELA: Mérida: Ruiz-Terán & López-Figueiras 1793 (Mu).

#### **CITHAREXYLUM KOBUSKIANUM** Moldenke

Additional bibliography: Moldenke, *Phytologia* 31: 461. 1975; Soukup, *Biota* 11: 9. 1976.

**CITHAREXYLUM KUNTHIANUM** Moldenke

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 355, 359, & 364. 1975; Moldenke, Phytologia 32: 49, 57, & 220. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 42. 1976.

Recent collectors describe this species as a treelet, 4 m. tall, or a tree, 6--8 m. tall, with reddish or red fruit, and have found it growing in hillside thickets, at 900--2200 m. altitude, flowering in September and November, and fruiting in February, March, August, and September. The corollas are said to have been "white" on Florman & Vaughan 5259 and "creamy-white" on López-Palacios & Espinal T. 4314. Vernacular names reported for it are "hoja blanca", "palo blanco", and "pendo".

López-Palacios & Idrobo refer to the species as an "árbol 8--10 m. [or] arbolito de 4 m. Hojas opuestas discoloras, envés tomentoso. Inflorescencias terminales. Flores de corola blanca, 5-mera, séviles, fragrantas". López-Palacios (1976) notes, quite truly, that "Es difícil de distinguirlo del C. subflavescens, y las diferencias de color de indumento y presencia y ausencia de glándulas, que les señales el Dr. Moldenke, no son del todo convincentes. No sé si valiera la pena ensayar una separación por pisos térmicos y dejar en el C. kunthianum los ejemplares de tierra caliente y en el C. subflavescens los de tierra fría."

Material of C. kunthianum has been misidentified and distributed in some herbaria as C. subflavescens Blake.

Additional citations: COLOMBIA: Antioquia: López-Palacios & Espinal T. 4314 (Ld). Cauca: López-Palacios & Idrobo 3756 (Ld, N, Ws). Nariño: Espinal T. 1076 (Ld); López-Palacios & Idrobo 3827 (N, Z). Valle del Cauca: Cuatrecasas 23017 (W--2817328), 23691 (W--2817329); López-Palacios & Idrobo 3702 (Ac, N); Florman & Vaughan 5259 (Ld). CULTIVATED: Ecuador: Asplund 16986 (N).

**CITHAREXYLUM LAETUM** Hiern

Additional bibliography: Moldenke, Phytologia 32: 50. 1975; Hocking, Excerpt. Bot. A.28: 258. 1976.

Because of a typographic error, the name for this species appears as "L. laetum" in Hocking (1976).

**CITHAREXYLUM LANKESTERI** Moldenke

Additional bibliography: Moldenke, Phytologia 32: 50, 57, & 58. 1975.

Fosberg reports this species "common in forest filling deep ravines in pasture; tree 10 m. tall; spikes pendent, flowers white", and found it growing at 2800 meters altitude on the slopes of Irazu volcano, flowering in October.

Additional citations: COSTA RICA: Cartago: F. R. Fosberg 43269 (N).

[to be continued]

## BOOK REVIEWS

Alma L. Moldenke

"FOUNDATIONS OF CLIMATOLOGY — An Introduction to Physical, Dynamic, Synoptic and Geographical Climatology" by E. T. Springer, xiii & 586 pp. & 194 b/w illus. 1972. W. A. Freeman & Company, Reading RG1 3AA Berkshire & San Francisco, California 94104. \$25.00.

The subtitle indicates that this book is much more than just a descriptive text about weather — an everyday experience involving all the atmospheric conditions at a given place at a given time and about climate — an abstract concept integrating weather conditions for a given period of time within a given area. It is rather an outstandingly well prepared text "for students in university geography departments where climatology is taken seriously as a subject in its own right, for teachers of physics, mathematics, and geography who wish to interest their pupils in atmospheric science" and for the forecaster, various scientists, technicians, architects, etc. This fine book has a worldwide range of possible use as does the same author's "Techniques of Climatology",

"TECHNIQUES OF CLIMATOLOGY by E. T. Springer, xiii & 539 pp., 124 b/w illus. & 8 tab. W. H. Freeman & Company, San Francisco, California 94104. 1972. \$25.00.

This is a practical and carefully presented companion text to the same author's "Foundations of Climatology". Its first section deals with the basic techniques used in observing the weather both current and historical, interpreting the observations statistically and cartographically and preparing experimental models of the phenomena of weather and climate. Its second section demonstrates some applications of the basic techniques to radiation, temperature, clouds, visual climate with the theory of visibility and atmospheric optical effects. Its third section deals with geographical climatology including world and regional studies of actual climates and the turbulence theory. It closes with this characteristic admonition: "there is no justification for empirical geographical studies that purport to solve the pollution problem, or any other problem, in a certain region on the basis of maps constructed without reference to the findings of theoretical meteorologists. Empiricism without theoretical foundation must always be inconclusive, and theory without the backing of confirmatory observation is useless as a contribution to applied climatology."

"CLIMATES OF THE STATES" Volume I - Eastern States plus Puerto Rico and the U. S. Virgin Islands & Volume II - Western States including Alaska and Hawaii, by Officials of the National Oceanic and Atmospheric Administration, U. S. Department of Commerce, 994 pp., 395 tab. & 310 b/w maps. Water Information Center, Inc., Huntington, New York 11743. 1974. \$45.00 for the 2-volume set.

This valuable publication has served as and will continue to be "a valuable reference for professionals and students in climatology, hydrology, the environmental and agricultural sciences, and other persons interested in finding out what climatic conditions prevail in specific sections of the United States". It is based on carefully collected data over a decade prior to publication and includes for each state a "general summary of climatic conditions followed by detailed tables of freeze data; normal temperature and precipitation by climatic divisions and stations; normals, means, and extremes of selected individual stations; and maps showing temperature, precipitation and locations of stations. Also included are miscellaneous data on snowfall, sunshine and occurrence of tropical storms".

"ATLAS OF THE FLORA OF THE GREAT PLAINS" edited by T. M. Barkley, xiii & 600 pp., 2218 distribution maps. Iowa State University Press, Ames, Iowa 50010. 1977. \$15.00.

This useful atlas of about 3,000 vascular plants has been prepared by the Great Plains Flora Association coordinated by R. L. McGregor, the above-mentioned editor and eight other botanists. It brings up-to-date Rydberg's classical study. It covers the entire states of Kansas, Nebraska, North and South Dakota and contiguous parts of neighboring states that are Great Plains country. What a valuable precursor all these county distribution maps will be for the planned "Flora of the Great Plains" and for sound agricultural and safe ecological land-use treatment!

"PROJETO MADEIRO DE SANTA CATARINA — Levantamento das Espécies Florestais Nativas em Santa Catarina com a Possibilidade de Incremento e Desenvolvimento" by Raulino Reitz, Roberto M. Klein & Ademir Reis, 320 pp. & 88 b/w line-drawn or photographic plates. Sellowiana Anais Botânicos do Herbário "Barbosa Rodrigues" nos. 28--30. 1978. 88.300 Itajai, Santa Catarina, Brazil, paperbound.

This special issue commemorates 30 years of publication. The introduction describes the original heavily forested nature of the state of Santa Catarina and then lists alphabetically by its 72 families and 713 species the trees and shrubs collected in this herbarium. The plants are then described, drawn exceedingly well

and/or photographed, located on maps of the state. Their growing nature and conditions, economic uses and potentials, and common native names are given. In a fold of the back cover there is a 16" x 24" folded, plasticized colored phytogeographic map with detailed legend prepared by the second author. The first author, Padre Reitz, has been the kindly, brilliant, hard-working botanical leader in Santa Catarina for over three decades.

"WHITEFLY OF THE WORLD — A Systematic Catalogue of the Aleyrodidae (Homoptera) with Host Plant and Natural Enemy Data" by L. A. Mound & S. H. Halsey, iii & 340 pp. British Museum (Natural History) and John Wiley & Sons, Chichester, Brisbane, Toronto and New York, N. Y. 10017. 1978. \$29.00.

This is a mighty careful compilation of a great deal of material of interest to many entomologists, botanists, ecologists, horticulturalists and agronomists (at least). The catalogue lists 1156 species in 126 genera which are differentiated according to the structure of the fourth larval instar or the pupal case. "Morphologically the aleyrodids seem to be degenerate psyllids, although ecologically they are the tropical equivalents of aphids — opportunist insects with transient populations." They are sap-sucking, nectar-slobbering pests of crops and ornamental plants as well as pathogen virus vectors.

Whitefly species are listed alphabetically within their genera (also alphabetic) with name, authority, synonymy, dates, local common names, geographic distribution, host plant and its family, and natural enemies. Most aleyrodid species are found on dicots, "colonizing the available flora, rather than along lines of botanical affinity".

"COURSE BOOK IN GENERAL BOTANY" Second Edition by John D. Dodd, xxxiv & 259 pp., 353 b/w fig. & 1 tab. Iowa State University Press, Ames, Iowa 50010. 1977. \$10.50.

The first edition of this textbook was released in 1962 under the title "Form and Function in Plants" and had three printings. It is still planned for a one term course in general botany, intentionally omitting the molecular and biochemical presentations covered in various beginning biology courses and later in detailed courses for majors and intentionally reverting to "dealing with organisms and structures and be[ing] so organized that the student becomes aware of the numerous kinds of living plants existing in natural environments". The new text is carefully written and illustrative material has been added but nothing that would not be seen under ordinary light microscopes. My liking this presentation is flavored with nostalgia and a concern about how it will survive today.

"DISTRIBUTION OF THE ILLINOIS VASCULAR PLANTS" by Robert H. Mohlenbrock & Douglas M. Ladd, 296 pp. & 3001 b/w county distribution maps. Southern Illinois University Press, P. O. Box 3697, Carbondale, Illinois 62901. 1978. \$9.85 paperbound.

County dotted distribution maps, twelve per large unnumbered page, are arranged alphabetically by genera and their species for a total of 3,001 taxa representing native and naturalized species. Numbered pages at the end of the book contain a list of pertinent synonyms used by Fernald (1950), Gleason (1952) and Jones (1963) in phylogenetic sequence listing. Descriptions for these, keys and ecological notes are in the companion volume from the same press and by the senior author entitled "Guide to the Vascular Flora of Illinois".

"GUIDE TO THE VASCULAR FLORA OF ILLINOIS" by Robert H. Mohlenbrock, xii & 494 pp., 2 b/w maps. Southern Illinois University Press, P. O. Box 3697, Carbondale, Illinois 62901. 1975. \$15.00 clothbound, \$7.95 paperbound.

This carefully prepared study is of value not only for its "keys to 3,047 taxa of ferns, gymnosperms, and flowering plants in the state" and Schwegman's introduction to the fourteen main natural divisions described for their principal features, topography, glacial history, and plant communities, but also for its keyed direction to families in the illustrated serially published sections of this flora. Serious students, teachers and amateurs in this area might do well for themselves by using a paperbound copy in the field and saving a clothbound copy for their reading shelf or desk at home along with their Flora volumes.

"NATURAL HISTORY IN AMERICA from Mark Catesby to Rachel Carson" by Wayne Hanley, xii & 339 pp., 12 b/w fig. & 16 color plates. A Demeter Press Book, Quadrangle/The New York Times Book Co., New York, N. Y. 10016. 1977. \$14.95.

This interesting publication is presented under the auspices of the Massachusetts Audubon Society and offers a treasure store of reading treats for the fortunate and willing who get access to this book now so readily available. "It is essentially a collection of readable passages selected from the writings of [over 30] great American naturalists" whose original tomes "are now almost inaccessible to the general reader. The material is arranged chronologically, is introduced by Hanley's often 'chatty' comments, and is chosen to "reveal the humanness of the author rather than his or her heft as an observer" to instigate "more adventures in reading". Does it, as in facetiously calling Linnaeus the "dirty old man" of botany?

"GLIMPSES OF BIRD LIFE" by Alexander Dawes DuBois, 100 pp. & 36 b/w photographic plates. T. S. Denison & Co., Inc., Minneapolis, Minnesota 55431. 1974. \$5.95.

Here for a bargain price you can mull over exquisite nesting photographs and descriptive text from behind blinds of the family scenes of hummingbirds, peewees, bitterns, cedar waxwings, mourning doves, goldfinches, great horned owls, wood thrushes and nighthawks. These are what you nostalgically recall seeing, or wish you had photographed as clearly, or hope to follow through on "some day" and should share with some young person or new retiree interesting in observing bird life in a sustained way.

"BIRDS AND THEIR WAYS" by Alexander Dawes DuBois & Charlotte A. DuBois, 184 pp. & 78 b/w photographic plates. T. S. Denison & Co., Inc., Minneapolis, Minnesota 55431. 1976. \$8.95.

This charming publication serves as a companion piece to the lovely "Glimpses of Bird Life". Like it, this one was published posthumously and this one was completed by the author's sister who often assisted her ornithologist-photographer-engineer-teacher brother in the field over the years. Again the illustrations are beautiful and precise and the text accurate and interesting, especially since the observations are written unobtrusively in the "first person singular". Part One of the book considers "Some Ways of Birds I Have Known"; Part Two "Some Birds Whose Ways I Have Known".

"MICRO-CLIMATE The Biological Environment" by Norman J. Rosenberg, xii & 315 pp., 136 b/w fig. & 196 tab. Wiley-Interscience Publication of John Wiley & Sons, New York, N. Y. 10016. 1974. \$15.00.

Microclimate — that near the ground in which most terrestrial life exists — has its properties delineated often through applied physics and mathematics as well as "its changing condition with time of day and season and the extremes which impose stresses on plant and animal life...and ways in which the microclimate can be beneficially altered." This study should appeal particularly to students, engineers, technicians and related scientists studying and working in agricultural climatology and meteorology. The author has been a university leader in this field, and so this text is highly validated. The main topics well discussed are (1) radiation balance, (2/3) soil and sensible heat flux and temperature, (4) wind and turbulent transport, (5) atmospheric humidity, (6) modification of the soil temperature regime, (7) evapotranspiration, (8) photosynthesis, (9) carbon dioxide balance, (10) windbreaks and the shelter effect, (11) frost and frost control, and (12) improving water use efficiency by some new methods.

"THE ORCHIDS Scientific Studies" edited by Carl L. Withner, xii & 604 pp., 131 b/w photographs & figs. A Wiley-Interscience Publication of John Wiley & Sons, Chichester, Sydney, Toronto & New York, N. Y. 10016. 1974. \$26.50.

This excellently prepared study is really the previously planned companion or second volume to the also excellent work "The Orchids, A Scientific Survey" edited by the same C. L. Withner in 1959 for *Chronica Botanica* and later dispersed by Ronald Press of New York City. "Orchid enthusiasts and experts the world over refer to it [the first volume] for authoritative information that does not go out of date....This second volume accounts for areas not reviewed previously and adds to other specialties by an increase in details and recent advances". The eleven chapters, each written by one or more experts, include such topics as ecology, seedlings and embryo development, anatomy and physiology, cytology, alkaloids, polyploidy, chromosome numbers, natural and artificial hybrid generic names and clonal multiplication. This last topic is the work of George Morel who died shortly before the book was printed. "The orchid world will long remember his scientific application of meristemming to the art of orchid culture."

"MEDICAL BOTANY - Plants Affecting Man's Health" by Walter H. Lewis & Memory P. F. Elvin-Lewis, xvi & 515 pp., 156 b/w figs. & 50 tabs. A Wiley-Interscience Publication of John Wiley & Sons, London, Sydney, Toronto & New York, N. Y. 10016. 1977. \$27.50.

This book makes fascinating reading about plants affecting man's health and an excellent text for a university course such as this husband-and-wife author team give for students planning medical or health related careers and those also in anthropology, psychology, etc. It should also interest physicians and professional biologists and botanists. There is a great wealth of material carefully documented, effectively presented, attractively illustrated often from the old woodcuts of Gerard's *Herball*, and very accessibly indexed.

The subject matter is divided into three main use groups: (1) Injurious plants as poisons, allergens, mutagens, etc., (2) Remedial plants with present-day evaluations where known as antibiotics, pesticides, panaceas, and those effective for afflictions for each of the body systems, etc., and (3) Psychoactive plants as stimulants, hallucinogens, depressants, etc. The specific epithet for Vitex agnus-castus is misspelled on p. 332.



# PHYTOLOGIA

*Designed to expedite botanical publication*

Vol. 41

December 1978

No. 2

LIPSON  
JAN 4 1979

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Published by Harold N. Moldenke and Alma L. Moldenke

303 Parkside Road  
Plainfield, New Jersey 07060  
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SPOROBOLUS COAHUILENSIS (GRAMINEAE)  
A NEW SPECIES FROM COAHUILA, MÉXICO

Jesús Valdés Reyna  
Departamento de Botánica y Herbario  
Universidad Autónoma Agraria "Antonio Narro"  
Buena Vista, Saltillo, Coah., México

During an investigation of the grasses of Coahuila, some specimens were examined that do not correspond to any previously published species. They are described as a new species here.

Sporobolus coahuilensis J. Valdés, nov. sp.

Gramen annuum; culmi glabri 15-60 cm. alti adscendentes. Foliorum vaginae internodiis breviorae glabrae, ligulae ciliatae pilis 0.5-1 mm. longis, laminae planae effusae 4-12 cm. longae saepe 1.5-6 mm. latae supra sparse ciliato-pustulatae non confertae. Paniculae 6-22 cm. longae diffusae 5-13 cm. latae vel raro contractae ca. 1 cm. latae; pedicelli verticillati bene evoluti, pedicelli saepe (2-)3-6(-8) mm. longi; spiculae 1-1.5 mm. longae; glumae tenues acutae, gluma infera ca. 0.5 mm. longa supera 1.4-1.5 mm. longa; lemma 1.3-1.4 mm. longum acutum; palea translucida 1-1.3 mm. longa; granum saepe 0.6-0.9 mm. longum oblongum pallide brunneum; embryo 0.2-0.4 mm. longus (Fig. 1).

Annual; culms glabrous, 15-60 cm. tall, ascending; sheathblades shorter than the internodes, glabrous; ligule ciliate, hairs 0.5 - 1 mm. long; blades flat, spreading, evenly distributed, 4 to 12 cm. long and usually 1.5 - 6 mm. wide, sparsely ciliate-pustulate in the adaxial surface.

Inflorescence open panicle, sometimes contracted, 6 to 22 cm. long. 5 - 13 cm. wide (1 cm. when contracted) pedicels in whorls well developed, ending in a spikelet; spikelets 1 - 1.5 mm. long on capillary pedicels (2) 3 - 6 (8) mm. long; glumes thin, acute, the first ca. 0.5 mm. long, the second 1.4 - 1.5 mm. long; lemma 1.3 - 1.4 mm. long. acute; palea translucent 1 - 1.3 mm. long; grain mostly 0.6-0.9 mm. long oblong light brown; embryo 0.2 - 0.4 mm. long.

Distribution, known only from Central Coahuila, near Las Delicias and Cuatrociénegas.

TYPE: Mexico, Coahuila, about 58 air-miles southwest of Cuatrociénegas, 6.4 road-miles northeast of turn-off to Las Delicias on highway 30; clay flats and gypsum outcrops; with Ti-destromia tenella, Atriplex, Suaeda, Euphorbia, Acacia, Anulocaulis, etc. Annual. August 15, 1976. 815 m. alt., near 26°17' N., 102°40' W. J. Henrickson 15363 with B. Prigge (holotype: LL; isotypes: CSLA, MEXU and others to be distributed).

Additional specimens examined: about 72 airmiles southwest of Cuatrociénegas below the spring about 0.5 mile south of the main spring southwest of Las Delicias in limestone; infrequent around irrigated bean-patch; in shaded area; with Acacia berlandieri, Arundo, Celtis, Rhus, etc., 3,600 ft. alt., August 12, 1973, near 26°11' N., 102°50' W., J. Henrickson with T. Wendt (TEX, CSLA); Km. 11 al este de Cuatrociénegas, chaparral desertico, suelo arcilloso cafe, salitroso, 40 cm. de altura, amacollado, decumbente, September 24, 1955, 650 m. alt., E. Hernandez-X. & Mathus L. N-2025 (CHAPA, TAES); about 44 miles northeast of San Pedro de las Colonias, 6 miles northeast of Las Delicias turnoff along highway 30, 26°14' N., 102°41' W., on distinct outcrop of pure gypsum, with Larrea, Atriplex, Selinocarpus, Flaveria, Acacia, Suaeda, Nama and Fouquieria shrevei, frequent annual, 2980 ft. alt., August 25, 1971, J. Henrickson 6022 (LL).

This species is closely related to Sporobolus tuberculatus Hackel, a South American species (Stuckert, 1906), and S. pyramidatus (Lam.) Hitchc., a widespread species, and differs principally in the annual habit, size of the capillary pedicels and size of the panicle of S. coahuilensis. It is important to mention that S. tuberculatus is used as a synonym of S. pyramidatus by L. R. Parodi (1929).

Sporobolus coahuilensis is also closely related to S. patens Swallen, a species of annual grasses of North America. From the latter it differs in the size of the plants, the better development of whorls of capillary pedicels, the size of the spikelets, the size of the panicle, the much taller culms and wider leaf-blades.

Acknowledgements: I wish to thank Dr. Marshall C. Johnston for valuable help in the Latin description, for reviewing the manuscript and for his encouragement during this investigation. Sincere appreciation is expressed to Dr. Frank W. Gould, Tom Wendt and Jim Henrickson for their help.

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Figure 1. Sketch of a representative of Sporobolus coahuilensis, sp. nov. (left), along with enlarged views of the spikelet and a dot-map showing localities in Coahuila (right.)



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## Contributions to the Flora of the Sierra de Perijá, Venezuela. I

Stephen S. Tillett

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The following material was collected <sup>(1)</sup>, while accompanying an expedition of the Dirección de Fronteras del Ministerio de Relaciones Exteriores, of the Venezuelan Government, in the Sierra de Perijá, in the State of Zulia, along the international boundary with Colombia. A brief ecological description is given immediately below for each of the general localities, (indicated by underlining), since these are the first collections from the sites at those altitudes, except at 'Campamento Frontera I'. Not included are entities found by previous collectors (Ginés, Steyermark) at lower altitudes.

### Serranía de Los Motilones, Distrito Perijá

Environs of 'Campamento Frontera I', (Lat. 09°50'47.5" N, Long. 72°57'18.6" W), headwaters of the Río Tocuco; steep-sided ridge with deep humus, on siltstone and limestone, with dense evergreen forest 30-40 m tall, with considerable **Chusquea** and more **Olyra?** (to 5 m tall); the N-facing slope gentler and with a semi-deciduous forest 20-25 m tall; small patches of scrub-savanna (probably burned) on ridge; 1900-2000 m elevation; 24 to 26 June 1974.

Environs of 'Campamento Frontera II', (Lat. 10°00'13" N, Long. 72°58'ca.25" W), mesa below international border on main ridge; headwaters of the Río Negro; main ridge mostly of horizontal red sandstones and grey conglomerates, the lateral rolling ridges and more level areas with a very thin soil on a variety of silty, sandy, or gravelly substrates, varying from near-white to red-purple, and in many areas with rampant erosion due to recent fires; the more level areas covered with an **Hypericum**-scrub 1-2 m tall (of 3-4 species), which has been burned off several times, with grasses and sedges, especially in the swales and around shallow ponds; a páramo or supáramo vegetation, in part from burning; the steeper and wetter quebradas have remnants of the once more dominant forest 10-15 m tall, with innumerable downfall and standing dead trunks, largely invaded by bamboo; the area was apparently ungrazed as of the time of collection; ca. 3000 m elevation; the temperature during the visit varied from 0° to 15° C; 27 June to 5 July 1974.

### Serranía de Valledupar, Distrito Perijá

Along international boundary, from 'Hacienda Buenavista', (Lat.

10°20'ca.23" N, Long. 72°54'ca.14" W), to N side of 'Cerro Laminado' (ca. 5 km N of 'H.B.'); headwaters of Río Apón; broad, steep-sided, limestone and conglomerate ridgetops, covered with very thin soil, repeatedly burned and sadly overgrazed, a "bambusillo" to 1 m tall dominant in most of the area; many swales, rivulets, and somewhat marshy areas; 'Cerro Laminado' rising from the main ridge as a long E - W mesa of horizontally bedded red sandstone, equally overgrazed; remains of forest in the lower, steep-sided quebradas, below 3200 m; 3300-3650 m elev.; 9 to 10 July 1974.

Environs of 'Campamento Frontera V', (Lat. 10°23'07.8" N, Long. 72°52'42.5" W), headwaters of the Río Guasare, on the main 'maletero' trail from Manaure, Colombia; the whole area severely burned over in the previous ten years, and overgrazed, being changed from a nearly complete cover of forest to a grass savanna, much of the soil highly eroded and with a high proportion of charcoal; very steep limestone ridges, but with very little exposed rock; some small vernal pools, and the gentler quebradas with sedges and grasses, the main quebradas very steep-sided, and forested; 2700-3300 m elevation; 10 to 19 July 1974.

#### Serranía de Valledupar, Distrito Maracaibo

'Monte Viruela', (Lat. 10°25'ca.13" N, Long. 72°52'ca.42" W), a tepuí-like massif, 5 x 2.5 km, on the international boundary, covered with areas of highly eroded limestone, crevasse areas, cliffs, and funnel-shaped sinkholes; drainage all subterranean; soil brownish-black, rather impervious, to 2 dm deep; the natural vegetation of low forest (to 10m), Hypericum-scrub (to 2 m), and areas of wet and dry meadows, with much mounding of Sphagnum (to 5-6 dm) around bases of shrubs and 'bambusillo'; entirely burned over in early 1974 save for small patches of forest, and almost all of the Hypericum (1 sp.) killed; a great abundance of grasses due to the complete absence of cattle to that date; in general little flowering of woody plants during the visit; temperatures from 3-12° C, with much fog, rain, and occasional hail; ca. 3100 m elevation; 21 to 28 July 1974.

### Onagraceae

#### Fuchsia spp. aff. venusta and jahnii

Tillett & Hönig 746-678, 746-705, 747-766, 'Campamento Frontera II'; Tillett 747-1033, 747-1086, 'Campamento Frontera V'; Tillett 747-1175, 'Monte Viruela'. Known previously in Venezuela from the states of Mérida and Táchira.

#### Oenothera seifrizii Munz

Tillett & Hönig 746-760, 'Campamento Frontera II'; Tillett 747-1138, 'Monte Viruela'. Known previously only from the Sierra Nevada de Santa Marta, in Colombia.



## Umbelliferae

**Azorella cuatrecasasii** Math. & Const.

Tillett & Hönig 746-626, 'Campamento Frontera II'; Tillett 747-1250, 'Monte Viruela'. New to Venezuela; known previously only from northern Colombia, the Sierra Nevada de Santa Marta.

**Azorella aff. cuatrecasasii** Math. & Const.

Tillett 747-1249, 'Monte Viruela'. New to Venezuela.

**Daucus montanus** Humb. & Bonpl. ex Spreng.

Tillett & Hönig 746-714, 'Campamento Frontera II'; Tillett 747-1150, 'Monte Viruela'. Known previously in Venezuela from the states of Mérida, Falcón, Aragua, Distrito Federal, and Monagas.

**Eryngium humboldtii** Delar. f.

Tillett & Hönig 746-602, 'Campamento Frontera II'. Known previously in Venezuela from the Sierra Nevada de Los Andes, in the states of Apure, Táchira, and Mérida, and in the Cordilleras Central and Oriental of Colombia.

**Hydrocotyle domingense** Math. & Const.

Tillett & Hönig 747-803, 'Campamento Frontera II'. Known previously in Venezuela from the state of Mérida.

**Hydrocotyle grossulariaefolia** Rusby

Tillett 747-1036, 'Campamento Frontera V'. New to Venezuela, formerly from Ecuador to Colombia.

**Neonelsonia acuminata** (Benth.) Coult. & Rose

Tillett & Hönig 747-836, 'Campamento Frontera II'. New to Venezuela, previously from Perú to Colombia.

**Niphogeton colombiana** Math. & Const.

Tillett 1164, 'Monte Viruela'. New to Venezuela; known previously from the Sierra Nevada de Santa Marta, in Colombia.

**Perissocoeleum phylloideum** (Math. & Const.) Math. & Const.

(*Prionosciadium phylloideum* Math. & Const.)

Tillett & Hönig 746-601, 'Campamento Frontera II'; Tillett 747-1125, 'Monte Viruela'. New to Venezuela; type locality on the Colombian side of the Sierra de Perijá.

**Perissocoeleum purdiei** Math. & Const

Tillett 747-1148, 'Monte Viruela'. Known previously only from the Sierra Nevada de Santa Marta, in Colombia.

- (1) Collections made while employed by the Instituto Botánico, Ministerio de Agricultura y Cría, Caracas, Venezuela.
- (2) I wish to express my sincere appreciation to Drs. Lincoln Constance Mildred Mathias, and Peter Raven, and to Paul Berry, for their collaboration in the identification of this material.

OBSERVATIONS ON THE DIATOM FLORA FROM SPRINGS  
ALONG THE BALCONES FAULT, TEXAS

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This is a single summer study of the diatoms from selected large Texas springs. To the author's knowledge this is the only investigation specific to diatoms from these areas. These are in all cases rapid flowing springs producing large volumes of water.

The literature indicates that few studies have been completed on diatoms from spring habitats. In the United States, Whitford (1956) and Hohn (1961) have studies on diatoms from Florida springs and Reimer (1961) discusses spring diatoms in his work from Indiana. Cholonoky (1933-34) and Hustedt (1945) have produced reports on diatoms from springs in Europe. Other works from Europe include Foged's (1951) studies on diatoms in Danish springs and the two papers by Round (1957, 1960) on diatom flora in English springs (Table 5). These works in a general way seem to indicate that there is not a true "spring-type" diatom flora but rather these flora are more similar to small stream flora than river or lake assemblages.

Study Areas

The study areas include three spring complexes along the Balcones Fault which runs through central Texas (Map 1). Indications are that the water for all three collecting areas is furnished by the Edwards Underground Reservoir (Map 2).

The Balcones zone of faulting was formed under conditions of strain during Tertiary times by the down-warping near the Gulf Coast and moderate uplift inland (Sellards, et al 1932). The area is made up of natural and/or gravity faults with the major down throw being to the east. This area is at the edge of the Edwards plateau having rock formations constructed mainly of limestone with some amount of out-cropping.

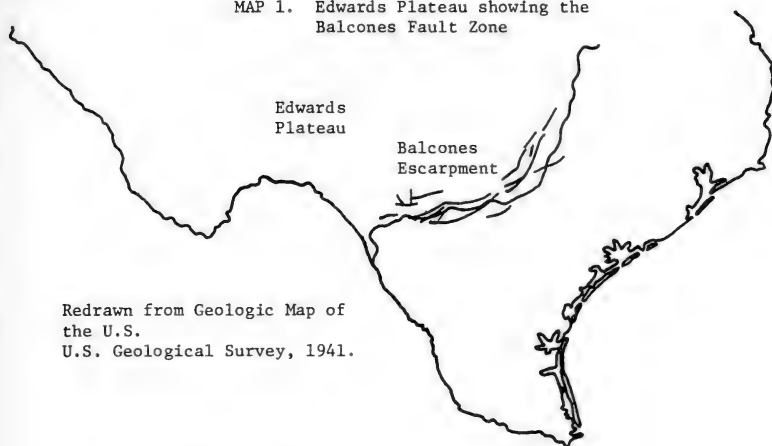
The springs considered in this study are of the artesian type known as "fissure springs" as opposed to gravity springs also found in the area. These springs are associated with the Balcones scarp line and associated faults. They are the most prominent of a chain of springs extending in a continuous line for 250 miles between Austin and Del Rio, Texas (Map 2). They appear at the foot of the Balcones escarpment from openings in the Cretaceous limestone. The faults of the Balcones escarpment run southwest for 80 miles from Austin to San Antonio and, from there, west for 150 miles to Del Rio (Map 2).

The water reservoir feeding these springs is the Edwards (Balcones Fault Zone) Aquifer, not to be confused with the more extensive and deeper Edwards-Trinity (Plateau) Aquifer which lies to the west. The location and size of the aquifer in this study can be observed on Map 2.

The aquifer is not at great depth and is, in part, recharged by spring-fed streams as they flow across the Balcones fault zones. Because of this, spring

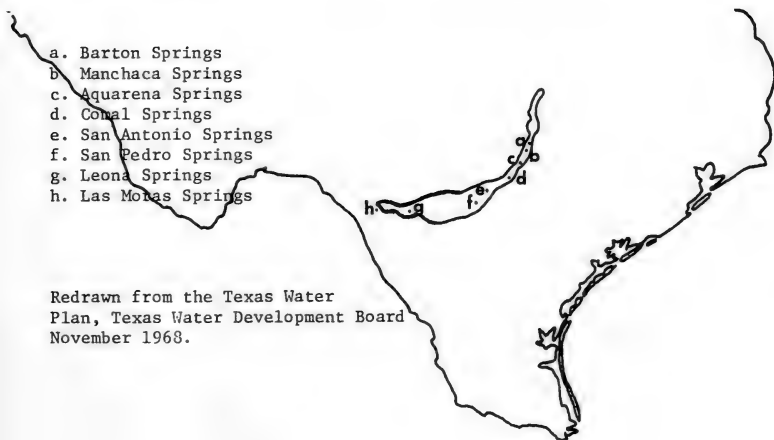
## SOUTH-CENTRAL TEXAS

MAP 1. Edwards Plateau showing the Balcones Fault Zone



Redrawn from Geologic Map of  
the U.S.  
U.S. Geological Survey, 1941.

MAP 2. Edwards Aquifer with Spring Locations



Redrawn from the Texas Water  
Plan, Texas Water Development Board  
November 1968.

flow, mineral content and temperature are affected, with but a short lag, by environmental conditions of the area.

Average winter temperature in the area is about 51.2°F. Summer temperatures average 84.2°F. Thus average yearly temperature in the Balcones fault area is about 68°F. As can be seen in Table 2, this is in close agreement with the observed water temperatures of 21+°C (69.8°F) found in the springs considered.

Annual precipitation in the area ranges from 33.24 inches in the east to 25.91 inches in the west. The rainfall, of course, varies from year to year and this, in turn, affects the depth of the water below the land surface and the rate of flow of the springs.

Normal depth of the Edwards Aquifer is 40-50 feet below the surface. The water level dropped to 100 feet and below during the drought of the early 1950's in central Texas. Many of the major springs have never recovered from the drought and have flow limited only to abnormally high water periods.

Study sites include spring complexes in Austin, San Marcos and New Braunfels. In each of these areas there are many points of upwelling underground water from cracks between the rocks (Table 1). Because of the force and volume of water, these springs must be classified as true rheocrenes. The resulting water may form various sized pools or develop directly in streams.

The study site at Barton Springs in Austin was a rather large body of slow moving water. The collection area at Aquarena Springs was a man-made impoundment with almost no water flow in the spring area. The study area at Comal Springs in New Braunfels was represented by a small but rapid flowing stream formed by the upwelling spring water.

#### Sampling Stations

The first collecting site included a number of springs located in southwest Austin (Latitude 30°16' north and Longitude 97°47' west). These springs are known locally as Barton or Zilker Springs. They are located in and near Barton Creek where it flows through Zilker Park. The area containing the major spring complex has been dammed and treated with chlorine to produce a public swimming pool. Most of the minor spring areas are contained in man-made rock structures so as to create an unnatural habitat.

The second study area, known as Aquarena Springs, is located in the city of San Marcos (Latitude 29°53' north and Longitude 97°51' west) about thirty miles south of the first collecting site. These springs are located in a park area in the north part of the city. Man-made containing walls are present in most of the spring area.

The final collecting site was springs in Landa Park in the city of New Braunfels (Latitude 29°43' north and Longitude 98°07' west) about fifty miles south of the first collecting area. It proved to be the least disturbed, most natural of the collecting sites. These are called Comal Springs and are considered to be the largest in Texas.

TABLE 1. Springs related to the Balcones fault belt of Texas and their flow rates.

NAME	LOCATION	SPRING FLOW	
Barton Springs	Austin	40 sec.-ft.	26,000,000 gal./day
Manchaca Springs	Buda	---	---
Aquarena Springs	San Marcos	135 sec.-ft.	100,000,000 gal./day
Comal Springs	New Braunfels	350 sec.-ft.	220,000,000 gal./day
San Pedro Springs	San Antonio	---	---
San Antonio Springs	San Antonio	90 sec.-ft.	---
Leona Springs	Uvalde	---	---
Las Moras Springs	Brackettville	34 sec.-ft.	14,200,000 gal./day
*San Felipe Springs	Del Rio	115 sec.-ft.	49,200,000 gal./day
*Good Enough Springs	Comstock	222 sec.-ft.	116,000,000 gal./day

#### Methods

Chemical and physical parameters were measured under field conditions at each site using a portable Hach Engineer's Laboratory DR-EL. The results are shown in Table 2 and are to be considered only as general indicators suggesting that these spring waters are slightly basic and hard in nature. These tests are in fair agreement with water tests conducted by other groups in the same general area. Most tests were run against known standards.

Collections of plant materials and rock scrapings were made (Table 7). Plankton and substratum samples were also taken. Each collection was examined for living diatoms and then divided. One-half of each sample was treated with formalin and saved as uncleaned material. The organic matter was removed from the remainder of the sample using 30% hydrogen peroxide and potassium dichromate. The resulting material was cleaned by decanting several times with distilled water and stored.

Each sample bottle was shaken and a dropper of material was obtained. This cleaned diatom material was placed on #0 cover slips and allowed to air dry. The cover slips were then placed on a hot plate and heated to 600°F for several hours. Each was inverted and placed on a standard microscope slide containing a drop of Hyrax. The entire mount was heated on a hot plate to 350°F for a short period of time to remove the mounting medium solvent.

A systematic search was made of each slide to identify and record each specimen (Table 6). Genus counts were tabulated to determine the relative abundance of each. These data are to be found in Tables 3 and 4.

### Discussion

The three spring areas studied are similar in that they are of the artesian type, are formed by the Balcones zone of faulting and derive their water from the Edwards Aquifer. The close similarity of the chemical and physical parameters as shown in Table 2 bears this out. At this point the similarities end.

Barton Springs are found in and near a rather large slow moving stream. Aquarena Springs are dammed to form a large pond or lake-like environment. The Comal Springs studied produced a rapid flowing small stream in the area considered.

These environmental likenesses and differences are reflected in the diatom populations. Table 6 indicates that 18% of the diatom forms were observed in collections from all three spring areas, while 24% were found in, at least, two of the study sites. An analysis of the diatom population (Table 3) points up these similarities and differences even more.

A study of the structure of the diatom population (Table 4) reflects the water conditions. The diatom structure of Comal Springs is similar to that of a cool rapid stream containing a fair amount of plants. The increase in planktonic and bottom forms found in the other two spring areas are indicative of a more pond-like population structure. These results were expected and in agreement with the physical and chemical parameters observed (Table 2).

To carry this study one more step the author tabulated the number of forms recorded in each of the genera as found by other investigators studying springs (Table 5). This comparison is of value only in a very general way because of the great differences in the studies. One study is based on a years' collections, while another is developed from a single set of collections. The study by Foged (1951) considers six spring areas, but others have information on larger and smaller numbers. Some of the springs studied are of the seepage type which form bog-like conditions very dissimilar to the springs in this study.

The only real deviation in genus forms in this study from investigations by others appears to be *Achnanthes* and *Gomphonema*. The high percentage of the population and the variation of forms in the genus *Achnanthes* may be in part explained by the rocky environment and the water movement, which favors their development. As a general rule, diatoms of this genus tend to be bottom forms that live attached firmly to rocks and are able to compete successfully under these conditions.

The diatoms of the genus *Gomphonema*, on the other hand, are main epiphytic, found living on various higher plants. A rather diverse population of higher plant forms was observed and collected. This may account to some extent for the large number of *Gomphonema* forms recorded.

Many of the diatoms observed in this study have not been reported previously

TABLE 2. Chemical and physical parameters as found at the collecting sites.\*

	#1	#2	#3	#4	#5
Alkalinity	290	280	278	256.5	320
Carbon Dioxide	3.8	4.6	4.2	----	4.2
Hardness, Total	227	260	280	280	260
Hardness, Ca.	176	195	221	----	200
Hardness, Mg.	51	65	59	----	60
Phosphate, Ortho	.11	.10	.60	----	.08
Nitrate	51.92	39.60	48.84	----	52.78
Nitrite	.021	.026	.027	----	.013
Sulfate	17.2	17.0	17.5	----	----
Manganese	----	.3	trace	----	----
Oxygen, Dissolved	6	6	5	7	9
pH	7.01	7.08	7.10	7.20	7.40
Turbidity	8JTU	13JTU	11JTU	----	8JTU
Water Temp.	21°C	22.5°C	21°C	21+°C	22.5°C
Air Temp.	29°C	25°C	24.8°C	26°C	30.1°C
Date	6/15/70	6/16/70	6/22/70	6/22/70	7/9/70
Time	6:30p.m.	9:45a.m.	9:00a.m.	10:00a.m.	9:00a.m.

#1 Travis Co.-Austin-Zilker Park-Barton Springs-west side near pool.

#2 Comal Co.-New Braunfels-Landa Park-Comal Springs

#3 Hays Co.-San Marcos-Aquarena Springs

#4 Hays Co.-San Marcos-Aquarena Springs-100' downstream from springs.

#5 Travis Co.-Austin-Zilker Park-Barton Springs-10' below spring area.

\*All results in parts per million (ppm) unless otherwise noted.

as occurring in Texas. In fact, few published studies on recent diatoms have been done, although some fossil work on soil cores is available. Those diatoms listed in Table 6 that are followed by an asterisk have been reported from collections made from Texas. The other entities, to the author's knowledge, are new diatom records for the state.

TABLE 3. Analysis of diatom population by genera.

Genera	Comal Springs	Aquarena Springs	Barton Springs	Composite	Genera	Comal Springs	Aquarena Springs	Barton Springs	Composite
Achnanthes	15	12	13	19	Frustulia	--	1	2	2
Amphipleura	1	1	1	1	Gomphonema	11	11	9	22
Amphora	4	4	3	4	Gyrosigma	--	--	2	2
Bacillaria	1	--	--	1	Hantzschia	1	1	--	1
Caloneis	1	1	1	2	Meridion	--	--	1	1
Cocconeis	2	2	4	4	Navicula	11	12	17	29
Cymatopleura	--	--	2	2	Nitzschia	3	7	14	17
Cymbella	13	7	6	15	Pinnularia	--	1	3	4
Denticula	2	1	2	2	Rhopalodia	1	--	--	1
Diploneis	2	3	2	3	Stauroneis	2	1	4	4
Epithemia	--	1	--	1	Surirella	--	2	6	6
Eunotia	4	3	3	6	Synedra	4	8	3	10
Fragilaria	3	3	1	4	Terpsinoe	1	1	1	1

This study of three springs includes a total of 165 taxa representing 25 genera.

The diatom population as indicated by species ecological parameters is mainly that of a stable alkaline hard water environment. About 47% of all of the diatoms observed are considered to be alkaliphilous forms. When 5000 counts were conducted on each spring individually 50% of the diatoms in Barton Springs, 45% of those from Aquarena Springs and 46% from Comal Springs were alkaliphilous forms. In these same counts less than 3% could be considered acidophilous and along with this only about 15% of the total entities can be considered indicative of entrophic conditions.

Twenty-five per cent (44) of the total population are found typically in the Gulf Coast states. Twenty per cent of the observed diatoms are periphytes. Thirteen per cent were found to be rheophilous while only 16 forms are recognized as planktonic.

It should also be noted that diatoms considered to be aerophilic or soil diatoms were from time to time observed as isolated individuals. Diatoms that



TABLE 4. Structure of diatom population analyzed.\*

Genera	Comal Springs		Aquarena Springs		Barton Springs	
	No. of Subord. Taxa	Appx. % of pop.	No. of Subord. Taxa	Appx. % of pop.	No. of Subord. Taxa	Appx. % of pop.
Achnanthes	15	41.03%	12	42.01%	13	35.33%
Amphora	4	9.96%	4	0.96%	3	3.34%
Caloneis	1	+	1	+	1	+
Cocconeis	2	12.30%	2	14.56%	4	19.08%
Cymbella	13	3.91%	7	0.80%	6	1.83%
Denticula	2	30.80%	1	15.68%	2	6.25%
Diploneis	2	0.24%	3	0.72%	1	0.35%
Eunotia	4	2.11%	3	0.91%	3	2.75%
Fragilaria	3	1.84%	3	3.20%	1	1.00%
Gomphonema	11	1.92%	11	10.80%	9	2.83%
Meridion	--	---	--	---	1	4.66%
Navicula	11	1.04%	12	2.15%	17	10.25%
Nitzschia	3	1.12%	7	4.96%	14	7.50%
Pinnularia	--	---	1	+	3	+
Stauroneis	2	+	1	+	4	+
Surirella	--	---	2	+	6	1.64%
Synedra	4	0.64%	8	2.96%	3	2.16%
Terpsinoe	1	0.80%	1	+	1	+

\*Data based on 5000 counts.

+Present; low frequency.

TABLE 5. Number of taxa identified in each genus recorded from studies on springs.

	Foged (1951)	Whitford (1956)	Round (1957)	Round (1960)	Hohn (1961)	Reimer (1961)	Christensen (1970)
Achnanthes	11	2	11	12	17	8	19
Amphipleura	--	1	--	1	--	--	1
Amphora	6	3	4	2	5	2	5
Anomoeneis	3	--	1	1	--	1	--
Bacillaria	--	--	--	--	1	--	1
Biddulphia	--	2	--	--	1	--	--
Caloneis	12	--	2	6	6	5	2
Cocconeis	4	2	4	1	6	--	4
Campylodiscus	1	--	--	1	--	--	--
Cyclotella	3	1	1	--	2	--	--
Cymatopleura	2	--	2	2	--	--	2
Cymbella	21	1	5	12	6	14	15
Denticula	2	--	1	1	--	1	2
Diploneis	8	--	3	3	2	3	3
Epithemia	5	3	4	--	3	2	1
Eunotia	9	1	3	6	7	3	6
Fragilaria	13	1	7	9	10	2	4
Frustulia	2	--	--	2	1	--	2
Gomphonema	14	2	12	7	16	8	22
Gyrosigma	--	--	1	1	--	--	2
Hantzschia	2	--	1	1	1	--	1
Mastigloia	--	1	--	--	--	2	--
Melosira	9	3	2	1	4	--	--
Meridion	1	--	--	1	--	--	1
Navicula	80	2	18	26	60	33	29
Neidium	2	--	4	3	2	6	--
Nitzschia	20	6	11	12	15	18	17
Opephora	1	--	--	--	1	--	--
Pinnularia	20	--	7	5	3	6	4
Pleurosigma	--	2	--	--	--	--	--
Rhoicosphenia	--	--	1	--	--	--	--
Rhopalodia	3	--	--	1	1	4	1
Stauroneis	8	1	3	5	2	7	4
Stephanodiscus	2	1	--	--	--	--	--
Surirella	9	1	5	8	1	5	6
Synedra	12	4	5	4	12	4	10
Tabellaria	3	--	1	--	--	--	--
Terpsinoe	--	1	--	--	1	--	1
Thalassiosira	--	--	--	--	1	--	--

fit into this category include Achnanthes linearis, Achnanthes hustedtii, Amphora ovalis var. pediculus, Eunota pectinalis var. minor, Hantzschia amphioxys, Navicula confervacea, Navicula mutica and Nitzschia kulzingiana. Their presence may be the result of the heavy rains and flooding of the areas a few weeks before the collections were made.

The following taxa are by the author considered to be organic pollution indicators when observed in large numbers in the diatom population: Amphipleura pellucida, Cymatopleura solea, Fragilaria capicina var. mesolepta, Gomphonema angustatum and varieties, Gomphonema intricatum, Gomphonema olivaceum, Meridion circulara, Navicula accomoda, Navicula cryptocephala and varieties, Navicula cuspidata, Navicula lanceolata, Navicula pupula, Navicula rhynchocephala, Nitzschia amphibia, Nitzschia frustulum var. subsalina, Nitzschia kulzingiana, Nitzschia linearis, Nitzschia palea and varieties, Nitzschia sigmoidea, Rhopalodia gibberula var. protracta, Stauroneis anceps, Stauroneis phoenicuntheron f. gracilis, Synedra acus and Synedra ulna.

This group of diatoms represents 18.4% of the taxa and 23.4% of the population of Barton Springs indicating a high pollution stress condition. The Aquarena Springs assemblage of these indicator diatoms was 14.5% of the taxa and 15% of the diatom population suggesting only minor but chronic pollution present. Comal Springs with about 13% of the taxa and only 6% of the population being from this group of diatoms is the lowest the author has ever observed and shows a normal, noneffected spring.

The use of these three parameters: indicator species, diversity and population structure of diatoms when following standard procedures, can present a clear and accurate picture of the long term organic pollution conditions of flowing bodies of water.

This report is the result of a NSF Research Participation Program directed by Dr. H. C. Bold, The University of Texas, in the summer of 1970. This information was presented at the AIBS meetings in Fort Collins, Colorado, in September, 1971.

The author wishes to thank Dr. H. C. Bold for his kindness and the use of his laboratory and equipment. Thanks also must go to Dr. John D. Dodd, Iowa State University, and Dr. Charles Reimer, Philadelphia Academy of Natural Sciences for their help and advice during this study.

TABLE 6. Identified diatoms from three major springs: (1) Barton Springs, (2) Aquarena Springs and (3) Comal Springs.

	(1) Barton Springs	(2) Aquarena Springs	(3) Comal Springs
<u>Achnanthes</u>			
<i>A. affinis</i> Grun.	+	+	+
<i>A. exilis</i> Kutz.	-	-	+
<i>A. exigua</i> Grun.*	+	+	+
<i>A. exigua</i> var. <i>constricta</i> (Grun.) Hust.	-	+	+
<i>A. exigua</i> var. <i>heterovalva</i> Krasske*	-	-	+
<i>A. flexella</i> (Kutz.) Brun.	+	-	-
<i>A. hauchiana</i> Grun.	+	+	-
<i>A. hungarica</i> (Grun.) Grun.*	-	-	+
<i>A. hustedtii</i> (Krasske) Reim.	+	-	-
<i>A. inflata</i> (Kutz.) Grun.*	-	+	+
<i>A. lanceolata</i> (Breb.) Grun.*	+	+	+
<i>A. lanceolata</i> var. <i>dubia</i> Grun.*	+	+	+
<i>A. lanceolata</i> var. ?	-	+	-
<i>A. linearis</i> (W.Sm.) Grun.	+	+	+
<i>A. linearis</i> f. <i>curta</i> H. L. Sm.	+	+	+
<i>A. marginulata</i> Grun.	+	-	+
<i>A. microcephala</i> (Kutz.) Grun.*	+	+	+
<i>A. minutissima</i> Kutz.	+	+	+
<i>A. wellsiae</i> Reim.*	+	-	+
<u>Amphipleura</u>			
<i>A. pellucida</i> Kutz.	+	+	+
<u>Amphora</u>			
<i>A. normani</i> Rabh.	+	+	+
<i>A. ovalis</i> Kutz.	+	+	+
<i>A. ovalis</i> var. <i>pediculus</i> Kutz.	+	+	+
<i>A. perpusilla</i> Grun?	-	-	+
<i>A. veneta</i> Kutz.	-	+	-
<u>Bacillaria</u>			
<i>B. paradoxa</i> var. <i>tumidula</i> Grun.	-	-	+
<u>Caloneis</u>			
<i>C. bacillum</i> (Grun.) Cl.*	+	+	+
<i>C. ventricosa</i> var. <i>truncatula</i> (Grun.) Meist.*	-	-	+

TABLE 6. Continued.

	(1)	(2)	(3)
<u>Cocconeis</u>			
<i>C. pediculus</i> Ehr.*	+	-	-
<i>C. placentula</i> Ehr.*	+	+	+
<i>C. placentula</i> var. <i>euglypta</i> *	+	-	-
<i>C. placentula</i> var. <i>lineata</i> (Ehr.) V. H.*	+	+	+
<u>Cymatopleura</u>			
<i>C. elliptica</i> (Breb.) W. Sm.	+	-	-
<i>C. solea</i> (Breb.) W. Sm.	+	-	-
<u>Cymbella</u>			
<i>C. affinis</i> Kutz.	+	-	+
<i>C. amphicephala</i> Naegeli	-	-	+
<i>C. aspera</i> (Ehr.) Cl.	+	+	+
<i>C. cistula</i> (Hemp.) Grun.	+	+	-
<i>C. hustedtii</i> Krasske	-	+	-
<i>C. laevis</i> Naegeli	+	-	+
<i>C. microcephala</i> Grun.	-	+	+
<i>C. naviculiformis</i> Auerswald	-	+	+
<i>C. pusilla</i> Grun.	-	-	+
<i>C. similis</i> Krasske	-	-	+
<i>C. tumidula</i> Grun.	-	-	+
<i>C. ventricosa</i> Kutz.	+	+	+
<i>C. sp. #1</i>	+	+	+
<i>C. sp. #2</i>	-	+	+
<i>C. sp. #3</i>	-	-	+
<u>Denticula</u>			
<i>D. elegans</i> Kutz.	+	+	+
<i>D. tenuis</i> Kutz.	+	-	+
<u>Diploneis</u>			
<i>D. elliptica</i> (Kutz.) Cl.*	-	+	-
<i>D. oblongella</i> (Naeg. ex Kutz.) Ross*	-	+	+
<i>D. puella</i> (Schum.) Cl.*	+	+	+
<u>Epithemia</u>			
<i>E. zebra</i> var. <i>saxonica</i> (Kutz.) Grun.	-	+	-
<u>Eunotia</u>			
<i>E. arcus</i> var.?	-	-	+
<i>E. curvata</i> (Kutz.) Lagerst.*	+	+	-
<i>E. maior</i> (W. Sm.) Rabh.*	-	+	+
<i>E. maior</i> var. <i>ventricosa</i> A. Cl.	-	-	+
<i>E. monodon</i> Ehr.*	-	+	+
<i>E. pectinalis</i> var. <i>minor</i> (Kutz.) Rabh.*	+	-	-

TABLE 6. Continued.

	(1)	(2)	(3)
<u>Fragilaria</u>			
<i>F. capucina</i> var. <i>mesolepta</i> Rabh.	-	-	+
<i>F. construens</i> (Ehr.) Grun.*	-	+	+
<i>F. crotonensis</i> Kitton*	-	+	+
<i>F. virescens</i> Ralfs	+	+	-
<u>Frustulia</u>			
<i>F. rhomboides</i> var. <i>amphipleuroides</i> (Grun.)	+	+	-
<i>F. rhomboides</i> var. <i>viridula</i> (Breb.) Cl.	+	-	-
<u>Gomphonema</u>			
<i>G. abbrevialum</i> Kutz.	+	-	+
<i>G. abbrevialum</i> var. <i>brasiliense</i> Grun.	-	-	+
<i>G. acuminatum</i> Ehr.	+	-	-
<i>G. affine</i> Kutz.	-	+	-
<i>G. angustatum</i> (Kutz.) Rabh.	+	+	+
<i>G. angustatum</i> var. <i>intermedia</i> Grun.	-	+	-
<i>G. angustatum</i> var. <i>producta</i> Grun.	-	+	-
<i>G. apicatum</i> Ehr.	+	-	-
<i>G. gracile</i> Ehr.	-	+	-
<i>G. gracile</i> var. <i>naviculoides</i> (W. Sm.) Grun.	-	-	+
<i>G. intricatum</i> Kutz.	-	-	+
<i>G. intricatum</i> var. <i>dichotoma</i> Grun.	-	+	-
<i>G. lagenula</i> Kutz.	-	-	+
<i>G. lanceolatum</i> Kutz.	+	-	+
<i>G. lanceolatum</i> var. <i>insignis</i> (Gregory) Cl.	-	-	+
<i>G. longiceps</i> var. <i>gracilis</i> Hust.	-	+	+
<i>G. longiceps</i> var. <i>subclavata</i> Grun.	+	-	-
<i>G. olivaceum</i> Rhr.	+	-	-
<i>G. parvulum</i> (Kutz.) Grun.	+	+	+
<i>G. parvulum</i> var. ?	-	+	-
<i>G. sphaerophorum</i> Ehr.	+	+	+
<i>G. sp #1</i>	-	+	-
<u>Gyrosigma</u>			
<i>G. attenuatum</i> (Kutz.) Rabh.*	+	-	-
<i>G. obscurum</i> (W. Sm.) Griff. & Henfr.	+	-	-
<u>Hantzschia</u>			
<i>H. amphioxys</i> (Ehr.) Grun.	-	+	+
<u>Meridion</u>			
<i>M. circulara</i> (Grev.) Ag.	+	-	-

TABLE 6. Continued.

	(1)	(2)	(3)
<u>Navicula</u>			
<i>N. accomoda</i> Hust.*	-	-	+
<i>N. confervacea</i> Kutz.*	-	+	-
<i>N. cryptocephala</i> var.?	+	-	-
<i>N. cuspidata</i> (Kutz.) Kutz.*	+	-	-
<i>N. exigua</i> var. <i>capitata</i> Patr.	-	-	+
<i>N. festiva</i> Krasske	-	+	+
<i>N. graciloides</i> A. Mayer	-	+	-
<i>N. grimmei</i> Krasske*	+	-	-
<i>N. gysingensis</i> Foged	-	+	-
<i>N. halophila</i> (Grun.) Cl.*	-	-	+
<i>N. heufferia</i> Grun.*	+	-	-
<i>N. hustedii</i> Krasske*	-	+	-
<i>N. lanceolata</i> (Ag.) Kutz.	+	-	-
<i>N. luzonensis</i> Hust.*	+	-	-
<i>N. minuscula</i> Grun.	+	+	-
<i>N. mutica</i> Kutz.*	+	+	+
<i>N. notha</i> Wallace*	+	-	-
<i>N. odiosa</i> Wallace	+	-	+
<i>N. pupula</i> Kutz.*	+	-	+
<i>N. pupula</i> var. <i>capitata</i> Skv. Meyer*	+	-	-
<i>N. pupula</i> var. <i>mutata</i> (Krasske) Hust.	-	+	-
<i>N. pupula</i> var. <i>rectangularis</i> (Greg.) Grun.	-	+	-
<i>N. radiosa</i> Kutz.*	+	+	+
<i>N. radiosa</i> var. <i>parva</i> Wallace*	-	-	+
<i>N. radiosa</i> var. <i>tenella</i> (Breb. ex Kutz.) Grun.*	+	+	+
<i>N. rhynchocephala</i> Kutz.*	+	-	-
<i>N. sanctaerucis</i> Ostr.	+	-	-
<i>N. secreta</i> var. <i>apiculata</i> Patr.*	+	-	-
<i>N. seminulum</i> Grun.	-	-	+
<u>Nitzschia</u>			
<i>N. amphibia</i>	+	+	+
<i>N. apiculata</i>	+	-	-
<i>N. clausii</i> Hantzsch	+	-	-
<i>N. debilis</i> (Arn.) V. H.	+	-	-
<i>N. frustulum</i> var. <i>subsalina</i> Hust.	+	-	-
<i>N. gracilis</i> Hantzsch	-	+	-
<i>N. hantzschi</i> Rabh.	-	+	+
<i>N. heufferiana</i> Grun.	+	-	-
<i>N. kulzingiana</i> Hilse	+	+	-
<i>N. lacunarum</i> Hust.	+	-	-
<i>N. linearis</i> W. Sm.	+	-	-
<i>N. palea</i> (Lutz.) W. Sm.	+	+	+
<i>N. palea</i> var.?	+	-	-
<i>N. parvula</i> Levis	+	-	-
<i>N. sigmoidea</i> (Ehr.) W. Sm.	-	+	-
<i>N. spectabilis</i> (Ehr.) Ralfs	+	-	-
<i>N. tryblionella</i> var.?	+	+	-

TABLE 6. Continued.

	(1)	(2)	(3)
<u>Pinnularia</u>			
<i>P. intermedia</i> (Lagerst.) Cl.	-	+	-
<i>P. streptoraphe</i> Cl.	+	-	-
<i>P. stomatophora</i> (Grun.) Cl.	+	-	-
<i>P. subcapitata</i> Greg.	+	-	-
<u>Rhopalodia</u>			
<i>R. gibberula</i> var. <i>protracta</i> Grun.	-	-	+
<u>Stauroneis</u>			
<i>S. anceps</i> Ehr.*	+	-	+
<i>S. kriegeri</i> Patr.	+	-	-
<i>S. phoenicuntheron</i> f. <i>gracilis</i> (Ehr.) Hust.*	+	-	-
<i>S. smithii</i> Grun.	+	+	-
<u>Surirella</u>			
<i>S. angustata</i> Kutz.	+	+	-
<i>S. linearis</i> W. Sm.	+	-	-
<i>S. linearis</i> var. <i>constricta</i> (Ehr.) Grun.	+	-	-
<i>S. linearis</i> var. <i>helvetica</i> (Brun.) Meister	+	+	-
<i>S. ovata</i> Kutz.	+	+	-
<i>S. robusta</i> ?	+	-	-
<u>Synedra</u>			
<i>S. acus</i> Kutz.*	-	-	+
<i>S. amphicephala</i> Kutz.	-	+	-
<i>S. amphicephala</i> var. <i>austriaca</i> (Grun.) Hust.	-	+	-
<i>S. goulardi</i> (Breb.)	+	-	-
<i>S. rumpens</i> var. <i>fragilarioides</i> Grun.	-	+	-
<i>S. rumpens</i> var. <i>scotica</i> Grun.	-	-	+
<i>S. ulna</i> (Nitz.) Ehr.*	-	+	+
<i>S. ulna</i> var. <i>amphirhynchus</i> (Ehr.) Grun.	+	+	+
<i>S. ulna</i> var. <i>danica</i> (Kutz.) V. H.*	+	+	-
<i>S. ulna</i> var. <i>oxyrhynchus</i> ?	-	+	-
<u>Terpsinoe</u>			
<i>T. musica</i> Ehr.	+	+	+



TABLE 7. Collection Samples

SPRING AREA	SAMPLE NUMBER	ORIGIN OF SAMPLE
Barton Springs	105	bottom sample plus plant materials
	106	rock scrapings in seep
	107	angiosperm plant material
	108	rock scrapings
	119	algae (filamentous)
	120	bottom sample
	121	angiosperm
Comal Springs	109	angiosperm material
	110	rock scrapings
	111	rock scrapings plus bottom material
Aquarena Springs	112	rock scrapings
	113	angiosperm material
	114	rock scrapings
	115	rock scrapings
	116	angiosperm material
	117	scrapings, wooden pilings
	118	plant material - sagitaria

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NOTES ON NEW AND NOTEWORTHY PLANTS. CXIX

Harold N. Moldenke

**PREMNA TOMENTOSA** f. **JEJUNA** Moldenke, f. nov.

Haec forma a forma typica speciei recedit foliorum laminis subtus in statu maturitate tantummodo sparse stellato-tomentellis.

This form differs from the typical form of the species in having its mature leaf-blades merely sparsely stellate-tomentellous beneath.

The type of the form was collected by P. L. Comanor (no. 722) along a roadside at the edge of a patch of forest on the Matale to Dambulla road (A.9) before milepost 44 at 215 meters altitude on January 12, 1968, and is deposited in the Britton Herbarium at the New York Botanical Garden.

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ADDITIONAL NOTES ON THE GENUS CITHAREXYLUM. XIV

Harold N. Moldenke

**CITHAREXYLUM LAURIFOLIUM** Hayek

Additional bibliography: Moldenke, *Phytologia* 32: 50 & 70. 1975; Soukup, *Biota* 11: 9. 1976.

**CITHAREXYLUM xLEONIS** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 51 & 223. 1975; Anon., *Biol. Abstr.* 61: AC1.580. 1976; Hocking, *Excerpt. Bot. A.* 28: 170. 1976.

**CITHAREXYLUM LIGUSTRINUM** Van Houtte

Additional bibliography: Moldenke, *Phytologia* 32: 51-52 (1975) and 34: 272. 1976; Anon., *Biol. Abstr.* 61: AC1.580. 1976; Moldenke, *Phytologia* 38: 260 & 261 (1978) and 41: 69. 1978.

Rosas describes this plant as a shrub, with red fruit 1 cm. in diameter, and encountered it in secondary vegetation as 2300 meters altitude, fruiting in November. He reports the vernacular name, "naranjillo". Rosas R. 862, cited below, was previously incorrectly cited by me as C. gleasonianum Moldenke.

Additional citations: MEXICO: Puebla: Rudd 2018 (Ld). Veracruz: Rosas R. 862 (Z); Ventura A. 1181 (Sd--78332), 2033 (Ld).

**CITHAREXYLUM LOJENSE** Moldenke, *Phytologia* 34: 245. 1976.

Bibliography: Moldenke, *Phytologia* 34: 245 & 257. 1976.

Citations: ECUADOR: Loja: Samaniego V. & Vivar C. 46 (Z--type).

**CITHAREXYLUM LUCIDUM** Schlecht. & Cham.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 104 & 105. 1858; Moldenke, Phytologia 32: 52--53 & 200 (1975) and 40: 491. 1978.

The corollas are said to have been "white" on W. D. Stevens 1410 and this collector encountered the plant along a river in a steep humid barranca "with dry level plains above", describing it as a shrub, 2 m. tall, in flower in August.

Linden 32 appears to be a mixture of C. lucidum, Begonia hydrocotylifolia, and Oncidium iridifolium.

Additional citations: MEXICO: Veracruz: Linden 32 in part (Mi); W. D. Stevens 1410 (Ln).

**CITHAREXYLUM LYCIIIDES** D. Don

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; Moldenke, Phytologia 32: 53 & 222. 1975.

Additional citations: MEXICO: Hidalgo: González Quintero 3525 (Ld); Lundell & Lundell 12332 (Au--289401, Ld).

**CITHAREXYLUM MACRADENIUM** Greerm.

Additional bibliography: Moldenke, Phytologia 32: 53--54 (1975) and 41: 63. 1978.

Recent collectors have encountered this species in open pastures, in cloud-forests, and along roadsides, at 1600--1800 meters altitude, and describe the infructescences as pendulous and the drupes orange or bright-orange. They found it in fruit in February.

The Kupper 935, distributed as C. macradenium, actually is C. donnell-smithii Greerm.

Additional citations: COSTA RICA: Heredia/San José: Burger, Visconti, & Gentry 10277 (N). San José: Lent 3207 (Ac, N). PANAMA: Chiriquí: Mori & Dressler 7773 (N).

**CITHAREXYLUM MACROCHLAMYS** Pittier

Additional synonymy: Citharexylum macroclamys Pittier, in herb.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 44: 253. 1922; Fedde in Just, Bot. Jahresber. 45 (1): 5--6. 1923; Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 148. 1923; Moldenke, Phytologia 32: 54 & 56. 1975.

**CITHAREXYLUM MACROPHYLLUM** Poir.

Additional bibliography: López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 359--362, 369, 370, 372, 373, & 381--383. 1975; Moldenke, Phytologia 32: 54--55, 200, & 225 (1975) and 34: 255. 1976; Anon., Biol. Abstr. 61: AC1.580. 1976; López-Palacios, Fl. Venez. Verb. 220--224, 238--241, & 647, fig. 54. 1977; Moldenke, Phytologia 36: 33. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [239], fig. 54. 1977.

López-Palacios refers to this plant as an "Arbolito de 4—6 m. Hojas opuestas y 3 verticiladas, de haz ligeramente áspera y de envés indumentado solo en la nervadura. Glándulas excavadas," or, in the case of his sterile Ecuadorean collection: "brotes estériles de un arbolito cortado, hojas glabras, más coriáceas y mayores que las de 4256 [C. poeppigii Walp.], nodos jóvenes con un anillo de pelos blancas". Actually, the leaf-blades on the material of this number seen by me are not noticeably coriaceous. He records the vernacular names, "chuco", "palo de mono", and "totumillo blanco".

Mori and his associates describe the plant as a tree, 14 meters tall, the trunk 40 cm. in diameter, the calyx green, and the corollas "greenish-cream". They comment: "Note the glands at base of petiole [actually, at the apex of the petiole, not the base!]"

López-Palacios (1977) cites from Venezuela the following collections: Aragua: Antonio 385; Aristeguieta 2787; Benítez de Rojas 633; Killip & Lasser 3778h; Mérida 11; Trujillo 4124, 5241. Bolívar: Breteler 5039. Delta Amacuro: Marcano-Berti 166; Steiermark 87472; Zabala 116.

Additional citations: COLOMBIA: Arauca: López-Palacios 3946 (Ac, N). GUYANA: Mori, Bolten, Persaud, & Roberts 8236 (Ld, N). SURINAM: Lindeman 5595 (Ld). ECUADOR: Napo: López-Palacios 4258 (Ld).

#### CITHAREXYLUM MICROPHYLLUM (P. DC.) O. E. Schulz

Additional bibliography: Moldenke, Phytologia 32: 56 & 66. 1975.

Additional citations: HISPANIOLA: Haiti: Ekman H.4456 (Ld), H. 8508 (Ld).

#### CITHAREXYLUM MIRIFOLIUM Moldenke

Additional bibliography: López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 357, 361—362, 369, 372, & 384—385. 1975; Moldenke, Phytologia 32: 54 & 56—57 (1975) and 34: 256. 1976; Anon., Biol. Abstr. 61: AC1.580. 1976; López-Palacios, Fl. Venez. Verb. 220—223, 241—244, & 647, fig. 55. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [242], fig. 55. 1977.

Breteler 4314 (N, W—2466239) was distributed and annotated by me as C. mirifolium, but López-Palacios feels that it cannot be this species because of its habitat. He regards it as C. xhybridum Moldenke, but I cannot concur in this determination. For C. mirifolium he cites (1977) from Venezuela only the following collections: Mérida: Bernardi 6163, 6165; Gehriger 269; Ruiz-Terán & López-Palacios 6614; Ruiz-Terán, López-Palacios, & López-Figueiras 3949; Ruiz-Terán, López-Palacios, & Rodríguez 6740 [topotype]. Trujillo: Aristeguieta & Medina 3690; Ruiz-Terán & López-Palacios 7452. He found the species growing only at altitudes of 2450—2800 meters, and lists the vernacular names, "huesito" and "palomero".

#### CITHAREXYLUM MOCINNI D. Don

Additional synonymy: Citharexylum moccini Don, in herb.

Additional bibliography: Schau. in A. DC., Prodr. 11: 612 & 614.

1847; Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 48. 1975; Moldenke, Phytologia 32: 50 & 57—58. 1975; Anon., Biol. Abstr. 61: ACL580. 1976; Moldenke, Biol. Abstr. 66: 1277. 1978; Moldenke, Phytologia 38: 384. 1978.

Recent collectors describe this species as a shrub, 5—7 m. tall, or a tree, 40 feet tall, the leaves leathery, the inflorescences drooping, and the fruit at first yellow, black when mature. They have encountered it in "primary pine woods on rocky volcanic soil", in "Liquidambar, pine, and oak woods on reddish soils", "near stream in tall humid forest with Fraxinus, Quercus, Abies, Alnus, and Clusia", on "steep slopes with Pinus, Quercus, Hauya, Erythrina, Lysiloma, Oreopanax, and Ostrya", and in "transition forest with an extremely variable mixture of elements from both the pine-oak below and the montane rainforest above", at altitudes of 1390—1600 meters, fruiting in January and July. Ortega, Hernandez, and Dorantes all refer to it as "rare". The corollas are said to have been "white" on McVaugh 26162.

The Williams, Molina R., & Williams 23378, distributed as typical C. mocinni, actually is the type collection of f. williamsii Moldenke, while Gibson & Gibson 2587 is C. hidalgense Moldenke.

Additional citations: MEXICO: Chiapas: Breedlove 26371 (Ld, Mi); Thorne & Lathrop s.n. [6-23-1970] (Ld); Ton 2576 (Ld), 3555 (Ld), 3598 (Ld). Jalisco: McVaugh 26162 (Mi). Nayarit: R. McVaugh 12092 (Au—236134). Veracruz: Hernández M. & Dorantes 1765 (N); Ortega & al. 107 (N); Ventura A. 619 (Ld), 4820 (Au).

CITHAREXYLUM MOCINNI f. WILLIAMSII Moldenke, Phytologia 38: 384. 1978.

Bibliography: Moldenke, Biol. Abstr. 66: 1277. 1978; Moldenke, Phytologia 38: 384. 1978.

Citations: NICARAGUA: Matagalpa: Williams, Molina R., & Williams 23378 (Ld—type, Z--isotype).

CITHAREXYLUM MONTANUM Moldenke

Additional bibliography: Moldenke, Phytologia 32: 59 (1975) and 36: 33. 1977.

The López-Palacios collection cited below is described as from an "arbol 5—7 m, flor blanca, fr. rojo" and he encountered it at 2200 meters altitude, flowering in December. It certainly exhibits close similarity to C. kunthianum Moldenke and C. subflavescens Blake and it may well be that C. montanum may eventually prove to be conspecific with one or the other (or both) of these taxa. Recent collectors describe C. montanum as a tree, 10—20 m. tall, with a white latex, the racemes congested, the rachis gray, the flowers subsessile, and the fruit green and warty, and have encountered it at 1900—2200 m. altitude, fruiting in March. The corollas on López-Palacios 4312 are said to have been white.

Material of typical C. montanum has been misidentified and distributed in some herbaria as var. chimboraense Moldenke.

López-Palacios, in a personal communication to me, lists "casoso" and "palo cuadrado bogotano" as vernacular names for C. montanum.

Additional citations: COLOMBIA: Antioquia: López-Palacios 4312 (Ld). ECUADOR: Imbabura: López-Palacios 4050 (Z). Napo: Dwyer & MacBryde 9619 (W—2812970); Little & Campusano 104 (N).

#### CITHAREXYLUM MONTANUM var. CHIMBORAZENSE Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 59. 1975.

López-Palacios, in a personal communication to me, says that "Little & Camp registran para él el nombre vulgar de 'shoto'; presumablemente la pronunciación local sea 'choto'".

The Little & Campusano 104, distributed as this variety, appears better placed as representing the typical form of the species.

#### CITHAREXYLUM MONTEVIDENSE (Spreng.) Moldenke

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 104. 1858; Lombardo, *Fl. Arb. & Arbust. Urug.*, ed. 2, 122, fig. 191. 1964; Kooiman, *Act. Bot. Neerl.* 24: 463. 1975; Moldenke, *Phytologia* 32: 59—60, 62, & 200. 1975; Anon., *Biol. Abstr.* 61: ACl. 580. 1976.

Additional illustrations: Lombardo, *Fl. Arb. & Arbust. Urug.*, ed. 2, 122, fig. 191. 1964.

The corollas are described as having been "cream-colored" on Pabst 6539 and "yellow with white lobes" on Schinini & Carnevali 10590.

Additional citations: BRAZIL: Rio Grande do Sul: Pabst 6539 [Pereira 6713; *Herb. Brad.* 22514] (Mu). URUGUAY: H. H. Bartlett 21287 (N). ARGENTINA: Corrientes: Schinini & Carnevali 10590 (Ld).

#### CITHAREXYLUM MYRIANTHUM Cham.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 105. 1858; Moldenke, *Phytologia* 32: 61—62, 195, 196, & 200. 1975; Reitz, Klein, & Reis, *Proj. Madeira S. Catar*, 42 & 267—272, pl. 83—85. 1978.

Additional illustrations: Reitz, Klein, & Reis, *Proj. Maderra S. Catar*. 268—270, pl. 83—85. 1978.

Recent collectors describe this plant as a tree, 10—15 meters tall, with a trunk diameter of 20—25 cm., green calyx, and fruit green when immature. They have found it in flower in February and November and in fruit in February. The corollas on Pabst 5783 are described as having been "white" when fresh, while those on Pinheiro & Santos 2284 and on Santos 565 were "yellow".

Reitz and his associates (1978) list the following vernacular names for this plant in southern Brazil: "baga-de-tucano", "jacareúba", "pombeiro", "tarumã-branco", "tarumã", and "tucaneira", and, after a detailed description of the tree and its ecology, conclude that "Caixotaria, táboas em geral, embalagens leves, ferro, etc. Um estudo mais acurado talvez pudesse comprovar a possibilidade de sua utilização em compensados e contra-placados."

Material of *C. myrianthum* has been misidentified and distributed in some herbaria as *C. rigidum* (Briq.) Moldenke.

Additional citations: BRAZIL: Bahia: Almeida & Santos 258 (Ld); Pinheiro & Santos 2284 (Ld); T. S. Santos 565 (Ld). Paraná: Dusen 7562 (Mu), 8850 (Mu). São Paulo: Pabst 5783 [E. Pereira 5956; Herb. Brad. 22505] (Mu).

#### CITHAREXYLUM OBTUSIFOLIUM Kuhlmann

Additional bibliography: Moldenke, *Phytologia* 32: 62. 1975.

Raimundo refers to this plant as a tree, 20 meters tall, the trunk to 20 cm. in diameter, the fruit green (in March).

Additional citations: BRAZIL: Bahia: Raimundo 1085 (Z).

#### CITHAREXYLUM OLEINUM (Benth.) Moldenke

Additional bibliography: Schau. in A. DC., *Prodr.* 11: 628 & 697—698. 1847; Moldenke, *Phytologia* 32: 62—63. 1975.

Recent collectors have described this species as a tree, 5 m. tall, the leaves thick, dark glossy-green, and the fruit black. They have found it growing in "steep limestone canyons just below the pine zone", on "limestone slopes with matorral of *Flourensia resinosa*", and "in open juniper woodland on gentle often shaley limestone slopes with *Juniperus*, *Acacia* spp., *Mimosa*, *Sophora*, *Berberis trifoliolata*, *Quercus*, and *Flourensia laurifolia*", at 1800 meters altitude, flowering in February, fruiting in December. McVaugh refers to it as "occasional". The corollas are said to have been "white" on McVaugh 26481.

Additional citations: MEXICO: Hidalgo: González Quintero 2389 (Ld); Moore & Wood 4365 (Mi). Querétaro: R. McVaugh 10360 (Ld), 26481 (Mi); J. Rzedowski 31610 (Mi). Tamaulipas: Wendt 2094a (Ld).

#### CITHAREXYLUM OVATIFOLIUM Greenm.

Additional bibliography: Hinton & Rzedowski, *Anal. Esc. Nac. Cienc. Biol.* 21: 48. 1975; Moldenke, *Phytologia* 32: 63. 1975.

#### CITHAREXYLUM PACHYPHYLLUM Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 63. 1975; Soukup, *Biota* 11: 9. 1976.

#### CITHAREXYLUM PACHYPHYLLUM var. CANESCENS Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 63. 1975; Soukup, *Biota* 11: 9. 1976.



**CITHAREXYLUM PENTANDRUM** Vent.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 324 (1826) and ed. 2, 417. 1830; G. Don in Loud., Hort. Brit., ed. 1, 248 (1830) and ed. 2, 248. 1832; Loud., Hort. Brit., ed. 2, 551. 1832; G. Don in Loud., Hort. Brit., ed. 3, 248. 1839; Sweet, Hort. Brit., ed. 3, 551. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; Moldenke, Phytologia 32: 49, 64, & 69. 1975.

Don (1930), Sweet (1830), and Loudon (1832) all list this plant as cultivated in British gardens in their time, introduced from Puerto Rico in 1815, and, as C. molle, from the "West Indies" in 1822. They refer to it as the "pentandrous fiddle-wood" and the "soft-leaved fiddle-wood".

**CITHAREXYLUM PERNAMBUCENSE** Moldenke

Additional bibliography: Moldenke, Phytologia 32: 64 (1975) and 36: 34. 1977.

Recent collectors describe this species as a tree, 5 meters tall, the calyxes green, and the corollas white, and have found it in flower in January.

Additional citations: BRAZIL: Maranhão: Ribeiro & Pinheiro 1226 [Herb. IPEAN 151885] (Ld).

**CITHAREXYLUM POEPPIGII** Walp.

Additional synonymy: Citharexylum peoppinni Moldenke ex López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 362, sphalm. 1975.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 360, 362—363, 365, 366, 369, 372, 373, & 386—388. 1975; Moldenke, Phytologia 32: 52, 55, 64—67, 224, & 225 (1975) and 34: 257 & 272. 1976; Anon., Biol. Abstr. 61: Acl.580. 1976; Finol U., Act. Bot. Venez. 11: 24, 45, 48—50, 54, 55, [58], & [60]. 1976; Soukup, Biota 11: 9. 1976; López-Palacios, Fl. Venez. Verb. 220, 222—224, 244—248, 258, 261, & 647, fig. 56. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [245], fig. 56. 1977.

López-Palacios refers to this species as an "Arbol de 6—8 m [or 'arbolito 5—7 m']". Hojas opuestas y trifolioladas [or '3-verticiladas'] de envés velutinoso, fls. aun sin abrir hasta de 2 cm de largo, cáliz verde, corola blanca. Frutos rojos" and found it growing at 400—500 meters altitude, flowering in February, fruiting in October and January. I am sure that he does not mean to say that the leaves are ever trifoliolate; rather, he doubtless means that they are sometimes ternate. The corollas on Asplund 10227 and on Vogelman, Olday, & Hernández 1225 are said to have been "white" when fresh. The latter collectors encountered the species along ravines.

Material of C. poeppigii has been suggested as being C. cooperi Standl. or C. macrophyllum Poir. However, C. cooperi is not known to occur in South America, its petioles are only 8—10 mm. long,

with very inconspicuous basal glands, and the racemes are mostly solitary, short, and terminal. In C. macrophyllum the leaf-blades are glabrous beneath. Citharexylum poeppigii differs from all these in being South American in distribution, the petioles to 4 cm. long, the leaf-blades densely pubescent beneath and with very large and conspicuous basal glands, and the inflorescences much longer and usually very numerous toward the tips of the branches.

Gentry comments in a letter to me dated May 28, 1976, that P. poeppigii, as he knows it from Amazonian Ecuador, is a rather shrubby tree growing mostly along rivers. Dodson's collection, on the other hand, cited below, was from a tall slender tree, 20 meters tall, growing in mature forests at 150--220 meters altitude, and the collector notes that the "leaves on sterile branches [are] whorled in sets of 3".

The Dodson & Gentry 6348 & 6575, distributed as C. poeppigii, actually are C. gentryi Moldenke, the latter number being the type collection, while Cuatrecasas 15949 and A. Gentry 9810, appear to represent C. poeppigii var. calvescens Moldenke and García-Barriga, Hashimoto, & Ishikawa 18505 is var. margaritaceum Poepp. & Moldenke.

López-Palacios (1977) cites as typical C. poeppigii from Venezuela the following collections: Amazonas: Cardona 1421. Apure: López-Palacios 2928. Barinas: Bernardi 6739, 7190. Mérida: López-Palacios & Bautista 3180. Táchira: López-Palacios 3157; Steyermark 96629. In a personal communication to me he lists the following vernacular names for the plant: "cerezillo", "cerezillo", "totumillo negro", "tinto", "totumo", and "totumo de monte".

Additional citations: COLOMBIA: Meta: López-Palacios 3913 (Ld, N). Putumayo: Vogelman, Olday, & Hernández 1225 (Ut--320467). ECUADOR: Los Ríos: Dodson 6002 (E--2325667, Ld). Napo: López-Palacios 4189 (Ld), 4256 (Ld). Napo-Pastaza: Asplund 10227 (Ld).

#### CITHAREXYLUM POEPPIGII var. CALVESCENS Moldenke

Additional bibliography: López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 366. 1975; Moldenke, Phytologia 32: 67. 1975.

Recent collectors describe this plant as a tree, 8 meters tall, the inflorescences pendent, and the fruit orange. They have encountered it in mature forests, at 5--80 meters altitude, flowering in February and May, fruiting in February.

Additional citations: COLOMBIA: Valle del Cauca: Cuatrecasas 15949 (W--2772826), 17606 (W--2817668). ECUADOR: Napo: A. Gentry 9810 (W--2788331).

#### CITHAREXYLUM POEPPIGII var. MARGARITACEUM Poepp. & Moldenke

Additional bibliography: Moldenke, Phytologia 32: 67. 1975; Soukup, Biota 11: 9. 1976.

Recent collectors describe this plant as a tree, 4 meters tall, the flowers aromatic, and the corollas white. They have encountered it in primary forests, at 750 meters altitude, flowering in

December. Schunke Vigo refers to it as a 'tree, 9--10 m. tall, the flowers white and fragrant, the fruit dark reddish-orange (7.5 4/11), and found it growing in tall forests at 233--590 m. altitude, fruiting in September, reporting the vernacular name, "mullohuayo".

López-Palacios, in a personal communication to me, reports the additional vernacular name, "nacedera".

The García-Barriga & al. 18505, cited below, was previously erroneously cited by me as typical C. poeppigii Walp.

Additional citations: COLOMBIA: Méta: García-Barriga, Hashimoto, & Ishikawa 18505 (N). ECUADOR: Napo: E. W. Davis 417 (G, S). PERU: Loreto: Schunke Vigo 6399 (W--2703791).

#### CITHAREXYLUM PTEROCLADUM Donn. Sm.

Additional bibliography: Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 48. 1975; Moldenke, Phytologia 32: 68. 1975.

Contreras refers to this species as a small tree and found it growing in rainforests.

Additional citations: MEXICO: Chiapas: Matuda 18484 (N). GUATEMALA: El Petén: Contreras s.n. (Ld).

#### CITHAREXYLUM PUNCTATUM Greenm.

Additional bibliography: Moldenke, Phytologia 32: 63 & 68. 1975; Soukup, Biota 11: 9. 1976.

Additional citations: BOLIVIA: Cochabamba: J. Steinbach 9798 (Ut--1376A).

#### CITHAREXYLUM QUERCIFOLIUM Hayek

Additional bibliography: Moldenke, Phytologia 32: 69. 1975; Soukup, Biota 11: 9. 1976.

#### CITHAREXYLUM QUITENSE Spreng.

Additional bibliography: G. Don in Loud., Hort. Brit., ed. 1, 248 (1830), ed. 2, 248 (1832), and ed. 3, 248. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; Moldenke, Phytologia 32: 69. 1975.

Additional citations: ECUADOR: El Oro: Asplund 15682 (Ld). Guayas: Asplund 15233 (Ld).

#### CITHAREXYLUM RACEMOSUM Sessé & Moc.

Synonymy: Cytharexylum racemosum Sessé & Moc., Pl. Nouv. Hisp., ed. 1, 103. 1889.

Additional bibliography: Moldenke, Phytologia 32: 48 & 69. 1975.

#### CITHAREXYLUM RECURVATUM Greenm.

Additional bibliography: Moldenke, Phytologia 32: 69--70. 1975.

Kupper records the vernacular name, "dama", for this species.

Additional citations: COSTA RICA: Province undetermined: Kup-

per 983 [Carpintera] (Mu).

**CITHAREXYLUM RETICULATUM** H.B.K.

Additional bibliography: Hook. & Arn., Bot. Beech. Voy. 306. 1838; Schau. in A. DC., Prodr. 11: 613. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 361. 1975; Moldenke, Phytologia 32: 50, 57, 69, & 70. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 42. 1976; Soukup, Biota 11: 9. 1976; Moldenke, Phytologia 40: 339. 1978.

The Linden 71, distributed as C. reticulatum, actually is C. ellipticum Sessé & Moc., while Linden 11 is C. hexangulare Greenm. and López-Palacios 3588 is C. ulei var. obovatum Moldenke.

**CITHAREXYLUM RIGIDUM** (Briq.) Moldenke

Additional bibliography: Moldenke, Phytologia 32: 71. 1975.

The Herb. Brad. 22505, Pabst 5783, and E. Pereira 5956, distributed as C. rigidum, actually are C. myrianthum Cham.

**CITHAREXYLUM ROSEI** Greenm.

Additional bibliography: Moldenke, Phytologia 32: 72 (1975) and 40: 488 & 489. 1978.

Recent collectors have encountered this plant in "deep calcareous clay-loam", at 1050 meters altitude, growing in association with Celtis pallida, Pithecellobium pallens, Prosopis laevigata, etc., fruiting in June.

The Davidse & Davidse 9971, distributed as C. rosei, actually is C. altamiranum Greenm.

Additional citations: MEXICO: San Luis Potosí: Chiang, Wendt, & Johnston 8180 (Ld).

**CITHAREXYLUM ROSEI** var. **PILOSUM** Moldenke

Additional bibliography: Moldenke, Phytologia 32: 71. 1975.

Additional citations: MEXICO: Jalisco: R. McVaugh 17152 (Au—236130—isotype). San Luis Potosí: J. Rzedowski 24607 (Ln—217716).

**CITHAREXYLUM ROXANAE** Moldenke

Additional bibliography: Moldenke, Phytologia 32: 71—73. 1975; Anon., Biol. Abstr. 61: ACl.580. 1976.

Additional citations: MEXICO: Baja California: A. Carter 4123 (Sd—68619), 5083 (Sd—68620); Carter & Medellin Leal 4682 (Ld).

**CITHAREXYLUM SCABRUM** Sessé & Moc.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; Moldenke, Phytologia 32: 73. 1975.

**CITHAREXYLUM SCHOTTII** Greenm.

Additional bibliography: Moldenke, Phytologia 32: 73—74 (1975) and 41: 72. 1978.

Material of this species has been misidentified and distributed in some herbaria as C. integerrima (Kuntze) Moldenke.

Additional citations: MEXICO: Quintana Róo: Lundell & Lundell 7781 (Au--190590). Yucatán: Lundell & Lundell 7878 (Au--192501). COSTA RICA: Province undetermined: Kupper 1452 [Guachipelin] (Mu, Mu).

CITHAREXYLUM SERICEUM Lodd. ex G. Don in Loud., Hort. Brit., ed. 1, 248. 1830.

Synonymy: Citharexylum sericeum Lodd. ex Steud., Nom. Bot., ed. 2, 1: 375. 1840.

Bibliography: G. Don in Loud., Hort. Brit., ed. 1, 248 (1830), ed. 2, 248 (1832), and ed. 3, 248. 1839; Steud., Nom. Bot., ed. 2, 1: 375. 1840; Moldenke, Phytologia 6: 254. 1958; Moldenke, Résumé 254. 1959; Moldenke, Fifth Summ. 1: 430. 1971; Moldenke, Phytologia 36: 39 & 41. 1977.

Nothing is known to me of this taxon except that it is listed as having been grown in British gardens in 1830, supposedly introduced from "Ind. or."

CITHAREXYLUM SESSAEI D. Don

Additional synonymy: Citharexylum sessei D. Don ex Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 48. 1975.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 48. 1975; Moldenke, Phytologia 32: 195. 1975; Anon., Biol. Abstr. 61: AC1.580. 1976; Hocking, Excerpt. Bot. A.28: 258. 1976; Moldenke, Biol. Abstr. 61: 4888. 1976.

CITHAREXYLUM SHREVEI Moldenke

Additional bibliography: Moldenke, Phytologia 32: 195. 1975; Anon., Biol. Abstr. 61: AC1.580. 1976; Moldenke, Biol. Abstr. 61: 4888. 1976.

CITHAREXYLUM SOLANACEUM Cham.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 105. 1858; Moldenke, Phytologia 32: 195. 1975; Anon., Biol. Abstr. 61: AC1.580. 1976; Moldenke, Biol. Abstr. 61: 4888. 1976; Reitz, Klein, & Reis, Proj. Madeira S. Catar. 42. 1978

Pabst refers to this plant as a shrub, 2 m. tall, with white fragrant flowers, and found it growing at 1050 m. altitude. The corollas are said to have been "white" also on Hatschbach 37348.

Reitz and his associates (1978) report the following vernacular names for this species in Santa Catarina: "tarumã", "tarumã-branco", and "tucaneira".

Additional citations: BRAZIL: Paraná: Hatschbach 37348 (Z). Rio Grande do Sul: Pabst 6692 [E. Pereira 6866; Herb. Brad. 22515] (Mu).

**CITHAREXYLUM SOLANACEUM** var. **INSOLITUM** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 195. 1975; Anon., *Biol. Abstr.* 61: AC1.580. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976.

**CITHAREXYLUM SOLANACEUM** var. **MACROCALYX** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 195. 1975; Anon., *Biol. Abstr.* 61: AC1.580. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976.

**CITHAREXYLUM SPATHULATUM** Moldenke & Lundell

Additional bibliography: G. W. Thomas, *Tex. Pl. Ecolog. Summ.* 77. 1969; Moldenke, *Phytologia* 32: 196 (1975) and 34: 251. 1976; Anon., *Biol. Abstr.* 61: AC1.580. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976; Moldenke, *Phytologia* 40: 490. 1978.

Recent collectors describe this species as an infrequent or uncommon, small, stiff, divaricately branched shrub, 0.6—1 m. tall, and have found it in fruit in June, August, and September, at altitudes of 1350—2150 meters. The label accompanying Henrickson 6354 claims that the leaves are "to 8 mm." in diameter, but none on the specimen accompanying the label are more than 3 mm. wide. This collector also refers to the fruit as "green berries", when actually they are drupes; in the genus Lycium, with species very similar in aspect to C. spathulatum, they are true berries.

Recent collectors have encountered C. spathulatum "in mesquite, adobe soil". on low foothills in limestone soil, in "matorral desertico con espinos laterales (higher with izotal, dilute chaparral) on steep slopes of limestone mountains", in calcareous sandy loam and "thin pale calcareous gravelly desert loam", "in matorral subdesertico inerme y con espinos laterales in flat areas near bottom of bajada, calcareous gravelly adobe", and in "Chihuahua Desert with clay soil", associated with Prosopis glandulosa, P. laevigata, Flourensia cernua, F. laurifolia, Yucca carnerosana, Larrea tridentata, Agave lecheguilla, Fouquieria splendens, Parthenium incanum, Acacia neovernicosa, Celtis pallida, Condalia ericoides, Artemisia, Solanum, Mimosa, and Dasyli- rion. Thomas (1969) calls the species the "smooth fiddlewood".

The González-Merano 9031 distributed as C. spathulatum, seems actually to be the ordinary C. brachyanthum (A. Gray) A. Gray.

Additional citations: TEXAS: Hidalgo Co.: R. Runyon 136 (Au--269479, Au). Starr Co.: Lundell & Lundell 12676 (Ld). MEXICO: Chihuahua: Henrickson 12921 (Ld); Johnston, Wendt, & Chiang C. 8880 (Ld), 12317 (Ld). San Luis Potosí: Chiang, Wendt, & Johnston 8149 (Ld). Zacatecas: Chiang, Wendt, & Johnston 7858 (Ld), 7877 (Ld), 7904 (Ld); Henrickson 6354 (Ld).

**CITHAREXYLUM SPINOSUM** L.

Additional & emended synonymy: Cytharexylum teres Jacq., *Enum.*

Syst. Fl. Carib., imp. 1, 26. 1760. Citharexylum teres Jacq., Select. Stirp. Amer. Hist., imp. 1, 185—186, pl. 118. 1763. Citharexylum quadrangulare Jacq., Select. Stirp. Amer. Hist., imp. 1, 186, in syn. 1763; Select. Stirp. Amer. Hist. Picta 91. 1780 [not C. quadrangulare Boutelou, 1909, nor Griseb., 1909, nor Hort. Madrit., 1806, nor Millsp., 1907, nor A. Rich., 1909, nor Sessé & Moc., 1894]. Citharexylum cinereum  $\beta$  Lam. apud Schau. in A. DC., Prodr. 11: 611, in syn. 1847. Citharexylum cinereum var.  $\beta$  Lam. apud Moldenke, Phytologia 7: 34, in syn. 1959. Citharexylum americanum alterum, foliis ad marginem dentatis Pluk. apud López-Palacios, Fl. Venez. Verb. 248, in syn. 1977. Citharexylum cinereum var. Lam. apud López-Palacios, Fl. Venez. Verb. 248, in syn. 1977. Citharexylum quaterangulatum Warb. apud López-Palacios, Fl. Venez. Verb. 248, in syn. 1977. Citharexylum americanum alterum [Pluk.] apud López-Palacios, Fl. Venez. Verb. 647. 1977. Citharexylum quadriloculare [Jacq.] apud López-Palacios, Fl. Venez. Verb. 647, in syn. 1977.

Additional & emended bibliography: P. Browne in Sloane, Civil & Nat. Hist. Jamaic., ed. 1, 296. 1756; Jacq., Enum. Syst. Pl. Carib., imp. 1, 26 (1760) and imp. 2, 26. 1762; Jacq., Select. Stirp. Amer. Hist., imp. 1, 185—186, pl. 118. 1763; Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 417. 1830; G. Don in Loud., Hort. Brit., ed. 1, 248 (1830) and ed. 2, 248. 1832; Loud., Hort. Brit., ed. 2, 551. 1832; G. Don in Loud., Hort. Brit., Sweet, Hort. Brit., ed. 3, 551. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 104—105. 1858; H. Hallier, Meded. Rijks Herb. Leid. 37: 22—23. 1918; Sorauer, Handb. Pflanzenkrank. 5 (2): 337. 1956; Jacq., Enum. Syst. Pl. Carib., imp. 3, 26. 1967; Jacq., Select. Stirp. Amer. Hist., imp. 2, 185—186, pl. 118. 1970; Howard, Journ. Arnold Arb. 54: 449. 1973; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 355, 356, 358, 360, 361, 363—364, 369, 371—373, 378, & 388—391. 1975; Moldenke, Phytologia 32: 218. 1975; Anon., Biol. Abstr. 61: ACl.580. 1976; Grimé, Bot. Black Amer. 97, 209, & 224. 1976; Hocking, Excerpt. Bot. A.28: 258. 1976; Moldenke, Biol. Abstr. 61: 4888. 1976; Soukup, Biota 11: 9. 1976; Clay & Hubbard, Haw. Gard. Trop. Shrubs 185 & 288. 1977; Conant, Biol. Abstr. 64: 5416. 1977; Conant, Wilson Bull. 89: 198—208. 1977; López-Palacios, Fl. Venez. Verb. 221—223, 248—250, & 647. 1977; Moldenke, Phytologia 36: 37 & 41 (1977) and 41: 66. 1978; Mound & Halsey, Whitefly World 244. 1978.

Emended illustrations: Jacq., Select. Stirp. Amer. Hist., imp. 1, pl. 118 (1763) and imp. 2, pl. 118. 1970.

Recent collectors describe this species as a tree, 8 m. tall, the trunk diameter to 10 cm., the bark gray, the petioles orange, and the flowers fragrant or very fragrant. They found it growing on coastal rocks and in deciduous thorny scrub, at 50—500 m. altitude, flowering in May and November, fruiting in November. Kosterman found it growing, apparently escaped from cultivation,

along the river in back of the Botanical Garden at Peradeniya, Sri Lanka. The corollas are said to have been "white" on Kostermans 24918 and on Kunkel 8738 and "yellow" on Waas 703.

Both Jacquin's Cytherexylum teres and C. quadrangulare are described as being native to the island of Martinique. He illustrates only the former in his 1763 work and this is unfortunate since illustrations of both by him might have helped us decide now on the conspecificity or non-conspecificity of the two supposed species.

Browne (1756) says of this species in Jamaica "The berries small, and of a yellow color, are sometimes eaten by the negroes" — actually, the fruits are drupes.

Hallier (1918) cites Hallier C.237 from cultivated plants in Sri Lanka — very probably taken from the same tree from which my wife and I collected our nos. 28136 or 24143 thirty years later. He describes the corollas as "röthlichweiss". Don (1830), Sweet (1830), and Loudon (1832) all list the species as growing in British gardens in their day, introduced from Jamaica in 1759 and known as the "square-stalked fiddle-wood".

Conant (1977) found that in the Hawaiian Islands the "elapio" (Leiotoxix sandwichensis gayi) regularly nests in "forests" of this species mixed with Eugenia cumini, Aleurites moluccana, and Psidium guajava, with an undercover of Rubus rosaefolius, Cordyline terminalis, Setaria palmifolia, etc.

López-Palacios, in a personal communication to me says that "aunque en mis registros no aparece para Colombia, Duque-Jaramillo en su Diccionario de la Flora Industrial Colombiana— Botánica General Colombiana : 367, lo señala bajo el nombre vulgar de Palo cuadrado. Es posible que también se le de el de Péndula que Record & Hess, en su obra Timbers of the World, asignan para el género en Venezuela, sin precisar especie." In his 1977 work he cites from Venezuela the following collections: Bolívar: Steysmark 60941. Federal District: Vargas 91. Margarita Island: Ernst s.n.

The Crosby & Anderson 1342 and Gastony, Jones, & Norris 427, distributed as C. spinosum, actually are C. caudatum L., while Fosberg & Ogden 55329 and Sintenis 720b are C. fruticosum L.

Additional citations: CAYMAN ISLANDS: Little Cayman: Proctor 28135 (Ld). LEEWARD ISLANDS: Dominica: Wilbur, Dunn, Hesperheide, & Wiseman 8236 (Ld). WINDWARD ISLANDS: Martinique: Larsen & Larsen 35327 (Ac), 35570 (Ac, Ac). St. Vincent: N. L. H. Krauss 1203 (Ld). GUYANA: Irwin 808 (Au—165665). SRI LANKA: Kostermans 24918 (Ac). CULTIVATED: Canary Islands: Kunkel 8738 (Mu). Hawaiian Islands: Webster 1582 (Au—120375). Sri Lanka: Waas 703 (W—2806290).



**CITHAREXYLUM STANDLEYI** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 218. 1975; Hocking, *Excerpt. Bot. A.* 28: 258. 1976.

**CITHAREXYLUM STANDLEYI** var. **MEXICANUM** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 218. 1975.  
Additional citations: MEXICO: Michoacán: Turner 2077 (Au--197504--isotype).

**CITHAREXYLUM STEYERMARKII** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 218--219 (1975) and 41: 62 & 63. 1978.

Steyermark refers to this plant as a shrub, 15--20 feet tall, the leaves firmly subcoriaceous, deep-green and shining above, paler green beneath with prominent veins, the inflorescences erect, the fruit subglobose, 1 cm. in diameter, shiny orange, and found it growing at 2000--2600 meters altitude, flowering and fruiting in January. The collections cited below have been misidentified, distributed in some herbaria, and even previously cited by me as C. crassifolium Greenm. or C. donnell-smithii Greenm.

Additional citations: GUATEMALA: Zacapa: J. A. Steyermark 42840 (Ew, N), 42845 (N).

**CITHAREXYLUM SUBEROSUM** Loes.

Additional bibliography: Moldenke, *Phytologia* 32: 219. 1975; Soukup, *Biota* 11: 9. 1976.

**CITHAREXYLUM SUBFLAVESCENS** Blake

Additional & emended synonymy: Citharexylum subflabescens Blake ex Moldenke, *Phytologia* 7: 51, in syn. 1959; López-Palacios, *Bol. Soc. Venez. Cienc. Nat.* 31: 370. 1975. Citharexylum subflavescens Moldenke, *Phytologia* 36: 41, in syn. 1977.

Additional bibliography: López-Palacios, *Bol. Soc. Venez. Cienc. Nat.* 31: 359, 364, 369, 370, 373, & 391--394. 1975; Moldenke, *Phytologia* 32: 219--220. 1975; Anon., *Biol. Abstr.* 61: ACl. 580. 1976; López-Palacios, *Revist. Fac. Farm. Univ. Los Andes* 17: 42. 1976; López-Palacios, *Fl. Venez. Verb.* 220, 221, 223, 251--254, & 647, fig. 57. 1977; Moldenke, *Phytologia* 36: 41 (1977), 40: 487 (1978), and 41: 74. 1978.

Illustrations: López-Palacios, *Fl. Venez. Verb.* [252], fig. 57. 1977.

Recent collectors describe this species as an ornamental tree, 5--12 m. tall, with a wide crown, the petals fleshy, and the fruit red. They have found it growing in forests, at 1600--2620 meters altitude, flowering in March, April, October, and December, fruiting in August. Idrobo & Hernández note: "la corteza se desprende al secarse. en tiras largas". Duque-Jaramillo reports the tree both wild and cultivated. The corollas are said to

have been white on Duque-Jaramillo 2955, Idrobo & Hernández 1554, and López-Palacios 3926.

López-Palacios (1977) cites from Venezuela the following collections: Aragua: Fendler 1023; Karsten s.n.; Moritz 1777; Pittier 9333; Ruiz-Terán & López-Palacios 10180; Steyermark 94298. Federal District: Delgado 201. Mérida: Bernardi 2069; López-Palacios 3014; Steyermark 56449; Tillett 727-26. Táchira: Huech s.n. Trujillo: Matos 1136; Ruiz-Terán & López-Palacios 7616. In a personal communication to me he lists the following vernacular names: "cafesón", "ciudadito", "salvia", and "uruapa".

The Espinal T. 1076, distributed as C. subflavescens, seems better regarded as representing C. kunthianum Moldenke.

Additional citations: COLOMBIA: Cundinamarca: Idrobo & Hernández 1554 (W--2775923); López-Palacios 3926 (Id, N). Valle del Cauca: Cuatrecasas 22407 (W--2817221). PERU: Amazonas: Woytkowski 8207 (W--2788538). CULTIVATED: Colombia: Duque-Jaramillo 2955 (N).

#### CITHAREXYLUM SUBTHYRSOIDEUM Pittier

Additional synonymy: Citharexylum subtyrsoideum [Pittier] ex López-Palacios, Fl. Venez. Verb. 633, sphalm. 1977.

Additional bibliography: Perez-Arbelaez, Fl. Util. Colomb., ed. 1, 442. 1947; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 354, 359, 364--365, 369, 370, 372, & 394--396. 1975; Moldenke, Phytologia 32: 220--221. 1975; Anon., Biol. Abstr. 61: AC1.580. 1976; López-Palacios, Fl. Venez. Verb. 255--258 & 633, fig. 58. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [256], fig. 58. 1977.

López-Palacios (1977) cites from Venezuela the following collections: Federal District: Antonio 335; Aristeguieta 793; Berry 365; Curran 269; Eggers 13131; Fendler 842; Fernández 14; Landsbergen 277; Lasser 742; Pittier 7234, 9645, 9648, 12474, 13380; Steyermark 86308, Lara: Ferrari, Cárdenas, & Bunting 333; Saer 33, 664; Steyermark, Delascio, & Dunsterville 103643; Tamayo 3557.

He notes that Lasser 742 includes one branch with ternate leaves. In a personal communication to me he lists "palo guitarra" as a vernacular name and comments that "El único registro colombiano, Triana 299 (BM) parece dudoso".

Additional citations: VENEZUELA: Lara: Steyermark, Delascio, Dunsterville, & Dunsterville 103643 (Mu).

#### CITHAREXYLUM SULCATUM Moldenke

Additional bibliography: Moldenke, Phytologia 32: 221. 1975.

In a personal communication to me, López-Palacios says "Aunque el Dr. Moldenke no lo señala para E[cuador]. El Dr. Acosta-Solis, Recursos 1: 134, lo incluye su colección 6670 para la Provincia de Bolívar con el n. v. de 'cogollo morado'".

**CITHAREXYLUM TRISTACHYUM** Turcz.

Additional bibliography: Moldenke, *Phytologia* 32: 222--224. 1975; Anon., *Biol. Abstr.* 61: AC1.580. 1976; Hocking, *Excerpt. Bot. A.28*: 170. 1976.

Adams refers to this plant as a shrub, 6 feet tall, the petioles ochre, and the corollas pale-yellow. He found it growing in disturbed ground, flowering in July.

Additional citations: JAMAICA: C. D. Adams 7729 (Mu); Proctor 27582 (Id).

**CITHAREXYLUM TRISTACHYUM** f. **URBANII** (O. E. Schulz) Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 223--224. 1975; Anon., *Biol. Abstr.* 61: AC1.580. 1976; Hocking, *Excerpt. Bot. A.28*: 170. 1976.

**CITHAREXYLUM ULEI** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 224 (1975), 33: 29 (1976), and 34: 255. 1976; Hocking, *Excerpt. Bot. A.28*: 259. 1976; Soukup, *Biota* 11: 9. 1976; López-Palacios, *Revist. Fac. Farm. Univ. Los Andes* 17: 42. 1976.

The R. E. Schultes 3388, previously (1959) cited by me as typical C. ulei and so distributed in some herbaria, is now regarded by me as the type collection of var. obovatum Moldenke.

**CITHAREXYLUM ULEI** var. **CALVESCENS** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 224 (1975) and 34: 255. 1976.

**CITHAREXYLUM ULEI** var. **OBOVATUM** Moldenke, *Phytologia* 33: 129. 1976.

Bibliography: Hocking, *Excerpt. Bot. A.28*: 259. 1976; López-Palacios, *Revist. Fac. Farm. Univ. Los Andes* 17: 42. 1976; Moldenke, *Phytologia* 33: 129. 1976.

López-Palacios describes this plant as an "árbol de 12--14 m" [or "árbolito bajo de unos 3 m"]. Hojas verde oscuras por la haz, más claras por el envés, de envés glabro, excepto en la nervadura, aréolas punteadas." Schultes calls it a "small tree". It has been found growing at 100--285 m. altitude, fruiting in March. The vernacular names, "cauchilla" and "totumero", are recorded for it. Hitherto this taxon has been confused with typical C. ulei Moldenke and López-Palacios 3588 was previously erroneously cited by me as C. reticulatum H.B.K.

Citations: COLOMBIA: Antioquia: López-Palacios 3588 (N, Z). Córdoba: López-Palacios 3857 (N, Z). Putumayo: R. E. Schultes 3388 (N--type).

**CITHAREXYLUM VENEZUELENSE** Moldenke

Additional synonymy: Citharexylum poeppigii f. anomala Moldenke apud López-Palacios, *Bol. Soc. Venez. Cienc. Nat.* 31: 365, sphalm. 1975. Citharexylum poeppigii f. anomala Moldenke apud López-Palac-

ios, Bol. Soc. Venez. Cienc. Nat. 31: 362, sphalm. 1975.

Additional bibliography: López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 354, 355, 360, 362, 363, 365--366, 373, & 396--398. 1975; Moldenke, Phytologia 32: 224--225 (1975) and 34: 272. 1976; Anon., Biol. Abstr. 61: AC1.580. 1976; López-Palacios, Fl. Venez. Verb. 224, 258--261. & 647, fig. 59. 1977.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [259], fig. 59. 1977.

Curiously, López-Palacios (1975) seems to include C. poeppigii f. anomalum both in the synonymy of C. poeppigii Walp. and of C. venezuelense Moldenke. I regard it as a synonym of the latter taxon only.

In a personal communication to me, López-Palacios lists the following vernacular names for this species: "guarataro negro", "oreja de mula", and "paují". In his 1977 work he cites from Venezuela the following collections: Apure: López-Palacios 2924. Parinas: Marcano-Berti & Bautista 22; Ruiz-Terán 1177. Bolívar: Bernardi 2142. Federal District: Brito 4; Fendler 1298; Lasser 2104. Mérida: López-Palacios 3283.

Additional citations: VENEZUELA: Táchira: López-Palacios 3156 (N).

#### CITHAREXYLUM VIRIDE Moldenke

Additional bibliography: Moldenke, Phytologia 32: 225--227 (1975) and 34: 253. 1976; Anon., Biol. Abstr. 61: AC1.580. 1976; Moldenke, Phytologia 41: 70. 1978.

Recent collectors describe this plant as a shrub, 2--3 m. tall, or as a tree, 2 m. tall, the fruit red, rose-red, or red-orange, eventually turning purple, and have encountered it along roadsides in dense low forests on steep hills, fruiting from July to September.

The Zelaya collection, originally distributed as C. viride, is not verbenaceous, while Molina R., Williams, Burger, & Wallenta 17478 seems better placed as C. hexangulare var. latifolium Moldenke.

Additional citations: MEXICO: Jalisco: Stevens & Fairhurst 1867 (Z). PANAMA: Chiriquí: Croat 26502 (W--2788969). Veraguas: Stern, Chambers, Dwyer, & Ebinger 1005 (N).

#### CITHAREXYLUM WEBERBAUERI Hayek

Additional bibliography: Moldenke, Phytologia 32: 227. 1975; Hocking, Excerpt. Bot. A.28: 258. 1976; Soukup, Biota 11: 9. 1976.

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## ADDITIONAL NOTES ON THE GENUS CORNUTIA. VI

Harold N. Moldenke

### CORNUTIA Plum.

Additional & emended bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 417. 1830; Loud., Hort. Brit., ed. 2, 551. 1832; Sweet, Hort. Brit., ed. 3, 551. 1839; Schau. in A. DC., Prodr. 11: 628, 630, & 680—682. 1847; Sessé & Moc., Pl. Nov. Hisp., ed. 2, 96. 1893; Loes., Verh. Bot. Ver. Brand. 53: 81. 1912; Rouleau, Guide Ind. Kew. 49. 1970; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Zimmerm. & Ziegler in Zimmerm. & Milburn, Transp. Pl. 1 [Pirson & Zimmerm., Encycl. Pl. Physiol., ser. 2, 1]: 502. 1975; Moldenke, Phytologia 32: 232—240 & 337—342 (1975), 32: 508 & 509 (1976), and 34: 252, 255, 273, & 501. 1976; Anon., Biol. Abstr. 61: AC1. 585—586. 1976; Hocking, Excerpt. Bot. A.28: 258 & 259. 1976; Moldenke, Biol. Abstr. 61: 4888. 1976; Rogerson & Becker, Bull. Torrey Bot. Club 103: 145. 1976; Soukup, Biota 11: 4, 10, & 21. 1976; E. H. Walker, Fl. Okin. & South. Ryuk. 894. 1976; López-Palacios, Fl. Venez. Verb. 9, 22, 130, 284—291, 595, 646, 648, & 649, fig. 66 & 67. 1977; Moldenke, Phytologia 36: 39, 42, & 503 (1977), 40: 506 (1978), and 41: 10. 1978; Liogier, Moscosoa 1: 37. 1978.

### CORNUTIA AUSTRALIS Moldenke

Additional bibliography: Moldenke, Phytologia 32: 234. 1975; Anon., Biol. Abstr. 61: AC1.585. 1976; Hocking, Excerpt. Bot. A.28: 258. 1976.

### CORNUTIA AUSTRALIS var. OCCIDENTALIS Moldenke

Additional bibliography: Moldenke, Phytologia 32: 234—235. 1975; Anon., Biol. Abstr. 61: AC1.585. 1976.

### CORNUTIA COERULEA (Jacq.) Moldenke

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 417. 1830; Loud., Hort. Brit., ed. 2, 551. 1832; Sweet, Hort. Brit., ed. 3, 551. 1839; Schau. in A. DC., Prodr. 11: 682. 1847; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Moldenke, Phytologia 32: 235, 340, & 341. 1975; Anon., Biol. Abstr. 61: AC1. 585. 1976.

Sweet (1830) and Loudon (1830) list this plant as growing in British gardens in their day, imported from "S. America" in 1733 and known as the "blue-flowered hosta".

### CORNUTIA GRANDIFOLIA (Schlecht. & Cham.) Schau.

Emended synonymy: Cornutia grandiflora (Schlecht. & Cham.) Schau. ex Moldenke, Phytologia 26: 372, in syn. 1973; Zimmerm. & Ziegler in Zimmerm. & Milburn, Transp. Pl. 1 [Pirson & Zimmerm., Encycl. Pl. Physiol., ser. 2, 1]: 502. 1975.

Additional & emended bibliography: Loes., Verh. Bot. Ver.

Brand. 53: 81. 1912; Zimmerm. & Ziegler in Zimmerm. & Milburn, *Transp. Pl.* 1 [Pirson & Zimmerm., *Encycl. Pl. Physiol.*, ser. 2, 1]: 502. 1975; Moldenke, *Phytologia* 32: 235--245, 340, & 341 (1975) and 34: 252. 1976; Anon., *Biol. Abstr.* 61: AC1.585--586. 1976; Moldenke, *Phytologia* 41: 10. 1978.

Recent collectors refer to this plant as a soft-wooded tree, 5--6 m. tall, or as a straggy shrub, 3--6.5 m. tall, the foliage and flowers fragrant, and have found it growing in disturbed forests and premontane wet forests, at 300--500 feet altitude, flowering in May, July, and August. Croat refers to it as "uncommon" in Belize, but Wilbur & Stone report it "common on forested and pastured slopes". The corollas are said to have been "blue" on Croat 24815 and on A. Gentry 7959, "lilac" on Dwyer & Dieckman 13036, "violet-purple" on Wilbur & Stone 10557, "bright reddish-violet" on Rodríguez C. 427, "blue with a light spot on the inside of the lip" on Mori & Kallunki 5328, and "pale-violet" on Wunderlin & al. 317. Kupper reports the vernacular name, "murcielago", for the plant in Costa Rica.

The Seler & Seler 2560 cited by Loesener (1912) as "*Cornutia grandifolia* Schauer forma vel affinis" is regarded by me as var. *intermedia* Moldenke; Linden 141 is a mixture with *Hyptis verticillata*. The Lent 662, Mori & Kallunki 2504, Ton 2544, and Ventura A. 4517, distributed as typical *C. grandifolia*, actually are var. *intermedia* Moldenke, Bort 7, Correa & Stimson 19, Gibson & Gibson 2508, Liesner 847, and Zola B. 488 are var. *normalis* (Kuntze) Moldenke, M. Nee 7701 is *C. microcalycina* Pavon & Moldenke, & Dwyer & Pippin 10217 is *C. pyramidata* var. *isthmica* Moldenke.

Additional & emended citations: MEXICO: Chiapas: Breedlove 10366 (Ld), 14927 (Ld); Ton 2492 (Ld). GUATEMALA: Alta Verapaz: Contreras 4728 (Ld), 7807 (Ld). Veracruz: Linden 141 in part (Cb, K, Mi, X). BELIZE: Croat 24815 (Ld, N); Dwyer & Dieckman 13036 (W--2787799); A. Gentry 7959 (N); Wunderlin, Dwyer, Spellman, & Vaughan 317 (W--2787329). NICARAGUA: Estelí: Neill N.204 (Ac). Granada: Atwood & Neill AN.79 (Ld). COSTA RICA: Cartago: Rodríguez C. 427 (Ld); Wilbur & Stone 10557 (Ld). Province undetermined: Kupper 164 (Mu), 1370 [Cachon] (Mu). PANAMA: Veraguas: Mori & Kallunki 5328 (N).

#### CORNUTIA GRANDIFOLIA var. INTERMEDIA Moldenke

Additional bibliography: Loes., *Verb. Bot. Ver.* Brand. 53 [Abhandl. 241]: 81. 1912; Moldenke, *Phytologia* 32: 237--239 & 340. 1975; Anon., *Biol. Abstr.* 61: AC1.585. 1976.

Recent collectors describe this plant as "a woody herb", an aromatic shrub, 3 m. tall, or a tree, 6 m. tall, the flowers zygomorphic, 4-merous, the corollas "lilac", "blue with a yellow area at the throat", "dark-blue", or "purple, yellow at the throat", the stamens epipetalous, the calyx "persistent when the fruit falls

as an entire saucer", the fruit purple, 1-seeded, fleshy, the seeds pyramidal. They have encountered the plant on brushy roadsides, at 965--1500 meters altitude, flowering and fruiting in July and October.

Material of this variety has been misidentified and distributed in some herbaria as typical C. grandifolia (Schlecht. & Cham.) Schau. and as C. microcalycina var. pulverulenta Moldenke. On the other hand, the Breedlove 11399, previously cited by me as var. intermedia, seems, rather, to be C. lilacina var. velutina Moldenke. The Seler & Seler 2560, cited by Loesener (1912) as "Cornutia grandifolia Schauer forma vel affinis" is definitely C. grandifolia var. intermedia.

Additional citations: MEXICO: Chiapas: Ton 2544 (Ld). Veracruz: Ventura A. 4517 (Au, Ld). COSTA RICA: Cartago: Lent 662 (Ld). PANAMA: Veraguas: Mori & Kallunki 2504 (W--2788959); M. Nee 9835 (W--2787246).

#### CORNUTIA GRANDIFOLIA var. NORMALIS (Kuntze) Moldenke

Additional bibliography: Moldenke, Phytologia 32: 237, 239--240, 245, & 341. 1975; Anon., Biol. Abstr. 61:AC1.586. 1976.

Recent collectors describe this plant as a bush, shrub, or tree, 3--10 m. tall, regular in growth, and have found it growing in secondgrowth and at "the edges of forests along with melastomes and rubiads", at 800--1450 meters altitude, flowering in March and June, and fruiting in July. The corollas are said to have been "lilac" on Zola B. 488, "blue-violet" on Liesner 847, "purple" on Correa A. & Stimson 19, and "blue-purple" on Bartlett & Lasser 16528. Zola B. encountered the plant in primary deciduous woods on "suelo arcilloso rojizo".

Additional citations: MEXICO: Puebla: Gibson & Gibson 2508 (Ld). Veracruz: Zola B. 488 (N). PANAMA: Canal Zone: Correa A. & Stimson 19 (Ld). Chiriquí: Bartlett & Lasser 16528 (Mi); Bort 7 (N). Veraguas: Liesner 847 (N).

#### CORNUTIA GRANDIFOLIA var. PURPUSI Moldenke

Additional bibliography: Moldenke, Phytologia 32: 237, 240--241, & 311. 1975.

#### CORNUTIA GRANDIFOLIA f. QUADRANGULARIS (Ørst. & Moldenke) Moldenke, Phytologia 41: 10. 1978.

Additional bibliography: Moldenke, Phytologia 32: 241. 1975; Anon., Biol. Abstr. 61: AC1.586. 1976; Moldenke, Phytologia 41: 10. 1978.

The Rodriguez C. 427, distributed as this form, appears to be the typical form of the species instead.

#### CORNUTIA GRANDIFOLIA var. STORKII Moldenke

Additional bibliography: Moldenke, Phytologia 32: 241. 1975;

Anon., Biol. Abstr. 61: AC1.586. 1976.

**CORNUTIA JAMAICENSIS** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 241. 1975;  
Anon., Biol. Abstr. 61: AC1.586. 1976.

**CORNUTIA LATIFOLIA** (H.B.K.) Moldenke

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 417. 1830; Loud., Hort. Brit., ed. 2, 551. 1832; Sweet, Hort. Brit., ed. 3, 551. 1839; Moldenke, *Phytologia* 32: 241--242 & 340--342. 1975; Anon., Biol. Abstr. 61: AC1.586. 1976; Moldenke, *Phytologia* 36: 39. 1977.

Both Sweet (1830) and Loudon (1832) list this plant as growing in British gardens in their day, imported from "Mexico" in 1824, and known as the "broad-leaved hosta".

Additional citations: MEXICO: Veracruz: R. M. King 992 (Au--214227, Ld). GUATEMALA: El Petén: Contreras 6041 (Ld).

**CORNUTIA LATIFOLIA** f. **ALBA** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 242 & 340. 1975; Anon., Biol. Abstr. 61: AC1.586. 1976.

**CORNUTIA LILACINA** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 242--244, 340, & 341. 1975; Anon., Biol. Abstr. 61: AC1.586. 1976.

Recent collectors describe this species as 15 feet tall and have encountered it on wooded slopes and in arid Acacia-Iysiloma thorn-scrub forests, at 400--3200 feet altitude, flowering in July and August. The corollas are said to have been "blue" on Breedlove 11399, a collection previously erroneously cited by me as C. grandifolia var. intermedia Moldenke.

Additional & emended citations: GUATEMALA: Sacatepéquez: Breedlove 11399 (Ld, Z). Zacapa: Watkins, Torke, & Ellis 725 (Ld). HONDURAS: Comayagua: Molina R. 14377 (Ld). Morazán: Molina R. 14437 (Ld).

**CORNUTIA LILACINA** var. **VELUTINA** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 243--244, 340, & 341. 1975; Anon., Biol. Abstr. 61: AC1.586. 1976.

**CORNUTIA MICROCALYCINA** Pavon & Moldenke

Additional synonymy: Cornutia microcalicina Pav. & Mold. ex Soukup, *Biota* 11: 10. 1976.

Additional bibliography: Moldenke, *Phytologia* 32: 244--245, 339, & 341. 1975; Anon., Biol. Abstr. 61: AC1.586. 1976; Hocking, *Excerpt. Bot. A.28*: 258. 1976; Soukup, *Biota* 11: 10. 1976; López-Palacios, *Fl. Venez. Verb.* 285--289, 633, 648, & 649, fig. 66. 1977; Moldenke, *Phytologia* 36: 42. 1977.

Illustrations: López-Palacios, *Fl. Venez. Verb.* [287], fig. 66. 1977.



Recent collectors describe this species as a strongly aromatic shrub, 3 m. tall, the leaves velutinous, much paler beneath, with a disagreeable odor. They have found it growing in forests, at 170--1500 meters altitude, flowering in January, October, and December, fruiting in October. The corollas are said to have been "lilac" on Asplund 15400, "light-lilac" on Asplund 18155, "violet" on Boeke 844, "blue-violet" on López-Palacios 4080, and "blue with pale-yellow at base of lip" on M. Nee 7701. The vernacular names, "palo de San Juan", "San Juan", and "Santa Maria", have been recorded for the species.

López-Palacios (1977) cites from Venezuela the following collections: Barinas: Aristeguieta 3255; Breteler 4023, 4605; López-Palacios 3090; Ruiz-Terán 1739; Vergara 50. Lara: Linden 1457; R. F. Smith V.4448. Mérida: López-Palacios & Bautista 3169, 3406; Madriz 49; Ruiz-Terán 4047; Steyermark 56134.

Material of this species has been misidentified and distributed in some herbaria as C. grandifolia (Schlecht. & Cham.) Schau.

Additional citations: PANAMA: Panamá: M. Nee 7701 (W--2787293). VENEZUELA: Barinas: Breteler 4605 (N); López-Palacios 3090 (N). ECUADOR: Carchi: Boeke 844 (N). El Oro: Asplund 18155 (N). Guayas: Asplund 15400 (N). Manabí: López-Palacios 4080 (Id).

#### CORNUTIA MICROCALYCINA var. ANOMALA Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 245. 1975; Anon., *Biol. Abstr.* 61: AC1.586. 1976.

#### CORNUTIA MICROCALYCINA var. PULVERULENTA Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 244, 245, 339, & 341. 1975; Anon., *Biol. Abstr.* 61: AC1.586. 1976; Hocking, *Excerpt. Bot. A.* 28: 258. 1976.

Recent collectors describe this plant as a shrubby tree, 4 meters tall, the leaves pulverulent, and the fruit purple or "whitish when mature, and have found it growing in tropical wet forests and "rainforests with coffee and cocoa plantations", from near sealevel to 1650 meters altitude, flowering in February and August. The corollas are said to have been "violet" on Holm-Nielsen & al. 2801, "blue" on Gentry & Fallen 17175, and "blue-purple" on López-Palacios 4168 & 4241. The vernacular names, "culapa" and "mosquero", have been recorded for it. In a personal communication to me, López-Palacios records the variety from "la isla de Gallos, Nariño, Col [ombia]".

Material of this variety has been misidentified and distributed in some herbaria as C. odorata (Poepp. & Endl.) Poepp. On the other hand, the M. Nee 9835, distributed as C. microcalycina var. pulverulenta, seems actually to represent C. grandifolia var. intermedia Moldenke, while G. W. Barclay 634 is C. odorata (Poepp. & Endl.) Poepp.

Additional citations: COLOMBIA: Antioquia: López-Palacios 3587

(N). Chocó: Gentry & Fallen 17175 (N). Valle del Cauca: Cuatrecasas 16070 (W--2817665). ECUADOR: Bolívar: López-Palacios 4168 (Ld). Los Ríos: Holm-Nielsen, Jeppesen, Løjtnant, & Øllgaard 2801 (N, S). Pichincha: López-Palacios 4241 (Ld).

**CORNUTIA OBOVATA** Urb.

Additional bibliography: Moldenke, *Phytologia* 32: 337. 1975; Anon., *Biol. Abstr.* 61: ACL.586. 1976; Hocking, *Excerpt. Bot. A.* 28: 259. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976.

**CORNUTIA ODORATA** (Poepp. & Endl.) Poepp.

Additional bibliography: Moldenke, *Phytologia* 32: 337--339 (1975) and 34: 255. 1976; Anon., *Biol. Abstr.* 61: ACL.586. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976; Soukup, *Biota* 11: 10. 1976; López-Palacios, *Fl. Venez. Verb.* 285, 286, 289--[292], 648, & 649. 1977.

Recent collectors refer to this plant as a small tree, 4--8 m. tall, and have found it growing in sand and loam soil at the margins of woods, at sealevel, flowering in January, February, August, and November, fruiting in January. The corollas are said to have been "blue" on Barclay 634, Gentry 10046, and Torres 139 and "violet but reported to be white also" on Martin 1193.

Material of this species has been misidentified and distributed in some herbaria as C. microcalycina var. pulverulenta Moldenke.

López-Palacios describes C. odorata as an "arbolito de 4--6 m, erecto o de ramas arcuadas, hojas jóvenes de envés y haz velutinosos, las adultas algo glabrescentes, fl. morado claro, fr. morado oscuro, frecuente". Martin reports the vernacular name, "oquera", and states that in Peru the leaves, ground up in water, are used to treat headaches, the head being washed in the decoction, and the heartwood is heated and a chip dropped into the eye in treating eyeache.

The Beuther 55, distributed as typical C. odorata, actually is var. colombiana Moldenke, while Cuatrecasas 16070 is C. microcalycina var. pulverulenta Moldenke.

Additional citations: ECUADOR: Guayas: A. Gentry 10046 (W--2788961). Napo: López-Palacios 4180 (Z). Province undetermined: Oldeman 3351 [Tabiasco] (N). SALANGO ISLAND: G. W. Barclay 634 (W--2779688). PERU: Loreto: R. T. Martin 1193 (N); J. Torres 139 (Oa).

**CORNUTIA ODORATA** var. **CALVESCENS** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 338. 1975; Anon., *Biol. Abstr.* 61: ACL.586. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976; López-Palacios, *Fl. Venez. Verb.* 291--[292] & 648, fig. 67. 1977.

Illustrations: López-Palacios, *Fl. Venez. Verb.* [292], fig. 67. 1977.

López-Palacios (1977) notes that "Algunas hojas presentan már-

genes espaciadamente dentados". He cites from Venezuela the following collections: Miranda: Steyermark 90054. Zulia: Steyermark 99904.

**CORNUTIA ODORATA** var. **COLOMBIANA** Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 338--339 (1975) and 34: 255. 1976; Anon., *Biol. Abstr.* 61: AC1.586. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976.

Recent collectors refer to this plant as a tree or as a "small bushy tree", 4--15 meters tall, the leaves "thickly papery", dull pale-green, and the fruit subglobose-ovoid, black, glossy. They have found it growing in sunny meadows and along roadsides, at 350--2000 meters altitude, flowering in September, fruiting in August. The corollas are said to have been "violet" on Beuther 55, "purple" on Barclay & Juajibioy 3784, and "pale blue-lilac" on Cuatrecasas 23982.

López-Palacios describes the plant as an "árbol erecto 6--8 m" or "hasta de 12 m x 20 dm DAP" or "arbusto o arbolito de unas 2--4 m de aroma fuerte y algo desagradable. Hojas opuestas y 3-verticiladas; de la corteza se hace jaraba para el reumatismo; flor azul morada. Frutos morado rosados cuando maduros." In a personal communication to me, he notes "En Cundinamarca se le denomina 'Salvio lugo' y en la Costa del Pacífico 'Culape' o 'Juan Culape'. Este último nombre, mal leído, es citado por Record & Hess para Clerodendrum ('Tuonculape', en donde se ha interpretado la J por T y la a por o)." Another recorded vernacular name is "cenizo".

Additional citations: COLOMBIA: Arauco: López-Palacios 3963 (Ac, N). Bolívar: Beuther 55 (N). Cundinamarca: López-Palacios 3626 (N, Tu). Meta: López-Palacios 3924 (Id, N). Sucre: López-Palacios 3881 (N, Z). Valle del Cauca: Cuatrecasas 23982 (W--2817655). CULTIVATED: Colombia: Barclay & Juajibioy 3784 (W--2829161).

**CORNUTIA PUBESCENS** Gaertn. f.

Additional bibliography: Schau. in A. DC., *Prodr.* 11: 681--682. 1847; Moldenke, *Phytologia* 32: 339. 1975; Anon., *Biol. Abstr.* 61: AC1.586. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976.

Additional citations: FRENCH GUIANA: Halle 2498 (N).

**CORNUTIA PYRAMIDATA** L.

Additional bibliography: Sweet, *Hort. Brit.*, ed. 1, 1: 323 (1826) and ed. 2, 417. 1830; Loud., *Hort. Brit.*, ed. 2, 551. 1832; Sweet, *Hort. Brit.*, ed. 3, 551. 1839; Moldenke, *Phytologia* 32: 339--342. 1975; Anon., *Biol. Abstr.* 61: AC1.586. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976; López-Palacios, *Fl. Venez. Verb.* 285 & 648. 1977; Moldenke, *Phytologia* 36: 42. 1977; Liogier, *Moscosa* 1: 37. 1978.

Recent collectors describe this species as a shrub, treelet, or tree, 3--6 meters tall, with upright branches, and have found it growing at 50--800 meters altitude, flowering in June and October.

Wilbur and his associates refer to it as "common" on Dominica island. Liogier (1978) cites his no. 23057. The corollas are said to have been "blue" on Liogier & Liogier 23057 and "violet-blue" on Wilbur & al. 8254 & 8309.

Both Sweet (1830) and Loudon (1832) list this species as growing in British gardens in their day, introduced from the West Indies in 1733 and known as the "pyramidal cornutia"

The Dwyer 11580 and Ortiz 2735, distributed as typical C. pyramidata, actually represent var. isthmica Moldenke, while Watkins, Torke, & Ellis 725 is C. lilacina var. velutina Moldenke.

Additional citations: HISPANIOLA: Dominican Republic: Ekman H. 12464 (Ld); A. H. Liogier 16579 (W--2801659); Liogier & Liogier 23057 (N). LEEWARD ISLANDS: Dominica: Wilbur, Dunn, Hesperheide, & Wiseman 8254 (Ld), 8309 (Ld). WINDWARD ISLANDS: Martinique: Larsen & Larsen 35604 (Ac).

#### CORNUTIA PYRAMIDATA var. ISTHMICA Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 340--342. 1975; Anon., *Biol. Abstr.* 61: AC1.586. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976; Moldenke, *Phytologia* 36: 42. 1977.

Recent collectors describe this plant as a tree, 5--25 feet tall, the stems square, and the flower-buds bluish, and have encountered it in woods and forests. The corollas are said to have been "lavender" on Dwyer 11580, while those on Ortiz 2735 were "blue-violet" and those on Dwyer & Pippin 10217 were "purplish".

Material of this variety has been misidentified and distributed in some herbaria as C. grandifolia (Schlecht. & Cham.) Schau.

Additional citations: MEXICO: Yucatán: Lundell & Lundell 7888 (Au--188919). GUATEMALA: El Petén: Dwyer & Pippin 10217 (W--2788960); Ortiz 2735 (Mi). BELIZE: Croat 23982 (N); Dwyer 11580 (N).

#### CORNUTIA PYRAMIDATA var. ISTHMICA f. ALBIDA Moldenke

Synonymy: Cornutia pyramidata var. albida Anon., *Biol. Abstr.* 61: AC1.586. 1976.

Additional bibliography: Moldenke, *Phytologia* 32: 341 & 342. 1975; Anon., *Biol. Abstr.* 61: AC1.586. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976.

#### CORNUTIA THYRSOIDEA Banks & Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 342. 1975; Anon., *Biol. Abstr.* 61: AC1.586. 1976; Hocking, *Excerpt. Bot. A.* 28: 259. 1976; Moldenke, *Biol. Abstr.* 61: 4888. 1976.

Additional citations: JAMAICA: Proctor 16698 (Ld).

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## ADDITIONAL NOTES ON THE GENUS LIPPIA. XIV

Harold N. Moldenke

### LIPPIA Houst.

Additional bibliography: Baker & Moldes, *Revist. Chil. Hist. Nat.* 25: 623. 1923; Misra & Lamba, *Bull. Agric. Res. Inst. Pusa* 196: 3. 1929; Sampson, *An. Esc. Nac. Cienc. Biol. Méx.* 3: 443. 1944; Perez-Arbelaez, *Fl. Util. Colomb.*, ed. 1, 441 (1947) and ed. 2, 743. 1956; Valle, *Introd. Dendrol.* 275. 1972; García Barriga, *Fl. Med. Colomb.* 2: 506--508. 1975; Hocking, *Excerpt. Bot. A.* 25: 378 & 379. 1975; Mohlenbrock, *Guide Vasc. Fl. Ill.* 365. 1975; Moldenke, *Biol. Abstr.* 61: 4884. 1976; Austin, Coleman-Marois, & Richardson, *Fla. Scient.* 40: 353. 1977; Clay & Hubbard, *Haw. Gard. Trop. Shrubs* 185 & 291. 1977; Lewis & Elvin-Lewis, *Med. Bot.* 257, 376, 501, & 514. 1977; López-Palacios, *Fl. Venez. Verb.* 11, 20, 415--452, 637, 648--651, 563, & 654, fig. 98--106 & cover. 1977; Poppeton, Shuey, & Sweet, *Fla. Scient.* 40: 384. 1977; Richardson, *Fla. Scient.* 40: 303, 308, & 312. 1977; Thompson & Heineke, *Trans. Ill. Acad. Sci.* 70: 126. 1977; Markgraf & D'Antoni, *Pollen Fl. Argent.* 12, 25, 98, 112, & 115, pl. 42-362. 1978; Mohlenbrock & Ladd, *Distrib. Ill. Vasc. Fl.* [142] & 276. 1978; Moldenke, *Biol. Abstr.* 65: 6768 (1978) and 66: 1277. 1978; Moldenke, *Phytologia* 40: 200--205, 262, 507, 509, 510, & 512. 1978; A. L. Moldenke, *Phytologia* 40: 362. 1978; Mound & Halsey, *Whitefly World* 65, 123, 238, 305, & 311. 1978; Pirone, *Diseas. & Pests Ornament. Pl.*, ed. 5, 126. 1978; R. S. Sm., *Act. Bot. Venez.* 13: 193, 206, & 262. 1978.

López-Palacios, in a personal communication to me, notes: "Además el Dr. Aristeguieta registra para el género el nombre de 'Tomillo', pero sin que sepamos a que especie se aplica."

The Rodriguez 550, distributed as Lippia sp., actually is Phyla nodiflora var. rosea (D. Don) Moldenke.

### LIPPIA ALBA (Mill.) N. E. Br.

Additional synonymy: Nepeta maxima Sloane apud López-Palacios, *Fl. Venez. Verb.* 419, in syn. 1977.

Additional bibliography: Misra & Lamba, *Bull. Agric. Res. Inst. Pusa* 196: 3. 1929; García Barriga, *Fl. Med. Colomb.* 2: 506. 1975; López-Palacios, *Fl. Venez. Verb.* 416--424, 427, 637, 650, 651, 653, & 654, fig. 98. 1977; Moldenke, *Biol. Abstr.* 66: 1277. 1978; Moldenke, *Phytologia* 39: 434 & 449 (1978) and 40: 201. 1978; A. L. Moldenke, *Phytologia* 40: 362. 1978; Mound & Halsey, *Whitefly World* 123. 1978.

Additional illustrations: López-Palacios, *Fl. Venez. Verb.* [420], fig. 98. 1977.

The corollas on Proctor 16893 are described as having been "rose-pink" when fresh.

López-Palacios, in a personal communication to me, comments that "En cada uno de los países citados, con los siguientes nombres: En C[olombia] se le conoce como 'Prontoalivio', aplicado en la obra de Pérez-Arbeláez, posiblemente por error a Lantana canescens L. (sic). Aunque los dos taxa en material son semejantes, y Lantana canescens Hort. es un sinónimo de Lippia alba, nunca lo he oído aplicado a la verdadera Lantana canescens HBK, pero la ilustración dada por Pérez-Arbeláez (1966) corresponde claramente a una Lantana y no a una Lippia. En la edición de 1947 la misma ilustración tiene este título: Lantana sp. rugulosa HBK. Valga la oportunidad para anotar que al ilustre autor, además de la mala atribución a Linneo de Lantana canescens, se le deslizaron algunos otros errores en los dibujos de la Verbenaceae de la mencionada obra (cito los Nos. de la edición de 1956): el 742 por sus hojas pecioladas más parece corresponder a Petrea aspera Turcz. que a Petrea arborea HBK.; el 743 atribuido a Petrea volubilis Jacq. (sic) corresponde a una Congea y el 744, como de Verbena hispida R. & P., es de una Stachytarpheta.

"García Barriga agrega los de 'Orégano de cerro' para el Magdalena y el de 'Curalotodo' para otras partes; en el Ecuador la Dra. Flor de María Valverde ha registrado el de 'Mastranto' para Guayaquil, en V[enezuela] se le conoce generalmente como 'toronjil', 'Cidrona' en Guárico, 'Poleo' en Lara y también como 'Orégano', según Pittier, Suplemento: 117."

Misra & Lamba (1929) list this species as a host to the white-fly, Bemisia tabaci (Gennadius) Takahashi.

In his 1977 work López-Palacios cites the following collections of Lippia alba from Venezuela: Amazonas: Trujillo s.n. Apure: Char-don 22; Humboldt & Bonpland 1140; Trujillo 2065. Aragua: Trujillo 3384; Vogl s.n. Bolívar: Holt & Gehriger 146; N. G. S. 141; Tamayo 3430. Carabobo: Delascio 2440. Delta Amacuro: Agostini & Agostini 1654; Bond, Gillin, & Brown 166. Falcón: Tamayo 729. Federal District: Burkart 16013; Debeaux 87; Nevling 213; Pittier 12648. Guárico: Cárdenas 1417. Lara: Mocquerys s.n.; Pittier 13118; Saer 196. Mérida: López-Palacios 2615; López-Palacios & Bautista 3551. Miranda: Trujillo & al. 257. Sucre: Broadway 346; Humboldt & Bonpland s.n. Trujillo: Tamayo 1891. Yaracuy: Burkart 16500. Zulia: Mocquerys 851; Trujillo 7024. Margarita Island: Britton & Britton 2197; Cruger s.n.; Foldats s.n.; J. R. Johnston 81; Miller & Johnston 125.

Additional citations: WINDWARD ISLANDS: Grenada: Proctor 16893 (W-2814590).

#### LIPPIA ALBA var. GLOBIFLORA (L'Hér.) Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 419 & 653. 1977; Moldenke, Biol. Abstr. 66: 1277. 1978; Moldenke, Phytologia 39: 434. 1978; A. L. Moldenke, Phytologia 40: 362. 1978.

Recent collectors have encountered this plant in dry sandy soil

of disturbed habitats and describe it as an herb, to 40 cm. tall, with the odor of a mint, flowering in November. The corollas are said to have been "lilac" in color when fresh on Coradin & Cordeiro 1028.

Additional citations: BRAZIL: Roraima: Coradin & Cordeiro 1028 (N).

#### LIPPIA AMERICANA L.

Additional bibliography: García Barriga, Fl. Med. Colomb. 2: 506. 1975; López-Palacios, Fl. Venez. Verb. 417-419, 425-427, 650, & 651. 1977; Moldenke, Biol. Abstr. 66: 1277. 1978; Moldenke, Phytologia 39: 434-435 (1978) and 40: 81. 1978; R. F. Sm., Act. Bot. Venez. 13: 193, 206, & 263. 1978.

Additional illustrations: García Barriga, Fl. Med. Colomb. 2: 506. 1975; R. F. Sm., Act. Bot. Venez. 13: 263. 1978.

Smith (1978) reports this species from Lara, Venezuela, but only f. pilosa Moldenke is known to me from there.

López-Palacios, in a personal communication to me, lists the vernacular names, "guasguin" and "Indio viejo", for this species in Colombia, as well as the name "salvia de tierra caliente". He states that García-Barriga, between pages 506 and 507 of his work, gives a very good photograph of this plant. I am also indebted to López-Palacios for enabling me to localize more accurately the Karsten collection cited below, previously cited by me in Phytologia 12: 80 (1965) as from "Locality of collection undetermined".

Emended citations: COLOMBIA: Guajira: Karsten s.n. [Dibulla, Río Hacha] (V).

#### LIPPIA AMERICANA f. PILOSA Moldenke

Additional bibliography: García Barriga, Fl. Med. Colomb. 2: 507. 1975; López-Palacios, Fl. Venez. Verb. 418, 419, 425-427, & 650, fig. 99. 1977; Moldenke, Biol. Abstr. 66: 1277. 1978; Moldenke, Phytologia 39: 435 (1978) and 40: 81. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [426], fig. 99. 1977.

López-Palacios (1977) cites the following collections from Venezuela: Lara: Mocquerys s.n.; Smith V.238; Steyermark & Carreffo 108760. Zulia: Aristeguieta 2058; Pittier 10541. In a personal communication to me he notes that this plant is "Conocida como 'Velita'. Es posible que también se le den los siguientes de Record & Hess, o. c., 544, dados sin precisar especie: 'Rosa vieja', 'Varilazo' y 'Vara de lazo'."

#### LIPPIA CHIAPASENSIS Loes.

Additional bibliography: Moldenke, Phytologia 39: 435 (1978) and 40: 69 & 81. 1978.

Breedlove refers to this plant as a shrub, 5 feet tall, and found it growing at 900 meters altitude in a steep-walled ravine and on sandstone bluffs with seasonal evergreen forest of Quercus, Mastichodendron, Styrax, Oreopanax, and Bursera, flowering in May.

Additional citations: MEXICO: Chiapas: Breedlove 25269 (Mi).

**LIPPIA COSTARICENSIS** Moldenke

Additional bibliography: Moldenke, *Phytologia* 39: 436 (1978) and 40: 73. 1978.

Mori & Bolten describe this species as a tree, 6 meters tall, and encountered it at 6000--6500 feet altitude.

Additional citations: PANAMA: Chiriquí: Mori & Bolten 7246 (N).

**LIPPIA CURTISIANA** Moldenke

Additional bibliography: Moldenke, *Phytologia* 39: 32 & 36. 1978.

Henrickson refers to this species as a "frequent rounded shrub to 1 m. tall on open limestone ridge just below oak forest, with Artemisia, Agave, Dasyliirion, Opuntia, Cercocarpus, Croton, Cordia, grasses, etc." and found it in flower in September. He describes the corollas as "yellow".

Additional citations: MEXICO: Coahuila: Henrickson 13167 (Ld).

**LIPPIA GLANDULOSA** Schau.

Additional citations: López-Palacios, *Fl. Venez. Verb.* 450 & 651. 1977; Moldenke, *Phytologia* 39: 45, 78, & 263 (1978) and 40: 67. 1978.

**LIPPIA GRAVEOLENS** H.B.K.

Additional bibliography: J. F. Morton, *Quart. Journ. Crude Drug Res.* 15: 183. 1977; Moldenke, *Phytologia* 39: 436. 1978.

Morton (1977) informs us that of this species "Dried leaves reduced to small pieces are sold in plastic bags for flavoring. This is the principal species furnishing 'Mexican oregano' exported to the United States. The plant decoction is an emmenagogue and a remedy for diabetes and dysentery. A sirup of the dried leaves is a remedy for diabetes and dysentery. Lavadores warns that if taken during pregnancy it can cause abortion. A sirup of the dried leaves is a remedy for coughs and colds." It is "commonly cultivated in Mexico".

Recent collectors have found this plant in abandoned gardens, in flower in November, and in fruit in October.

Material has been misidentified and distributed in some herbaria as Lantana sp.

Additional citations: MEXICO: Durango: G. N. Jones 23197 (Ld). Querétaro: Calvert s.n. [Jalpan, 1 November 1977] (Ld). NICARAGUA: Grenada: Levy 250 (N).

**LIPPIA HATSCHBACHII** Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.* 25: 378. 1975; Moldenke, *Phytologia* 39: 89--90. 1978.

**LIPPIA HEDERAEFOLIA** Mart. & Schau.

Additional bibliography: Moldenke, *Phytologia* 39: 437 & 450. 1978.



Hatschbach describes this species as 70 cm. tall, growing from a xylopodium, and has found it growing in campo cerrado and in rocky soil of cerrado at the edge of chapada, flowering in January. He describes the corollas on his 40789 as "purple" and those on no. 41418 as "dark-rose, interior of tube yellow".

Additional citations: BRAZIL: Minas Gerais: Hatschbach 40789 (Ld), 41418 (Ld).

### LIPPIA HIRSUTA L. f.

Additional bibliography: Valle, Introd. Dendrol. 275. 1972; García Barriga, Fl. Med. Colomb. 2: 508. 1975; López-Palacios, Fl. Venez. Verb. 418, 419, 428—432, 444, 446, 452, 537, 648, 650, & 651. 1977; Moldenke, Phytologia 39: 82, 91—95, & 437 (1978) and 40: 59—62, 83, & 84. 1978.

In a personal communication to me, López-Palacios says: "Con los nombres de 'Salvio(a) blanco(a)' en Cundinamarca y 'Bunquín' en Boyaca. El Dr. Jorge Ignacio del Valle, en se Introducción a la Dendrología Colombiana: 275, le da los nombres de 'Gallinazo' o 'Neblino', que probablemente se apliquen también a la antigua variedad L. hirsuta var. glabrescens Moldenke, conocida hoy como L. schlimii var. glabrescens (Moldenke) Moldenke."

### LIPPIA HIRSUTA var. MORITZII (Turcz.) López-Palacios

Additional bibliography: López-Palacios, Fl. Venez. Verb. 418, 419, 428—432, 444, 452, 637, 648, 650, & 651, fig. 100 & cover. 1977; Moldenke, Phytologia 39: 437 (1978) and 40: 59—62. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [429], fig. 100 & cover. 1977.

López-Palacios (1977) cites the following collections from Venezuela: Aragua: Allart 288; Fendler 863, 864; Lasser & Foldats 4276; Moritz 1640; Pittier 9966; Ruiz-Terán & López-Palacios 10170; Steyermark 91592; Trujillo & Ferrari 873; Vogl s.n. Federal District: Allart 85, 167; Aristeguieta 787; Badillo 694; Bailey & Bailey 944; Delgado 54, 507; Eggers 13580; J. R. García 168; Lasser 1008; McKee 10752; Moritz 1688; Pittier 9869, 9870, 9966, 12251, 13779; Steyermark 55099; Ll. Williams 10625, 12251. Lara: Alston 6738; Quintero & Carroz 1049. Mérida: Bernardi 3135, 6399; Breteler 3398; Ginés 1587; Jahn 1140; López-Palacios 2627, 3610; López-Palacios & Bautista 3380; Oberwinkler 12449; Richardi 5630; Ruiz-Terán 4637; Ruiz-Terán & López-Palacios 1898. Miranda: Allart 288a. Trujillo: Aristeguieta & Medina 3350; Breteler 4134; Ruiz-Terán & López-Figueras 2213; Ruiz-Terán & López-Palacios 7394, 7673. State undetermined: Ernst 622. He says that Ruiz-Terán & López-Palacios 10170 is actually a topotype of the taxon. He also points out that the Bernardi "3735" cited by me in Phytologia 12: 292, 1965, actually should read Bernardi 3135 (cfr. seq.). In a personal communication to me he lists for this plant the vernacular names, "Amogre", "Almogre", "Mogre", and "Mugre".

[to be continued]

## BOOK REVIEWS

Alma L. Moldenke

"DISEASES AND PESTS OF ORNAMENTAL PLANTS" Fifth Edition by Pascal P. Pirone, x & 566 pp., 237 b/w photographs & line drawings. A Wiley-Interscience Publication of John Wiley & Sons, Chichester, Brisbane, Toronto & New York, N. Y. 10016. 1978. \$18.50.

This is an official publication of the New York Botanical Garden where the author spent his green-thumbed professional life to the great benefit of the field of horticulture, in terms of the plants, the planters trained and the thousands of amateur and professional gardeners aided.

"The organization of this edition closely follows that of its predecessors", but the content omits the use of banned chemicals, recommends those least harmful to other living creatures and includes the new ones not known at the time of the earlier editions. "The book describes the diseases, pests, and other troubles that assail nearly 500 genera of ornamental plants grown outdoors, under glass, or in the home and explains when and how to use the most efficient controls. The book is well and efficiently illustrated. Each edition has been excellent in its time, and each has been improved over its predecessor.

"ATLAS OF UNITED STATES TREES" Volume 5 - Florida by Elbert L. Little, Jr., 284 pp. & 256 color-dotted b/w county, hardiness zone and geographic distribution map plates. Forest Service, U. S. Department of Agriculture, Miscellaneous Publication No. 1361, Washington, D. C. Sold by the Superintendent of Documents, U. S. Government Printing Office. 1978. \$4.25 paper-bound.

Like the previous excellent volumes, this one limited to a single state because it has more native tree species and more tropical ones than any other of the contiguous states will be of great value to many foresters, botanists, assorted ecologists, etc. for the reliable data and for the effective presentation. Species maps 1--13 show the pertinent conifers or softwoods and species maps 14--158 deal with the temperate dicots or hardwoods with any necessary revisions since their earlier treatment in Volumes 1 or 4. Species maps 159--256 are new fullpage ones dealing with Florida's hardwoods and few tree-form yuccas and palms. In the introduction notes on ranges are supplied, rare and local species listed.

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Vol. 41

January 1979

No. 3

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CELOSIA TRIGYNA L. (AMARANTHACEAE), A SPECIES  
NEW TO CONTIGUOUS UNITED STATES

Richard P. Wunderlin  
Department of Biology, University of South Florida,  
Tampa, FL 33620

The only species of *Celosia* previously known to occur in contiguous United States were *C. palmeri* S. Watson from western Texas (Correll & Johnston, 1970), *C. nitida* Vahl from southern Florida (Long & Lakela, 1976) and southern Texas (Correll & Johnston, 1970), and *C. argentea* L., the commonly cultivated cockscomb native to South America, which is occasionally encountered as an escape in Texas (Correll & Johnston, 1970), North Carolina (Radford, et al., 1968), Missouri (Steyermark, 1963), and perhaps can be expected elsewhere. Now to this list of three species must be added *C. trigyna*, naturalized in central Florida. *Celosia trigyna* is native and widespread in tropical Africa, also occurring in Arabia and the Malagasy Republic (Keay, 1954). This species has apparently been in Florida for some time since the oldest herbarium specimen is dated 1931 and was made from a plant grown from seed collected in Pinellas County [DeBusk s.n. (FLAS)]. Since then, additional collections have been made in Pinellas as well as in Lake, Pasco, and Polk Counties in Florida.

*Celosia trigyna* has been confused with the native *C. nitida* in Florida. However, it can readily be distinguished by the characters in the following key to the two Florida species.

1. Sepals ca. 5 mm long, firm, dark brown or yellowish, prominently and finely parallel-nerved; style longer than stigmas.....  
..... *C. nitida*
1. Sepals ca. 3 mm long, membranaceous, white, 1-nerved; style shorter than stigmas..... *C. trigyna*

*Celosia nitida* is a hardwood hammock species confined to the southern counties in Florida. Collections have been seen from Dade, Lee, and Monroe Counties. On the other hand, *C. trigyna* occurs in central peninsular Florida. It is a weedy species most commonly encountered in cultivated fields and orange groves. It is an aggressive species and produces relatively large amounts of viable seed, thus has the potential of becoming a troublesome weed in central Florida.

The following collections of *C. trigyna* from Florida have been examined: LAKE CO.: Lady Lake, Mathews s.n. (FLAS, USF). PASCO CO.: FLA 41, ca. 2 mi. W of Blanton, D'Arcy & Beckner s.n. (FLAS). PINELLAS CO.: NE Clearwater, FLA 588, W of US 19, Genelle & Fleming 372 (USF), 374 (USF), 1922 (FLAS, FSU, USF). POLK CO.: Lake Hamilton, Conard s.n. (FLAS); Timberlane, 8 mi. NW of Lake Wales,

*Cooley 18381* (USF); 4 mi. W of Lake Wales, *King s.n.* (FLAS); Lake Alfred, *West s.n.* (FLAS).

Many thanks are due Drs. Daniel B. Ward, University of Florida, and Loran C. Anderson, Florida State University, for the opportunity to examine their specimens of *Celosia*. This research is supported in part by the George R. Cooley Research Fund.

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## NEW COMBINATIONS IN *SWERTIA* (GENTIANACEAE)<sup>1</sup>

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Several problems of generic delimitation in the Gentianeae, tribe Gentianeae, remain inadequately investigated. Interim decisions on generic treatments are, however, required for the revised edition of the *National List of Scientific Plant Names*, to be published by the Soil Conservation Service, United States Department of Agriculture, and the Department of Botany, Smithsonian Institution (target date 1979). The present paper includes a review of studies to date bearing upon the question of whether *Frasera* Walt. should be accepted as a genus distinct from *Swertia* L., and explains my reasons for including *Frasera* in *Swertia* in the forthcoming *National List*.

Subsequent to St. John's (1941) summarization of the case for including *Frasera* in *Swertia* (following several earlier authors), more recent data on chromosome numbers have led some authors to favor the retention of *Frasera*. Hitchcock (1959) accepted *Frasera* as a genus with  $x = 13$  and *Swertia* s. str. with  $x = 9, 12,$  and  $14$ , largely on the basis of an unpublished thesis by D.M. Post in 1950. (Post's cytotaxonomic conclusions had been based on data published by Rork in 1949; Hitchcock evidently also consulted Darlington & Wylie's [1957] compilation, since no multiple of 14 was reported until 1952.) *Frasera* was said to differ further in having tetramerous flowers and a distinct, slender style 2 mm or longer, contrasting with pentamerous flowers and a short, poorly differentiated style or no style in *Swertia*. *Swertia* was described as consistently having opposite or alternate rather than whorled leaves, two distinct foveae on each corolla lobe, and completely separate stamens without crown scales; *Frasera*, however, was said to be variable in having either opposite or whorled leaves, paired or solitary foveae, and stamens either separate or connected by a crown, the crown if present bearing well-developed, rudimentary, or no scales between the filaments. Allred (1977) followed Hitchcock (1959); further distinctions pertaining to stature, presence or absence of rhizomes, corolla color, and habitat evidently were intended only to the Utah representatives of this complex, since even the western North American species placed in *Frasera* by Card (1931) and Hitchcock (1959) are variable in these respects. Threadgill & Baskin (1978) concentrated only on *Swertia caroliniensis* (Walt.) O. Ktze. (as *Frasera caroliniensis* Walt.), with the objective of determining with which of the western North American groups, respectively designated *Frasera* and *Swertia* by Post, this eastern species was affiliated. Their acceptance of *Frasera* was based largely on Post's work (an unpublished dissertation in 1956), with the addition of Stout & Balkenhol's (1969) biochemical studies, discussed below.

Toyokuni (1956) expanded *Frasera* to include *Ophelia* D. Don of eastern Asia. *Frasera* sensu Toyokuni thus comprised species then known to have  $x = 10$  as well as  $x = 13$ . He rejected most of the morphological distinctions, however, recognizing *Frasera* almost entirely on the basis of chromosome numbers.

The North American species treated as *Frasera* do differ from *Swertia perennis* L., the only North American species of *Swertia* s. str., much as Hitchcock (1959) and Threadgill & Baskin (1978) stated, except for inconsistencies in the styler character, already noted by St. John (1941) and several earlier authors. Such species as *S. caroliniensis*, *S. pahutensis* (combination published below), and *S. radiata* (Kellogg) O. Ktze. are obviously closely related to each other, and more distantly related to *S. perennis*. On the other hand, such North American species as *S. albicaulis* (Dougl. ex Griseb.) O. Ktze. and *S. fastigiata* Pursh (chromosome numbers unknown), although they do exhibit the traits ascribed to *Frasera* by these authors, resemble *S. perennis* in their blue corollas and in their habit, being of low stature with most of the leaves basal, the cauline leaves being widely separated

<sup>1</sup>Contribution No. 33 from the Royal Botanical Gardens, Hamilton, Ontario.

and those in the inflorescence greatly reduced.

As Toyokuni (1965) observed, however, the correlation among morphological traits breaks down when species from other continents are considered. Several species with pentamerous flowers have only one fovea per corolla lobe, e.g., *S. cordata* Wall. ex C.B. Clarke (Himalaya), *S. kilimandscharica* Engl. (eastern Africa), and *S. schimperi* (Hochst.) Griseb. (eastern Africa). Card (1931) illustrated foveae ranging from two distinct foveae per lobe through various degrees of fusion to one unlobed fovea, indicating a continuum of variation rather than two distinct categories. In *S. atroviolacea* H. Sm. (China), various degrees of fusion of the foveae can be found on a single specimen (Smith, 1936). *Swertia swertopsis* Makino (Japan) combines pentamerous flowers with a well-developed, slender style. The corolla lobes of *S. bimaculata* (Sieb. & Zucc.) C.B. Clarke (eastern Asia) are similar in size and shape to those of North American species placed in *Frasera*, but its flowers are pentamerous. Axis type was mentioned by Threadgill & Baskin (1978, following Post, ined.), but the limitations of its taxonomic value are evident from Card's (1931) and Toyokuni's (1963) discussions of the diverse types of inflorescences found in this complex. Both *S. albicaulis* (western North America, treated as *Frasera*) and *S. perennis* have slender inflorescences, with the pedicels arising directly from the main axis, whereas *S. macrosperma* (C.B. Clarke) C.B. Clarke and *S. pulchella* Buch.-Ham. ex D. Don (both Himalaya), both with pentamerous flowers, have diffuse, compound, much-branched inflorescences resembling those of the tetramerous-flowered *S. tetrapetala* (eastern Asia). Still greater diversity has been described in more recent years, as in *S. acaulis* H. Sm. (Nepal), in which the stem is only 1-2 cm long and the cyme divisions obsolete, the long pedicels appearing to arise from the caudex. Finally, one may note the pronounced similarity of *S. perennis* and *S. pseudochinensis* Hara (Japan) as illustrated by Toyokuni (1965; the latter species as *Frasera pseudochinensis* (Hara) Toyokuni), compared with the diversity among the species he assigned to *Frasera*.

Post's (1958) studies of nodal anatomy were interpreted by him and by Threadgill & Baskin (1978) as supporting the recognition of *Frasera*. Post, however, reported five, rather than two, major types of nodal anatomy among the North American species, and found some species, especially *Swertia perennis*, to be remarkably variable even within individuals. Since no taxa from other continents were studied, the taxonomic significance of nodal anatomy in the complex as a whole cannot yet be assessed. Lindsey (1940) studied the floral anatomy of several species in this complex, but did not indicate which he accepted as *Swertia* and which as *Frasera* except for *S. perennis* L. and *F. speciosa* Dougl. ex Hook. [= *S. radiata* (Kell.) O. Ktze.]. However, he commented only upon the similarities among all of these species, particularly in the placentation and in the branching of the main corolla traces below the separation of the corolla tube from the receptacle.

Nilsson's (1967, 1970) studies of the pollen morphology of 53 taxa in *Swertia* s. lat. disclosed the existence of several types of pollen grains, but pollen morphology was not well correlated with the sections into which *Swertia* s. lat. had been divided by Gilg (1895). Nilsson followed Gilg (1895) in accepting the broad concept of *Swertia*, including *Frasera* and *Ophelia*. In his 1970 paper, however, he noted the relative uniformity in pollen morphology among the North American species exclusive of *S. perennis*, and suggested that this might support their treatment as a separate genus, along with *S. tetrapetala*, which has similar pollen, and possibly some other eastern Asiatic species. This suggestion would not be equivalent to Toyokuni's (1956) inclusion of all of *Ophelia* in *Frasera*; some species treated as *Ophelia*, including the other Japanese taxa studied by Nilsson, have dissimilar pollen. One of the Asiatic species with pollen similar to that of the North American species is *S. acaulis* H. Sm. (Nepal), which corresponds well to recent concepts of *Frasera*. It is, however, according to Smith, (1970), a part of the *S. hookeri* C.B. Clarke complex, which comprises species "all obviously of close affinity," yet at least some other members of this group do not possess this type of pollen. Conversely, pollen of similar appearance is known from some species, such as *S. handeliana* H. Sm. (eastern Asia), with pentamerous flowers and other traits of *Swertia* s. str.

It is unfortunate that recent authors have cited the supposed differences in chromosome number



believed by Post and Hitchcock, from the few counts published through 1955 ( $x = 13$  then known from only one species in the whole complex!), to separate *Frasera* from *Swertia*, without reference to more recent counts. Those now available indicate a much more complicated situation, including  $n = 8, 9, 10, 12, 13, 14, 21$ , and 39. Also, even allowing for the possibility of an occasional error, it is evident that dysploid chromosome numbers sometimes occur within species; four of the species reported to have  $n = 13$  are also reported to have  $n = 12$ , and still other counts have been published for two of these. (For compilations of chromosome counts, see Toyokuni, 1965; Bolkhovskikh et al., 1969; Moore, 1973; and Vasudevan, 1975.) From this array of chromosome numbers, it is difficult, in the absence of strong support from morphology (see discussion below), to attach special significance to  $x = 13$  either alone or in combination with  $x = 10$ , much less to suggest that taxa with  $x = 13$  are more closely related to *Gentiana* than to the rest of the *Swertia* complex.

According to Vasudevan (1975),  $n = 13$  is the most frequently encountered chromosome number in *Swertia* s. lat. It is found in North America, Asia, and Africa, in diverse species that have been assigned to different sections or segregate genera. Chromosome numbers published since 1955 clearly demonstrate that the basic number 13 is by no means exclusively correlated with the traits attributed to *Frasera* by Post, Hitchcock, and Threadgill & Baskin. For example, *S. petiolata* Royle ex C.B. Clarke and *S. thomsonii* C.B. Clarke (both Himalaya; both  $n = 13$ ) correspond strictly to their concept of *Swertia*, being of relatively low stature and similar to *S. perennis* in habit, and having pentamerous, deep blue corollas, two foveae per corolla lobe, and sessile stigmas. *Swertia cordata* ( $n = 13$ ) corresponds to *Swertia* sensu these American authors in its pentamerous corollas but to *Frasera* in its monocarpic life cycle, solitary foveae, distinct style, and filaments "obscurely connate" at the base (fide Clarke, 1883). Several species with  $n = 13$ , e.g., *S. kilimandscharica* and *S. petiolata*, have pollen unlike that of the species that Nilsson (1970) suggested might be segregated as *Frasera*.

Stout & Balkenhol (1969; see also Stout, Christensen, et al., 1969) concluded that their comparative studies of xanthonenes supported the recognition of *Frasera*. Although they found significant differences between the species they treated as *Frasera* and those they accepted as *Swertia*, they also found major differences among species-groups within *Frasera*. Moreover, Stout et al. uncritically accepted as *Swertia* all species that had been so designated in studies of xanthonenes by other authors; thus among the *Swertia* species from which *Frasera* was said to be differentiated they included *S. chirayita* (Fleming) Karsten (sometimes called *S. chirata* Wall., nom. nud.) (Himalaya).<sup>2</sup> In general aspect, *S. chirayita* bears a greater resemblance to North American species placed in *Frasera* than to *S. perennis*, and it corresponds to American authors' delimitations of *Frasera* in having  $n = 13$ , tetramerous, yellowish corollas, and stamens connected by a crown. It also falls within Toyokuni's (1965) concept of *Frasera*, having previously been placed in *Ophelia*.

In later studies of xanthonenes, Jossang et al. (1973) were able to state that, among the species studied, only *Frasera* had xanthonenes substituted at positions 2 and 4, and all xanthonenes of *Swertia* were substituted at position 8. Conversely, however, some samples of *Frasera* lacked xanthonenes substituted at 2 and 4, and some did contain xanthonenes substituted at 8. This study was likewise limited in taxonomic applicability by the small number of species studied. Also, all of the Asiatic species studied, including *S. chirayita*, were accepted as *Swertia*, without reference to the fact that some had been treated as *Frasera* by Toyokuni and as *Ophelia* by other authors. The numerical-taxonomic representation of the xanthone data placed *Swertia* much closer to *Gentiana* than to *Frasera*, just the reverse of the cytotoxic conclusions of Post (in Hitchcock, 1959), and likewise too much at variance with morphology to be accepted as an indication of phylogeny.

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<sup>2</sup>Stout et al. studied only species that they accepted as *Frasera*. The xanthonenes of these species were contrasted with those of *Swertia* species studied by other authors; the names of these species can be found in references cited by Stout et al.

Still later studies of the xanthonones of *Swertia bimaculata* led Ghosal et al. (1975) to a contrasting emphasis in interpreting the taxonomic significance of these compounds. Xanthonones of the types previously associated both with *Frasera* and with *Swertia* s. str. were found in this species, their data on xanthonones thus tending to unite rather than to differentiate between these groups.

It is obvious that further studies of the *Swertia* complex, including species previously placed in *Swertia* s. str., *Frasera*, *Ophelia*, and *Lomatogonium* A. Br., considering diverse lines of evidence, and involving species from all parts of the range of this complex, will be necessary before a satisfactory delimitation of genera can be reached. For the present, however, arguments for the acceptance of *Frasera* seem inadequate, and arguments for the broader concept of *Swertia* seem sounder. Nor is there a question of maintaining nomenclatural ability; both *Frasera* and *Swertia* s. lat. can be found in currently standard North American floras.

It seems desirable, therefore, to make a name in *Swertia* available for the one North American species described in *Frasera* since St. John's (1941) revision:

SWERTIA PAHUTENSIS (Reveal) Pringle, comb. nov. Basionym: *Frasera pahutensis* Reveal, Bull. Torrey Bot. Club 98:107. 1971.

Also, some taxa treated as species by St. John (1941) were reduced or restored to varietal status by Hitchcock (1959). Since varietal status for these taxa has been widely accepted, the appropriate combinations in *Swertia* are hereby provided:

SWERTIA ALBICAULIS Griseb. var. COLUMBIANA (St. John) Pringle, comb. nov. Basionym: *Swertia columbiana* St. John, Amer. Midl. Naturalist 26:22. 1941.

SWERTIA ALBICAULIS Griseb. var. CUSICKII (A. Gray) Pringle, comb. nov. Basionym: *Frasera cusickii* A. Gray, Proc. Amer. Acad. Arts 22:310. 1887.

SWERTIA ALBICAULIS Griseb. var. IDAHOENSIS (St. John) Pringle, comb. nov. Basionym: *Swertia idahoensis* St. John, Amer. Midl. Naturalist 26: 24. 1941.

#### Acknowledgment

I am grateful to Dr. Jerry M. Baskin for valuable comments and information and for his review of the manuscript.

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THE FRUIT OF GARDENIA WEISSICHII (RUBIACEAE)

Hawaiian Plant Studies 83

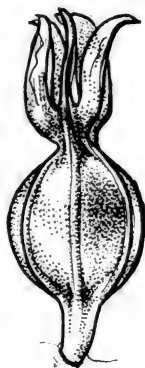
Harold St. John

Bishop Museum, Honolulu, Hawaii, 96818, USA.

Gardenia Weissichii St. John was recognized (1978) as the third species of the genus native to the island of Oahu. It was discovered in the Koolau Mountains at Malaekahana, and a single plant was successfully cultivated in the Wahiawa Botanic Garden, as no. 938. The type specimen was collected from this cultivated tree, and it consisted of herbage and flowers only. Now, it has as last fruited, and on Oct. 29, 1978 John Obata collected a fruiting branch, from which the following description and illustration is drawn.

The berry has the body 26 mm long, 23 mm in diameter, ellipsoid, but with 5 elevated, rounded, protruding ribs; at the apex with a 3 mm subcylindric neck; and above this the 24-25 mm calyx spurs, united for 5 mm, and free and as falcate lanceolate tips 18-20 mm long, and 4-5 mm wide, erect, but the tips outcurving.

Literature Cited  
St. John, Harold, 1978.  
Gardenia Weissichii of  
Oahu Island (Rubiaceae),  
Hawaiian Plant Studies  
70. Phytologia 39:  
108-111, one fig.



0 2cm

Fruit of  
Gardenia Weissichii

ADDITIONAL NOTES ON THE GENUS LIPPIA. XV

Harold N. Moldenke

**LIPPIA HOEHNEI** Moldenke

Additional bibliography: Moldenke, *Phytologia* 39: 96--97. 1978.

Goodland describes this plant as a shrub, 1.5 meters tall, and found it growing on roadsides, flowering in July.

Additional citations: BRAZIL: Mato Grosso: Goodland 511 (N).

**LIPPIA LACUNOSA** Mart. & Schau.

Additional bibliography: Hocking, *Excerpt. Bot. A.*25: 378 & 379. 1975; Moldenke, *Phytologia* 39: 162--163 & 453. 1978.

Burle-Marx describes this plant as a shrub, 1 meter tall, the corollas "pink", and found it in flower in June.

Additional citations: CULTIVATED: Brazil: Burle-Marx s.n. [Herb. Brad. 67354] (Ld).

**LIPPIA LASIOCALYCINA** Cham.

Additional bibliography: Moldenke, *Phytologia* 39: 163--164 & 394. 1978.

Goodland reports encountering this plant in cerrado.

Additional citations: BRAZIL: Minas Gerais: Goodland 848 (N).

**LIPPIA LUPULINA** Cham.

Additional bibliography: Moldenke, *Phytologia* 39: 437. 1978.

Recent collectors describe this species as an erect shrub or subshrub, 70 cm. to 1 m. tall, the bracts purple or "pale-purple at apex, white below", and have found it growing in "rocky terrain beside waterfalls", in "white sand on campina", and in cerrado, at 300--530 m. altitude, flowering in November. The corollas are said to have been "dark-rose" on Hatschbach 40086, while on Prance & al. P.24796 & P.25103 they are said to have had the "corolla-tube purple, with a yellow center".

Additional citations: BRAZIL: Goiás: Hatschbach 40086 (Ld).

Minas Gerais: Goodland 998 (N); Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27228 (Ac). Pará: Prance, Silva, Berg, Henderson, Nelson, Balick, Bahia, & Reis dos Santos P.24796 (N), P.25103 (N). Paraná: Hatschbach 2568 (N).

**LIPPIA MICROCEPHALA** Cham.

Additional bibliography: Moldenke, *Phytologia* 39: 437. 1978.

Recent collectors describe this plant as a branched shrub, 1.2 m. tall, and have found it growing on rocky cliffs, flowering in January. The corollas are said to have been "rose" when fresh on Hatschbach 40924.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 40924 (Ld).

**LIPPIA MICROMERA** Schau.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 417-419, 432--438, 649, & 651, fig. 101 & 102. 1977; Moldenke, Phytologia 39: 437 (1978) and 40: 71 & 72. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [433] & [434], fig. 101 & 102. 1977.

López-Palacios (1977) cites the following collections from Venezuela: Aragua: Trujillo 3080; Vogl 1348. Bolívar: Bailey & Bailey s.n.; Lasser 769; Moritz 492. Delta Amacuro: Ruiz-Terán & López-Palacios 9691. Federal District: Killip 37142; Lasser 3545; Vogl 127. Lara: Pittier 13108; Saer 484; Steyermark 55199; Steyermark & Carreño 107707; Tamayo 1101, 3351; Trujillo 2550, 4578, 6546. Mérida: López-Palacios 1356, 2724; López-Palacios & Bautista 3550; Ruiz-Terán & López-Figueiras 1797, 8796; Trujillo 6367. Miranda: Trujillo & al. 234. Monagas: Tamayo 3486. Sucre: Steyermark & al. 108065, 108152, 108190, 108290, 108315, 108704; A. M. Torres 1957. Táchira: Aristeguieta 2177; Ijjasz 246; López-Palacios 2778; Seelkopf s.n.; Tamayo 3700; Vareschi 3999. Trujillo: Ruiz-Terán & López-Palacios 7592. Margarita Island: Foldats 2658; Ginés 2790, 3072, 3387, 3711; Linares 429; Preau 116; Ramía 1843; Trujillo 4917. He notes that Steyermark & al. 108290 and 108315 were actually collected on Los Venados Island.

**LIPPIA MICROPHYLLA** Cham.

Additional bibliography: Moldenke, Phytologia 39: 178--179. 1978.

Recent collectors describe this species as an herb, undershrub, or slightly branched shrub, 0.8--1 m. tall, with pale-green inflorescences, and have encountered it in dry sandy soil of savannas, rocky "campo cerrado", and "occasional" on mountain slopes, at 110 meters altitude, flowering in July and October. The corollas are said to have been "white" on Coradin & Cordeiro 560 and "whitish" on Hatschbach 40090.

Additional citations: BRAZIL: Goiás: Hatschbach 40090 (Ld). Roraima: Coradin & Cordeiro 560 (N), 752 (N).

**LIPPIA MULTIFLORA** Moldenke

Additional bibliography: Lewis & Elvin-Lewis, Med. Bot. 391. 1977; Moldenke, Phytologia 39: 180--181 & 445. 1978.

Lewis & Elvin-Lewis (1977) report that the leaves of this species are used to make a native tea in western Africa.

**LIPPIA MYRIOCEPHALA** Schlecht. & Cham.

Additional bibliography: Sampson, An. Esc. Nac. Cienc. Biol. Méx. 3: 443. 1944; Hocking, Excerpt. Bot. A.25: 378. 1975; Moldenke, Phytologia 39: 438 (1978) and 40: 82. 1978; Mound & Halsey, Whitefly World 238. 1978.

Sampson (1944) and Mound & Halsey (1978) list this species as host to the whitefly, Ceraleurodicus altissimus (Quaint.) Mound & Halsey.

The Henrickson 13167, distributed as L. myriocephala, actually is L. curtisiana Moldenke, while Norris 17377, Ortega & al. 24, and M. Vazquez 2158 are L. myriocephala var. hypoleia (Briq.) Moldenke.

#### LIPPIA MYRIOCEPHALA var. HYPOLEIA (Briq.) Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.25: 378. 1975; Moldenke, Phytologia 39: 438 & 442 (1978) and 40: 82. 1978.

Recent collectors describe this plant as a "regular" shrub or fast-growing tree, 2--8 m. tall, the fruit green or greenish, and have found it growing in alder forests, low secondary deciduous forests, and secondary oak deciduous forests, on "suelo rojizo arcilloso" or "suelo negro arcilloso, rocas calizas aflorantes, cercana a las margen de arroyos", at 1000 meters altitude, flowering in September and November. The corollas are said to have been "white" on Norris 17377 and "yellow" on M. Vazquez 2158. The latter collector reports the plant being used in rural construction work.

Additional citations: MEXICO: Hidalgo: Norris 17377 (N). Veracruz: Ortega & al. 24 (N); M. Vazquez 2158 (N).

#### LIPPIA ORIGANOIDES H.B.K.

Additional bibliography: García Barriga, Fl. Med. Colomb. 2: 508. 1975; López-Palacios, Fl. Venez. Verb. 417, 418, 437--444, 450, 650, & 651, fig. 103. 1977; Moldenke, Phytologia 39: 261--264 (1978) and 40: 63. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [439], fig. 103. 1977.

According to López-Palacios, all the Venezuelan material hitherto regarded by me as L. schomburgkiana Schau. actually represents L. organoides growing in a xerophytic environment. He and Ruiz-Terán describe these plants as "Sufrútices erectos, hasta de 1,5 m., con olor a espliego (no a orégano!), con deje algo desagradable, cuya epidermis caulinar se desprende en tiras largas y delgadas; capítulos axilares, en grupos de 1--4; corola blanca, con garganta amarilla" and encountered it at 1450 m. altitude, flowering in July. I am not at all convinced that these specimens are not L. schomburgkiana, but defer to López-Palacio's extensive observations and field experience. In a personal communication to me he lists the following vernacular names for L. organoides: "orégano", "orégano ancho", "orégano cimarrón", "orégano de cerro", "orégano de burro", "oréganon", and "poleo".

In his 1977 work, López-Palacios lists the following collections from Venezuela: Aragua: Aristeguieta & Salvidia 533; Fendler 2051. Bolívar: Curran & Haman 199; Killip 37233; Maguire 32657; Maguire, Wurdack, & Bunting 35868, 35970, 35997, 36021; Ruiz-Terán,

Carabot, & Morales 10800; Ruiz-Terán & López-Palacios 11608; Sprague s.n.; Steyermark 57640, 58601; Tamayo 3122, 3474; Trujillo 5960; Wurdack 34376; Wurdack & Guppy 23; Wurdack & Monachino 40974. Carabobo: Curran & Haman 1150, 1150a; Trejo 6. Falcón: Curran & Haman 606; Lasser & Foldats 2956; Lasser & Vareschi 2779; Ruiz-Terán & López-Palacios 10287; Tamayo 975, 976. Federal District: André 150; Birschel s.n.; Boldingh 3947; Curran & Haman 966; Debeaux 87; Otto 456; Pittier 8096, 9671, 12725; Robinson & Lyon s.n.; Rose & Rose 21723a; Tamayo 4624. Guárico: Tamayo 4147. Lara: Alston 6378; Ferrari & al. 322; Marcuzzi s.n.; Saer 62; Tamayo 326, 2649, 3750; Trujillo 6493, 6587, 6769. Mérida: Breteler 3205; López-Palacios 2114, 2547; Oberwinkler 14148; Ruiz-Terán & López-Figueiras 1817; Ruiz-Terán & López-Palacios 6151; Trujillo 8007, 8106. Miranda: Pittier 8251. Sucre: Humboldt & Bonpland 1141; Mocquerys 722; Steyermark & al. 107926, 108064, 108078, 108103, 108193; Torres 1917. Táchira: López-Palacios 2864; Tillet 737-190. Zulia: Pittier 10542; Plée 2. Margarita Island: Ginés 2768, 3069; Ramia 1851. He has also kindly pointed out that the Lasser & Vareschi 2779, cited by me from Bolívar in *Phytologia* 12: 334 (1965), actually was collected in Falcón instead.

Additional & emended citations: VENEZUELA: Bolívar: Irwin 402 (W--2197626); Ruiz-Terán & López-Palacios 11415 (Ld). Falcón: Lasser & Vareschi 2779 (Ve).

#### LIPPIA OXYCNEMIS Schau.

Additional bibliography: López-Palacios, *Fl. Venez. Verb.* 400 & 651. 1977; Moldenke, *Phytologia* 39: 264--265. 1978.

#### LIPPIA OXYPHYLLARIA (Donn. Sm.) Standl.

Additional bibliography: Moldenke, *Phytologia* 39: 265--266. 1978.

Wilbur refers to this plant as a shrub, 2.5 m. tall, and encountered it at 6000 feet altitude, flowering in February. The corollas are said to have been "yellow" on his no. 24313.

Additional citations: PANAMA: Chiriquí: Wilbur 24313 (N).

#### LIPPIA PALMERI S. Wats.

Additional bibliography: Moldenke, *Phytologia* 39: 391--392. 1978.

Additional citations: MEXICO: Sonora: W. D. Stevens 1519 (Au).

#### LIPPIA PENDULA Rusby

Additional bibliography: Moldenke, *Phytologia* 39: 393. 1978.

Boeke refers to this plant as a shrub, 2 m. tall, "aromatic like cloves", and encountered it at 1500 meters altitude, flowering in April, the corollas said to have been "white" when fresh.

Additional citations: BOLIVIA: La Paz: Boeke 1452 (N).



**LIPPIA PRINGLEI** Briq.

Additional bibliography: Lewis & Elvin-Lewis, *Med. Bot.* 257. 1977; Moldenke, *Phytologia* 39: 440--443 & 454 (1978) and 40: 69 & 81. 1978.

Calzada refers to this species as a tree, 7 m. tall, regular in growth, the "fruto en racimos color blancos alados", and found it growing in deciduous forests "in suelo cafe arcillozo, humedo", at 1675 m. altitude, fruiting in February. Lewis & Elvin-Lewis (1977) report that in Mexico the sap of this species is used to treat toothache.

Additional citations: MEXICO: Veracruz: Calzada 2170 (N).

**LIPPIA PSEUDO-THEA** (A. St.-Hil.) Schau.

Additional bibliography: Lewis & Elvin-Lewis, *Med. Bot.* 391. 1977; Moldenke, *Phytologia* 39: 443--444. 1978.

Lewis & Elvin-Lewis (1977) report the leaves of this plant used as a medicinal tea in Brazil.

**LIPPIA ROSMARINIFOLIA** Anderss.

Additional bibliography: Moldenke, *Phytologia* 39: 450--452. 1978.

Recent collectors describe this species as an erect shrub, 1--4 m. tall, sometimes tree-like, the branches loosely spreading, the "stems arch over and grow toward the ground and when lodged in a suitable crevice root to form a new plant; if the stem does not root directly it creeps prostrate along the rock surfaces". They have found it to be "common in [a] broad green strip running from [the] summit to [the] sea on well-vegetated aa lava with pumice in the crevices" and "common on scoria rim with much fine pumice deposited on the surface, partly grassy, partly with loose shrubby vegetation, at 300 m. altitude, flowering in February, May, and June. The corollas are said to have been "pinkish to yellowish-pink" on Fosberg 45014, "pink" on Fosberg 45039, and "pale creamy-yellow or flesh-color" on Howell 9448.

Material has been misidentified and distributed in some herbaria as Macraea laricifolia Hook. f.

Additional citations: GALAPAGOS ISLANDS: Albemarle: Howell 9448 (W--2814443); Lévêque 94 (W--2813702). Narborough: F. R. Fosberg 45014 (W--2828124), 45039 (W--2828121).

**LIPPIA ROSMARINIFOLIA** f. **STEWARTI** (Moldenke) Moldenke

Additional bibliography: Moldenke, *Phytologia* 39: 451 & 452. 1978.

Fosberg refers to this plant as a small shrub "common on rough aa lava with irregular vegetation, at 300 m. altitude.

Additional citations: GALAPAGOS ISLANDS: Narborough: F. R. Fosberg 45067 (W--2828120).

**LIPPIA SALSA** Griseb.

Additional bibliography: Ragonese & Piccinini, *Darwiniana* 21: 53 & 59. 1977; Moldenke, *Phytologia* 39: 454--455. 1978.

Ragonese & Piccinini (1977) record this species from San Juan, Argentina, with the vernacular names there of "yerba del cierro" and "yerba del guanaco".

**LIPPIA SALVIAEFOLIA** Cham.

Additional bibliography: Moldenke, *Phytologia* 39: 455--456. 1978.

Hatschbach refers to this plant as a shrub, 1.5 meters tall, and found it growing in sandy soil of cerrado along roadsides, flowering in April.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 41313 (Ld).

**LIPPIA SCABERRIMA** Sond.

Additional bibliography: Lewis & Elvin-Lewis, *Med. Bot.* 343. 1977; Moldenke, *Phytologia* 40: 58--59. 1978.

Lewis & Elvin-Lewis (1977) report that the dried herbage of this species is considered hemostatic by native doctors in South Africa.

**LIPPIA SCHLIMII** Turcz.

Additional bibliography: López-Palacios, *Fl. Venez. Verb.* 418, 419, 444--449, & 651, fig. 104. 1977; Moldenke, *Phytologia* 40: 60--62 (1978) and 41: 135. 1978.

Illustrations: López-Palacios, *Fl. Venez. Verb.* [445], fig. 104. 1977.

López-Palacios (1977) cites the following collections from Venezuela: Lara: Steyermark 104919. Trujillo: Cuatrecasas, Ruiz-Terán, & López-Figueiras 28198; Ruiz-Terán & López-Figueiras 2350; Ruiz-Terán & López-Palacios 10444. He records the vernacular name, "saca candela".

**LIPPIA SCHLIMII** var. **GLABRESCENS** (Moldenke) Moldenke

Additional bibliography: López-Palacios, *Fl. Venez. Verb.* 418, 419, 446--449, & 651, fig. 105. 1977; Moldenke, *Phytologia* 40: 61--62 (1978) and 41: 135. 1978.

Illustrations: López-Palacios, *Fl. Venez. Verb.* [447], fig. 105. 1977.

In his 1977 work López-Palacios cites the following collections from Venezuela: Mérida: Gehriger 337; Linden 341; Little 15310; López-Palacios 1308, 2581; Matos 21; Ruiz-Terán 809, 1631, 2291; Ruiz-Terán & López-Figueiras 8598; Ruiz-Terán, López-Figueiras, & López-Palacios 8246; Ruiz-Terán, López-Palacios, & Rodríguez 6730; Tillett & Hönig 738-393; Trujillo 8170. Táchira: Badillo 3456; Bautista FAM.59; Madriz 79, 95; Ruiz-Terán & López-Figueiras 1273; Steyermark 52271, 57469, 96983; Tillett 737-300;

Tillett & Hönig 738-535. Trujillo: Ruiz-Terán & López-Figueiras 2247; Steyermark 97280. In a personal communication to me he lists the common names, "cancha", "gallinazo", "humo", "sacaojo", and "salvio".

Additional citations: COLOMBIA: Valle del Cauca: Cuatrecasas 20471 (W--2817824).

#### LIPPIA SCHOMBURGKIANA Schau.

Additional synonymy: Lippia schomburgkiana Moldenke, in herb.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 418, 450-452, & 651, fig. 106. 1977; Moldenke, Phytologia 40: 62-63. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [451], fig. 106. 1977.

López-Palacios (1977) comments that "Schauer...dice que es afin, pero distinta, a L. glandulosa Schauer, pero yo la considero mucho más cercana a L. organoides H.B.K., de algunas de cuyas formas quizás sólo varía en rango infraespecífico, pues la única diferencia que se les observa es el olor." He cites from Venezuela the following collections: Bolívar: Connel & Quelch 2; ImThurn 52; Irwin 402; Ruiz-Terán & López-Palacios 11415.

#### LIPPIA TURBINATA Griseb.

Additional bibliography: Markgraf & D'Antoni, Pollen Fl. Argent. 25, 98, 112, & 115, pl. 42-362. 1978; Moldenke, Phytologia 40: 201. 1978.

Additional illustrations: Markgraf & D'Antoni, Pollen Fl. Argent. pl. 42-362. 1978.

The pollen of this species is illustrated and described by Markgraf & D'Antoni (1978).

#### LIPPIA UMBELLATA Cav.

Additional bibliography: Moldenke, Phytologia 40: 68, 69, 73, & 80-82. 1978.

Jones encountered this plant at the edges of barrancas.

The Calzada 2170, distributed as L. umbellata, actually is L. pringlei Briq.

Additional citations: MEXICO: Morelos: G. N. Jones 23258 (Ld).

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### ADDITIONAL NOTES ON THE GENUS VERBENA. XXVIII

Harold N. Moldenke

#### VERBENA [Dorst.] L.

Additional synonymy: Verbena [Bauhin] L. ex Malag. Heras.,

Act. Phytotax. Barcin. 18: 108. 1976.

Additional & emended bibliography: Ligamine, Herb. Ampuleius. 1481; Bondt, Hist. Nat. Med. Ind. Orient. 150—151. 1658; Scop., Ann. Hist. Nat. 4: 56, 57, & 90. 1770; R. Br., Fl. Nov. Holl., imp. 1, 512 (1810) and imp. 2, [Isis 1819:] 154. 1819; Sweet, Hort. Brit., ed. 1, 1: 324 & 325 (1826), ed. 2, 418—419 (1830), and ed. 3, 553 & 768. 1839; Hassk., Cat. Pl. Hort. Bot. Bogor. Cult. Alt. 134. 1844; Darwin, Journ. Res. Voy. Beagle, ed. 2, 40. 1860; H. L. Williams, Poems N. P. Willis 221. 1882; Coult., Contrib. U. S. Nat. Herb. 2: 326—328. 1892; Rojas Acosta, Cat. Hist. Nat. Corrient. 76—77, 173, 193, & 206. 1897; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Perad. Man. Bot. 2:] 142 & 163. 1911; Stafford, Ann. Rep. Smithson. Inst. 1916: 414. 1917; Haines, Bot. Bihar & Orissa, ed. 1, 4: 704 & 707—708. 1922; Hanson, Univ. Nebr. Stud. 24: 24. 1924; Gathorne-Hardy, Wild Fls. Brit. 22 & 120. 1938; Perez-Arbelaez, Pl. Util. Colomb., ed. 1, 441. 1947; E. D. Merr., Journ. Arnold Arb. 31: 277. 1950; Perez-Arbelaez, Pl. Util. Colomb., ed. 2, 744—745. 1956; Haines, Bot. Bihar & Orissa, ed. 2, 2: 738 & 742. 1961; Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 432 & 434. 1963; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 437. 1963; Russell, Ann. Ent. Soc. Am. 56: 149—151 & 153. 1963; Gunawardena, Gen. Sp. Pl. Zeyl. 146 & 147. 1968; A. & I. Nehrling, Easy Gard. Drought-resist. Pl., imp. 1, 304. 1968; Rouleau, Guide Ind. Kew. 197. 1970; J. R. Foster in Kalm, Travels N. Am., ed. 2, 67. 1972; Gilmour, Thom. Johnson 31, 50, 78, 106, 107, & 122. 1972; Flook, Sida 5: 169. 1973; Prenis, Herb Growers Guide 50. 1974; Shostek, Flow. & Pl. 278—279. 1974; Asai, Journ. Jap. Bot. 50: 311—316. 1975; Garcia Barriga, Fl. Med. Colomb. 2: 511—514. 1975; Gubanov, Pavlov, & Yunus, Byull. Mosk. Ispyt. Prir. Otd. Biol. 80: 82—91. 1975; Hartmann & Kester, Pl. Prop., ed. 3, 103 & 646. 1975; Hocking, Excerpt. Bot. A.25: 379. 1975; T. Johnson, Gerard Herbal, ed. 3, 254 & 717—719. 1975; Mohlenbrock, Guide Vasc. Fl. Ill. 365—367. 1975; A. & I. Nehrling, Easy Gard. Drought-resist. Pl., imp. 2, 304. 1975; Palmer & Fowler, Fieldb. Nat. Hist., ed. 2, 286—287 & 777. 1975; Sharma, Bull. Bot. Soc. Bengal 29: 143. 1975; Stalter, Castanea 40: 13. 1975; Walls, Compl. Book Greenh. Gard. 378. 1975; Arutyunov, Izv. Akad. Nauk Turkm. SSR. Ser. Biol. Nauk 5: 69. 1976; E. M. Bush, Castanea 41: 304. 1976; Dantas Barreto, Fontes, Ramos Lopes, Rainha, Rozeira, Da Silva, Pinto da Silva, & Teles. Agron. Lusit. 37: 167—188. 1976; Dollenz-A., Anal. Inst. Patag. 7: 163—168, fig. 1. 1976; El-Kifl, El-Dessouki, & El-Khouly, Zeit. Angew. Zool. 63: 1—18. 1976; S. R. Hill, Sida 6: 325. 1976; Hocking, Excerpt. Bot. A.28: 170. 1976; Malag. Heras., Act. Phytotax. Barcin. 18: 108. 1976; Mohlenbrock, Castanea 41: 318. 1976; Tasei, Apidologia 7: [277]—280, 282, 285, 286, 291, 298, & 299, fig. 7e. 1976; Ziegler & Sohmer, Contrib. Herb. Univ. Wisc. LaCrosse 13: 16. 1976; F. J. Anderson, Illustr. Hist. Herb. 27, fig. 10. 1977; Anon., Biol. Abstr. 64: 3023. 1977; Arora, Biol. Abstr. 65: 3288. 1977; Arora, Cytologia Tokyo 42: 653—660. 1977; Baskin & Baskin, Castanea 42:

144. 1977; Burke, Journ. Appl. Ecol. 14: 517. 1977; Clay & Hubbard, Haw. Gard. Trop. Shrubs 185 & 294. 1977; Dantas Barreto, Fontes, Ramos Lopes, Rainha, Rozeira, Da Silva, Pinto da Silva, & Teles, Biol. Abstr. 63: 1849. 1977; DiFulvio, Kurtziana 10: 70 & 71, fig. lg. 1977; Dight, Biol. Abstr. 64: 2031. 1977; Dight, Exp. Hortic. 29: 65-71. 1977; Greenwood, Proc. Linn. Soc. N. S. Wales 101: 240. 1977; Greller, Bull. Torrey Bot. Club 104: 176. 1977; Gubanov, Pavlov, & Yanus, Biol. Abstr. 64: 710. 1977; Hehre, Rhodora 79: 237. 1977; Hocking, Quart. Journ. Crude Drug Res. 15: [iv]. 1977; Hood, Quart. Journ. Crude Drug Res. 15: 212. 1977; Lelong, Sida 7: [118] & 140. 1977; Lewis & Elvin-Lewis, Med. Bot. 122, 193, 370, 391, & 514. 1977; López-Palacios, Fl. Venez. Verb. 10, 11, 18, 182, 206, 207, 419, 421, 489, 491, 493, 498, 500, 504, 505, 512, 514, 520, 528, 531, 537, 543, 558-578, 646, 649, & 651-654, fig. 131-135. 1977; McGregor & al., Fl. Great Plains 280-282 & 568-569, maps 1118-1126. 1977; G. L. Mill., Bull. Torrey Bot. Club 104: 386 & 387. 1977; Moldenke, Biol. Abstr. 63: 1851-1852 (1977) and 64: 4787, 6574, & 6575. 1977; Moldenke, Phytologia 36: 117-158, 164, 216-250, 451-464, 501, 506, & 511 (1977) and 37: 275 & 512. 1977; A. L. Moldenke, Phytologia 37: 278. 1977; A. R. Moldenke in Thrower & Bradbury, Chile-Calif. Medit. Scrub Atlas 211. 1977; Musselman, Nickrent, & Levy, Rhodora 79: 264. 1977; Nagy & Albert, Act. Phytopath. Acad. Sci. Hung. 12: 303-306. 1977; Noblick, Annot. List Herb. Spec. M. Mitch. Assoc. 178 & 222. 1977; W. J. Park, Park Seeds Fls. & Veg, 1978: 90. 1977; "P.H.V.I.", Biol. Abstr. 64: 3530. 1977; Poppeton, Shuey, & Sweet, Fla. Scient. 40: 384. 1977; Powell, Econ. Bot. 31: 418, 419, & 424, 1977; A. R. Robbins, How Grow Annuals, ed. 2, 44, 82, 85, 181, 186, 200, [211]-216, 284-288, 290, 291, 296, & ad. 1977; K. E. Rogers, Sida 7: 78. 1977; Rogerson, Becker, & Prince, Bull. Torrey Bot. Club 104: 410. 1977; "J.W.S.", Biol. Abstr. 64: 5978. 1977; Speta, Candollea 32: 142, 145-146, & 155, fig. 2 t-w. 1977; O. Stern, Stern's Nurs. Guide Mir. Gard. 18. 1977; Tasei, Apidologia 8: 74. 1977; Tasei, Biol. Abstr. 64: 6635. 1977; J. Taylor, Cat. Vasc. Aquat. Wetl. Fl. Okla. [Herb. SE. Okla. St. Univ. Publ. 1:] 48, 57, & 74. 1977; R. L. Thompson, Castanea 42: 88. 1977; Thompson & Heineke, Trans. Ill. Acad. Sci. 70: 126. 1977; Troncoso & Bacigalupi, Darwiniana 21: 178. 1977; Van der Werff, Bot. Notiser 130: [89] & 96-97. 1977; Anon., Exxon USA 17 (2): 5. 1978; Arora, Biol. Abstr. 66: 2513. 1978; Arora, Cytologia 43: 91-96. 1978; Brink & Mayer, Phytologia 38: 494. 1978; Burke, Biol. Abstr. 65: 771. 1978; Craig, Proc. Fla. State Hortic. Soc. 90: 109. 1978; Dodson & Gentry, Selbyana 4: 578, 580, 581, 605, & 628, pl. 272C. 1978; Dolenz-A., Biol. Abstr. 66: 3131. 1978; Faust, New York Times sec. D, 30, March 5 (1978) and D.40, March 26. 1978; Frankel, Bull. Torrey Bot. Club 105: 154. 1978; Liogier, Moscosoa 1: 38. 1978; Markgraf & D'Antoni, Pollen Fl. Argent. 20, 25, 28, 99, 113, 204, 206, & 207, pl. 42-363 & 42-364. 1978; Mejias, Act. Bot. Venez. 13:

304. 1978; G. L. Mill., Biol. Abstr. 65: 4424. 1978; Mohlenbrock & Ladd, Distrib. Ill. Vasc. Pl. [246], [247], & 276. 1978; Moldenke, Biol. Abstr. 65: 71 (1978) and 66: 1277. 1978; Moldenke, Phytologia 38: 259, 386, 394, 395, 401, 402, 405, 478, 479, 489, & 511 (1978), 39: 99, 104, 105, 161, & 512 (1978), and 40: 261, 413, 414, & 417. 1978; A. L. Moldenke, Phytologia 39: 64 & 185 (1978), 40: 361, 468, & 511 (1978), and 41: 132. 1978; Mound & Halsey, Whitefly World 207, 216, 223, 305, & 314. 1978; Nagy & Albert, Biol. Abstr. 66: 1654. 1978; Pirone, Diseases & Pests Ornament. Pl., ed. 5, 527-528. 1978; Rogerson, Becker, & Prince, Bull. Torrey Bot. Club 105: 84. 1978; Troncoso & Bacigalupo, Biol. Abstr. 66: 3705. 1978; W. H. Warren, Garden 2 (4): 15. 1978.

In the 1975 edition of Gerard's Herbal the Latin-name index (unpaged) refers Verbena to page "778" instead of to p. 718. The Craig (1978) work is mis-dated "1977" on its titlepage. The figure in "The Herbal of Apuleius" (1481) hardly seems to apply to any Verbena species known at that time (the work is supposed to have been composed ca. 400 A.D.) nor do portions of the description which assert that the plant as "Known to the Anglo-Saxons as Ash-throat, it was applied to ulcers and swellings, and to dog, spider, and snake bites. When eaten it restored digestion and removed bladder-stones and liver ailments. It also made a poultice for wounds and head sores. Apuleius commended its root as a curative amulet, and said that whoever wore the plant was safe from snake bite."

Russell (1963) and Mound & Halsey (1977) list members of this genus as host to the whiteflies, Trialeurodes abutiloneus (Halderman) Quaint. & Bak. and T. vaporariorum (Westwood) Quaint. & Bak. Pirone (1978) lists as attacking the genus Verbena [probably meaning mostly V. xhybrida] the following: bacterial wilt (Pseudomonas solanacearum), foxglove, green peach, and melon aphids, clematis blister-beetle (Epicauta cinerea), yellow woollybear (Diacrisia virginica), oblique-banded leaf-roller (Choristoneura rosaceana), garden webworm (Loxostege similis), verbena leaf-miner (Agromyza artemisiae), verbena bud-moth (Endothenia hebesana), greenhouse whitefly (Trialeurodes vaporariorum), snapdragon lacebug, tarnished plant-bug, morning-glory leaf-cutter, greenhouse orthezia, cottony-cushion scale, flower thrip and greenhouse thrip, broad mite, cyclamen mite, two-spotted mite, fern nematode (Aphelenchoides olesistus), and northern root-knot nematode (Meloidogyne hapla).

The LeDoux & Dunn 1909, distributed as Verbena sp., actually is Priva grandiflora (Ort.) Moldenke.

Additional taxa excluded from the genus are  
Verbena foemina Gerard = Sisymbrium officinale L., Brassicaceae  
Verbena recta Gerard = Sisymbrium officinale L., Brassicaceae  
Verbena supina mas Dod. = Veronica chamaedrys L., Scrophulariaceae

**VERBENA ABRAMSI** Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 123. 1977.

Recent collectors have encountered this species in a "rocky and grassy road-edge in oak woodland mixed with grass and shale surface-rock", at 2100 feet altitude, flowering and fruiting in June. They have misidentified it as V. officinalis L.

Additional citations: CALIFORNIA: Mariposa Co.: Cox, Dunn, & Harmon 391 (N).

**VERBENA ALATA** Sweet

Additional bibliography: Sweet, *Hort. Brit.*, ed. 3, 553. 1839; Moldenke, *Phytologia* 36: 123, 236, & 242. 1977.

Hatschbach refers to this plant as a shrub, 1.5 m. tall, with "lilac" corollas, and found it growing in brejo (sedge meadow), flowering and fruiting in October and November. The corollas on Lindeman & Haas 5062 are said to have been "purple" when fresh.

Louson (1832) states that V. alata was cultivated in British gardens in his day, having been introduced in 1827 from Montevideo.

Additional citations: BRAZIL: Paraná: Hatschbach 39155 (Ld, N), 40473 (Ld); Lindeman & Haas 5062 (Ld).

**VERBENA XALLENI** Moldenke

Additional bibliography: Moldenke, *Biol. Abstr.* 63: 1851. 1977; Moldenke, *Phytologia* 36: 123--124, 217, 244, & 464. 1977.

The specimen cited below was originally identified and distributed as V. scabra Vahl; the collector notes "plants 2--3 feet tall, branches grotesquely sprawling, flowers blue, opening at base of branch first and alternately blooming to the tip". It was collected in flower in August, and apparently no seed had set.

Additional citations: TEXAS: Hardin Co.: G. Watson H.9 (Ld).

**VERBENA AMBROSIFOLIA** Rydb.

Additional bibliography: McGregor & al., *Fl. Great Plains* 280, map 1118. 1977; Moldenke, *Phytologia* 36: 124--125, 135, 141, 142, 148, 157, & 463. 1977; A. L. Moldenke, *Phytologia* 39: 184. 1978.

Recent collectors have encountered this species growing in association with Bouteloua and Yucca and in fields with Artemisia association vegetation. The corollas are said to have been "purple" when fresh on Semple 420.

The Taylor & Taylor 5978, distributed as V. ambrosifolia, actually is V. bipinnatifida Nutt., while Norris 17719 is V. bracteata Lag. & Rodr.

Additional citations: COLORADO: El Paso Co.: Cox & Dunn 1365 (N). TEXAS: Brewster Co.: Semple 420 (Ld). NEW MEXICO: Bernalillo Co.: Saufferer 175 (N).

**VERBENA ARISTIGERA** S. Moore

Additional bibliography: Moldenke, *Phytologia* 36: 125--126,

231, & 455. 1977.

Additional citations: PARAGUAY: V. Maruffak 126 (Ld).

**VERBENA BARBATA** Grah.

Additional bibliography: Sweet, Hort. Brit., ed. 3, 553. 1839; Moldenke, Phytologia 36: 127. 1977.

Loudon (1832) avers that this species was introduced into cultivation in Great Britain from Mexico in 1827.

**VERBENA BERTERII** (Meisn.) Schau.

Additional bibliography: Moldenke, Phytologia 36: 127, 151, & 231. 1977; A. R. Moldenke in Thrower & Bradbury, Chile-Calif. Medit. Scrub Atlas 211. 1977.

**VERBENA BIPINNATIFIDA** Nutt.

Additional bibliography: Sharma, Bull. Bot. Soc. Bengal 29: 143. 1975; McGregor & al., Fl. Great Plains 280, map 1119. 1977; Moldenke, Biol. Abstr. 64: 6574. 1977; Moldenke, Phytologia 36: 127--129, 141, 147, 231, 288, & 456. 1977; W. J. Park, Park Seeds Fls. Veg. 1978: 90. 1977.

Additional illustrations: W. J. Park, Park Seeds Fls. Veg. 1978: 90 [in color]. 1977.

Recent collectors have encountered this species "in loose soil on open relatively flat summits", "in large compact clumps with secondary rooting at the stem-bases", "in open creosote-bush country", "abundant in rocky clay soil in full sunlight", "in hard-packed limestone soil with juniper, cholla, Gutierrezia, Mentzelia, and Salsola", "in open sandy areas with some post oak and yaupon", "in areas of gypsum hills and flats", on mesa bluffs, and in "coarse well-drained soil in area of mountainous ridges with oak-pine major vegetation", at 4500--7700 feet altitude, flowering in April and October, fruiting in October. The corollas are said to have been "purple and showy" on Gentry & Arquellas 22955, "purple" on Kelley 2, and "blue-violet" on Novosad 1125. Bennett and his associates found it growing in arid scrub with tree yuccas, flowering and fruiting in July. They misidentified it as V. ciliata Benth. Other collections of V. bipinnatifida have been misidentified and distributed as V. ambrosifolia Rydb. and V. canadensis (L.) Britton. On the other hand, the Warnock 4600, distributed as V. bipinnatifida, actually is V. bracteata Lag. & Rodr., while Gee 6 and Harvey 5 are V. canadensis (L.) Britton and Norris 17654 as V. ciliata Benth. It should be noted that Beaman thinks that Barkley, Webster, & Rowell 7659 is V. ciliata, but on re-examination I still feel that it is V. bipinnatifida.

Additional citations: KANSAS: Barber Co.: Barrell 18-71 (W--2802777), 31-71 (W--2802778). OKLAHOMA: Bryan Co.: Taylor & Taylor 12927 (Ld). Choctaw Co.: Taylor & Taylor 15952 (Ld). Harmon Co.: Taylor & Taylor 10200 (Ac, Ld), 20668 (Ld). Major Co.: Tay-



lor & Taylor 15911 (N). TEXAS: Bexar Co.: Novosad 1125 (Mu). Ellis Co.: Shepherd 83 (Mi). Grayson Co.: Semple 567 (Ld). Mc Clennan Co.: S. Kelley 2 (Mu). Taylor Co.: Semple & Love 466 (Ld). NEW MEXICO: Socorro Co.: Barrell & Sponberg 158-66 (W--2809833); Edwards & Repass 4754 (N). MEXICO: Chihuahua: Gentry & Arguelles 22955 (W--2811206). Nuevo León: Bennett, Torke, Wieder, & Dunn 647 (N). Zacatecas: Taylor & Taylor 5978 (N).

#### xVERBENA BLANCHARDI Moldenke

Additional bibliography: Mohlenbrock, Guide Vasc. Fl. Ill. 366. 1975; Moldenke, Phytologia 36: 129. 1977; Mohlenbrock & Ladd, Distrib. Ill. Vasc. Pl. [247] & 276. 1978.

#### VERBENA BONARIENSIS L.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 325 (1826) and ed. 3, 553. 1839; García Barriga, Fl. Med. Colomb. 2: 514. 1975; Gunawardena, Gen. Sp. Fl. Zeyl. 147. 1968; S. R. Hill, Sida 6: 325. 1976; López-Palacios, Fl. Venez. Verb. 563 & 653. 1977; Moldenke, Biol. Abstr. 64: 6574. 1977; Moldenke, Phytologia 36: 129-132, 137, 226, 229, 236, & 455. 1977; K. E. Rogers, Sida 7: 78. 1977; Speta, Candollea 32: 142, 145, & 155, fig. 2 v & w. 1977.

Additional illustrations: Speta, Candollea 32: 142, fig. 2, v & w. 1977.

Recent collectors describe this plant as erect, 2 meters tall, and have encountered it in disturbed areas, at 2700 meters altitude, flowering in April. Speta (1977) reports that "In den Ker- nen der Korollenepidermis befinden sich 1--2 relativ dicke plattenförmige Kristalle".

Loudon (1832), calling it the "cluster-flower'd vervain", avers that it was introduced into cultivation in England from Buenos Aires in 1732. Rogers (1977) reports the species from Forrest and Perry Counties, Mississippi; Hill found it growing "in disturbed ground along farm road" and asserts that "This collection represents a genus new to the Bahamas". López-Palacios, in a personal communication to me, states that in both Colombia and Ecuador this species is known by the vernacular name, "verbena". Walker (1976) records the name, "tachi-ba-bena" [=erect leaf], from Okinawa. He cites Amano 7373, Hatusima 17571, and Walker 8133 from that island.

The Univ. Calif. Bot. Gard. Access. 63.740-S3, distributed as typical V. bonariensis, actually represents var. conglomerata Briq., while D. S. Correll 36837 and D'Arcy 1590 are V. brasiliensis Vell. and Bayliss BS.7344 is V. tenuisecta Briq.

Additional citations: LOUISIANA: Bienville Par.: Thieret 29749 (Ld). TEXAS: Sabine Co.: Correll & Correll 38761 (Ld, Ld, Ld). JAMAICA: Crosby, Hesperheide, & Anderson 231 (Ld); Proctor 23518 (Ld). ECUADOR: Pichincha: Humbles 6152 (W--2788938). ARGENTINA:

Buenos Aires: Ruiz Huidobro 1695 (Au--121760). Mendoza: Paci 794 (Au--121759). NEW ZEALAND: North Island: Philson, Doore, & Nash 234 (Au--289869). MOUNTED CLIPPINGS: Walker, Fl. Okin. & South. Ryuk. 884. 1976 (W, Z).

**VERBENA BONARIENSIS** var. **CONGLOMERATA** Briq.

Additional bibliography: Moldenke, *Phytologia* 36: 132. 1977.

The University of California specimen, cited below, was grown there from seed secured in the Canary Islands. Its leaves are very narrow and stiff. Hatschbach describes the plant as a shrub, 1 meter tall, with "violet" corollas, and found it growing in brejo (wet sedge meadow), flowering in March.

Additional citations: BRAZIL: Rio Grande do Sul: Hatschbach 41138 (ld). CULTIVATED: California: Univ. Calif. Bot. Gard. Access. 63.740.S3 (N, N, N, N).

**VERBENA BRACTEATA** Lag. & Rodr.

Additional synonymy: Verbena bracteata Cave Lag. & Rodr., in herb.

Additional bibliography: Sweet, *Hort. Brit.*, ed. 1, 1: 325 (1826) and ed. 3, 553. 1839; Mohlenbrock, *Guide Vasc. Fl. Ill.* 366. 1975; McGregor & al., *Fl. Great Plains* 280, map 1120. 1977; Moldenke, *Biol. Abst.* 64: 6574. 1977; Moldenke, *Phytologia* 36: 124, 133--136, 150, 219, 232, 295, 299, 300, 304--307, & 452. 1977; Brink & Mayer, *Phytologia* 38: 494. 1978; Mohlenbrock & Ladd, *Distrib. Ill. Vasc. Fl.* [246] & 276. 1978.

Recent collectors have found this species in douglas-fir and oak forests, in dry soil, among sagebrush on sandy slopes, "in riparian community in bog to sandy soil", "with Agropyron smithii and Elymus canadensis in red 'Flowerpot' soil on lower, gentle, south-facing slopes", "abundant on gravel flats", and "common in saline areas", at altitudes of 4160--7000 feet, flowering and fruiting from July to September. Mohlenbrock (1975) asserts that in Illinois the species is "occasional to common throughout the state", implying that it occurs in every county.

The corollas are said to have been "blue" on Taylor & Taylor 16319b, "lavender" on Taylor & Taylor 16127, "blue-violet" on Holmgren & Reveal 1023, "purple" on Crutchfield 1875 and Hutchins 430, "light-purple" on Duncan 12696, and "purple with white center" on Semple & Love 297.

Material of this species has been misidentified and distributed in some herbaria as V. ambrosiaefolia Rydb. On the other hand, the J. Jermey 65, distributed as V. bracteata, actually is V. pumila Rydb.

In Texas recent collectors have encountered V. bracteata in "sandy to loamy soil in Ptelea-Rhus-Prosopis communities" and "in clayey limestone to sandy soils in Rhus-Prosopis-Celtis communities".

Loudon (1832) states that it was introduced into cultivation in England from North America in 1812.

Additional citations: GEORGIA: Clarke Co.: Duncan 12696 (Au--295777). ILLINOIS: Peoria Co.: V. H. Chase 9707 (Au--121831). Woodford Co.: Thom A.54 (Ld). KENTUCKY: Jefferson Co.: Gunn J.189 (Ld). WISCONSIN: Walworth Co.: Wadmond s.n. [June 18, 1934] (Au--121833). KANSAS: Barber Co.: Barrell 57-74 (W--2802776). Douglas Co.: Horr E.570 (Au--121822, Ld). Kearny Co.: T. C. Browne s.n. [Aug. 1949] (Au--121834). ARKANSAS: Pope Co.: G. M. Merrill s.n. (Au--121823). UTAH: Garfield Co.: Holmgren, Reveal, & LaFrance 2101 (Au--251433). Piute Co.: Higgins 10711 (N). Washington Co.: Gentry & Jensen 2255 (Au--276516). NEVADA: Churchill Co.: Williams & Lott 75-66-2 (N). Douglas Co.: Tiehm 3716 (N). Mineral Co.: Williams & Lott 77-76-6 (N). Pershing Co.: Tiehm & Mozingo 3890 (N). White Pine Co.: Holmgren & Reveal 1023 (Au--242165); Mozingo s.n. [July 12, 1974] (N). OKLAHOMA: Beaver Co.: Taylor & Taylor 16127 (Ld). Bryan Co.: Taylor & Taylor 16319b (Ld). Cimarron Co.: Taylor & Taylor 8246 (Ld). Lincoln Co.: Matlock 11 (Au--121821). Mayes Co.: Coryell 934 (Au--121832). TEXAS: Andrews Co.: Scudday s.n. [5-8-60] (Ld). Culberson Co.: Warnock 4600 (Au--121785). El Paso Co.: Powell & Powell 3000 (Ld). Floyd Co.: Purvis 21 (Au--249247). Garza Co.: Hutchins 430 (Ld). Jeff Davis Co.: Head 10 (Au--121788). Martin Co.: Semple & Love 297 (Ld). Potter Co.: Higgins 10220 (N). Randall Co.: Higgins 11376 (N). NEW MEXICO: Colfax Co.: Taylor & Taylor 8275 (Ld). County undetermined: Fendler 587 (Ld). ARIZONA: Coconino Co.: Correll & Correll 39468 (Ld, N); Crutchfield 1875 (Ld). WASHINGTON: Benton Co.: L. S. Rose 48153 (Au--121819). MEXICO: Nuevo León: Norris 17719 (N).

#### VERBENA BRASILIENSIS Vell.

Additional bibliography: Stalter, Castanea 40: 13. 1975; Lelong, Sida 7: 140. 1977; Moldenke, Biol. Abstr. 64: 6574. 1977; Moldenke, Phytologia 36: 131, 136-138, 154, 216, 221, 235, 236, & 277. 1977; K. E. Rogers, Sida 7: 78. 1977; Van der Werff, Bot. Notiser 130: 96. 1977.

Lelong (1977) reports this species as common in waste places and along roadsides in Mobile County, Alabama, while Rogers (1977) refers to it as "common in a variety of disturbed habitats. Introduced" in Forrest and Perry Counties, Mississippi. Stalter (1975) records it from the Isle of Palms, Charleston County, South Carolina. Other recent collectors have found it growing in ruderal conditions and in grassland along roadsides, describing it as erect and wiry-stemmed or even as a "shrub", 1 meter tall, with small flowers. The corollas are said to have been "lilac" in color when fresh on Hatschbach 40662 and "deep-mauve" on Bayliss BS.7937. Bayliss encountered it at 4000 feet altitude in South Africa.

The Artz & Krouse s.n. [27 Aug. 1971], distributed as V. brasiliensis, actually is V. hastata L., while Correll & Correll 36351 is V. hastata var. scabra Moldenke.

Additional citations: SOUTH CAROLINA: McCormick Co.: Ellison 817 (Ld). FLORIDA: Alachua Co.: D'Arcy 1590 (Ld). ALABAMA: Montgomery Co.: Hocking 1089 (Ld). MISSISSIPPI: Covington Co.: Ray 7225 (Ld). OKLAHOMA: McCurtain Co.: Taylor & Taylor 10716 (Ld). TEXAS: Jackson Co.: D. S. Correll 36837 (Ld). Jefferson Co.: Crockett 1101 (Ld), 6961 (Ld); Stutzenbaker 205 (Au--292033). Liberty Co.: D. S. Correll 36472 (Ld). Sabine Co.: D. S. Correll 37230 (Ld). CALIFORNIA: Stanislaus Co.: Howell 30107 (Au--272412). MEXICO: Michoacán: Feddema 23 (Au--263621). Nayarit: Feddema 583 (Au--263599). BRAZIL: Minas Gerais: Irwin 2116 (Au--172779). Paraná: Hatschbach 40662 (Ld). ARGENTINA: Córdoba: Krapovickas & Cristóbal 14692 (Ld). San Juan: Cuezzo 1744 (Au--121836). SOUTH AFRICA: Cape Province: Bayliss BS.7937 (W--2831499).

#### VERBENA CABRERAE Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.25: 379. 1975; Moldenke, Phytologia 36: 138. 1977.

Additional citations: BOLIVIA: Tarija: Krapovickas, Mroginski, & Fernández 19272 (Ld).

#### VERBENA CABRERAE var. ANGUSTILOBATA Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.25: 379. 1975; Moldenke, Phytologia 36: 138. 1977.

#### VERBENA CALLIANTHA Briq.

Additional bibliography: Moldenke, Phytologia 36: 138--139. 1977.

Additional citations: BRAZIL: Paraná: Hatschbach 25509 (N). ARGENTINA: Formosa: Krapovickas 13085 (Ld). Misiones: Krapovickas, Cristóbal, & Maruñak 15492 (Ld).

#### VERBENA CAMERONENSIS L. I. Davis

Additional bibliography: Moldenke, Phytologia 36: 139. 1977.

Recent collectors have found this plant in flower in March and December and in fruit in March. The corollas are described as having been "blue" on Richardson 1090.

Additional citations: MEXICO: Tamaulipas: Richardson 1090 (Ld), 1125 (Ld). MOUNTED CLIPPINGS: Original description by Davis (W).

#### VERBENA CANADENSIS (L.) Britton

Additional synonymy: Verbena lamberti ♀ rosea Loud., Hort. Brit., ed. 2, 553. 1832. Verbena drummondii Hook. ex Loud., Hort. Brit., ed. 2, 553. 1832. Verbena aubletia ♀ drummondii Loud., Hort. Brit., ed. 2, 553. 1832. Verbena lamberti ♀ rosea D. Don in Sweet, Hort.

Brit., ed. 3, 553. 1839.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 325 (1826) and ed. 3, 553. 1839; Hartmann & Kester, Pl. Prop., ed. 3, 646. 1975; Mohlenbrock, Guide Vasc. Fl. Ill. 365 & 366. 1975; Mc. Gregor & al., Fl. Great Plains 281, map 1121. 1977; Moldenke, Biol. Abstr. 64: 6574. 1977; Moldenke, Phytologia 36: 125, 128, 135, 139-142, 221, & 454. 1977; K. E. Rogers, Sida 7: 78. 1977; Speta, Candollea 32: 142, 146, & 155, fig. 2 t & u. 1977; R. L. Thompson, Castanea 42: 88. 1977; Thompson & Heineke, Trans. Ill. Acad. Sci. 70: 126. 1977; Mohlenbrock & Ladd, Distrib. Ill. Vasc. Pl. [246] & 276. 1978.

Additional illustrations: Speta, Candollea 32: 142, fig. 2 t & u. 1977.

Sweet (1839) calls V. aubletia the "rose vervain" and says that it was introduced from North American and cultivated in British gardens in his day; V. lamberti he calls "Lambert's vervain", introduced from "Peru" in 1816 and V. lamberti ♂ rosea, the "rose-flowered vervain", introduced from Louisiana in 1836. I am convinced that more intensive study of what is now passing as V. canadensis will show that several infraspecific taxa can be and are well worth being segregated.

Speta (1977) reports that "Die 4-zelligen Köpfchen der Haare, die Korolleneperidermis und die Korollenhaare enthalten in ihren Zellkernen Stapel quadratischer, locker angeordneter Plättchen mit oftmals sehr grosser Seitenlänge. In kleineren Kernen befinden sich kompakte Stapel."

Tamm (1954) reports that V. canadensis is susceptible to infection by crown-gall, Agrobacterium tumefaciens.

Recent collectors report V. canadensis "relatively abundant in full sun, sandy soil in high grass", "abundant in full sun, sandy soil in association with grasses and dewberry vines", in woodlands, and "very infrequent but conspicuous in moist rich loam of dry, rocky, blackjack oak woods". Rogers (1977) reports it as "Infrequent in dryish woods. Native" in Forrest and Perry Counties, Mississippi, while Thompson (1977) refers to it as "rare" in Newton County, Arkansas. Hartmann & Kester (1975) call it the "clump verbena". Mohlenbrock (1975) asserts that the species occurs in "Rocky woods, edge of fields and prairies; occasional in the s. two-thirds of the state [of Illinois], rare or absent elsewhere." Thompson & Heineke (1977) record the species from Jackson County, Illinois.

The corollas are said to have been "purple" on Gee 6, "lavender-pink" on Correll & Lundell 18791, "bright purple-pink" on Ward 7487, and "blue" on Parham 24.

The Taylor & Taylor 15911 & 20668, distributed as V. canadensis, actually are V. bipinnatifida Nutt.

Additional citations: OKLAHOMA: Atoka Co.: M. Parham 24 (Ld). Choctaw Co.: Taylor & Taylor 17163 (Ld). Muskogee Co.: Taylor &

Taylor 10243 (Ld). Osage Co.: Ward 7487 (N). TEXAS: Bowie Co.:  
J. Taylor 18300 (Ld). Burleson Co.: Cee 6 (Mu); B. Harvey 5  
 (Mu). Marion Co.: Correll & Lundell 18791 (N).

**VERBENA CANADENSIS** f. **CANDIDISSIMA** (Haage & Schmidt) Palmer & Steyer-  
 erm.

Additional bibliography: Coult., Contrib. U. S. Nat. Herb. 2:  
328. 1892; Moldenke, Phytologia 23: 219. 1972.

**VERBENA CANESCENS** H.B.K.

Additional synonymy: Verbena scorpioides L., in herb.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 325  
 (1826) and ed. 3, 553. 1839; Moldenke, Biol. Abstr. 64: 6574. 1977;  
Moldenke, Phytologia 36: 135, 142-144, & 464. 1977.

Sweet (1826) asserts that this species was introduced into cul-  
 tivation in British gardens from Mexico in 1820.

Pichon encountered the species "in arid to semiarid habitat on  
 west-facing hillsides with shrubs and small woody plants" and avers  
 that it is "found from southern Texas to San Luis Potosí", Mexico.

The Mears & Mears 2501, Parker 366, and Smith & Butterwick 157,  
 distributed as V. canescens, actually represent var. roemeriana  
 (Scheele) Perry, while Lundell & Lundell 9796 and R. Runyon 2559  
 are mixtures with that variety.

Additional citations: TEXAS: Cameron Co.: R. Runyon 4870 (Au--  
 290474). Goliad Co.: S. R. Hill 4619 (N). Starr Co.: Crockett  
289a (Ld); Lundell & Lundell 9796 in part (Ld), 9930 (Ld); R. Run-  
yon 2559 in part (Au--290500. MEXICO: México: Cruz Cisneros 959  
 (Ld). Nuevo León: Pichon 177 (Au--297425). San Luis Potosí: J.  
Rzedowski 24811 (Ld).

**VERBENA CANESCENS** var. **ROEMERIANA** (Scheele) Perry

Additional bibliography: Moldenke, Phytologia 36: 143-144.  
 1977.

Recent collectors have found this plant on limestone ledges  
 and in roadside ditches, growing in association with Phacelia,  
Aphanostephus, Allium, Bouteloua rigidiseta, Diospyros texana, O-  
puntia lindheimeri, and Juniperus ashei, describing it as an an-  
 nual or perennial, 25--30 cm. tall, "with many branches above the  
 base". Smith refers to it as "common" in Bandera County, Texas,  
 while Smith & Butterwick found it "infrequent" in Val Verde Coun-  
ty. Runyon refers to it as "frequent in open clay soil" in Camer-  
on County.

The corollas are said to have been "purple" on Lundell & Lun-  
dell 10023 and J. Smith 464, "pinkish-purple" on Lundell & Lun-  
dell 9819, "blue" on Runyon 6067, and "lavender" on Smith & But-  
terwick 157.

Lundell & Lundell 9796 and R. Runyon 2559 appear to be mix-  
 tures with typical V. canescens H.B.K., but R. Runyon 4283, dis-

tributed as var. roemeriana, actually is V. plicata Greene.

Additional citations: TEXAS: Bandera Co.: J. Smith 464 (Ld). Cameron Co.: Lundell & Lundell 10023 (Ld); R. Runyon 1532 (Au--290491), 6067 (N). Hidalgo Co.: Lundell & Lundell 9819 (Ld). Travis Co.: York 49002 (Au--121927). Val Verde Co.: Mears & Mears 2501 (Au--296930); Smith & Butterwick 157 (Ld). MEXICO: Nuevo León: Crockett 6466 (Ld); Parker 366 (Ld).

#### VERBENA CANIUENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 28: 348. 1974.

Additional citations: BRAZIL: Paraná: Hatschbach 20177 (Ld).

#### VERBENA CAROLINA L.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 325 (1826) and ed. 3, 553. 1839; Moldenke, Biol. Abstr. 64: 6574. 1977; Moldenke, Phytologia 36: 144--145, 151, 152, 236, 238, 297, & 300. 1977.

Sweet (1826) and Loudon (1832), calling this the "Carolina vervain" and the "many-spiked vervain", assert that it was in cultivation in British gardens in their day, introduced from Mexico in 1820 and from "North America" in 1732.

Recent collectors have encountered the species "in valley between farms of corn and Agave among shrubs and many Lupinus marshallianus" and in "volcanic and very thin soil in oak and sparse pine forests", at 8300--8500 feet altitude, flowering and fruiting in July. The corollas are said to have been "purple" on Martínez Calderón 1765.

The G. L. Fisher s.n. [Jacala, Aug. 12, 1937], distributed as V. carolina, actually is V. ehrenbergiana var. richardsonii Moldenke, while Breedlove 10457 is V. menthaefolia Benth.

Additional citations: MEXICO: Chiapas: Breedlove 10519 (Ld), 10856 (Ld), 11159 (Ld), 12324 (Ld). Durango: LeDoux & Dunn 1926 (Ld). Federal District: Barkley, Rowell, & Webster 2199 (Au--170145). México: Wieder, Dunn, Bennett, & Torke 99 (N). Oaxaca: Conzatti, Rowell, & Barkley 174410 (Au--170073); R. M. King 2028 (Au--263303). Veracruz: Martínez-Calderón 1765 (Mi); Rosas R. 253 (Ld). GUATEMALA: Quezaltenango: Breedlove 11452 (Ld).

#### VERBENA CILIATA Benth.

Additional bibliography: Hanson, Univ. Nebr. Stud. 24: 24. 1924; McGregor & al., Fl. Great Plains 568. 1977; Moldenke, Biol. Abstr. 64: 6574. 1977; Moldenke, Phytologia 36: 124, 125, 146--148, & 156. 1977; A. L. Moldenke, Phytologia 39: 184. 1978.

Hanson (1924) encountered this plant "in woodland climax (Pinus-Juniperus) association with Salsola tragus and Psilostrophe tagetinae the first invaders on abandoned roads or other disturbed areas" in northeastern Arizona. Other recent collec-

tors have found it "in cultivated valley, thorn climax of tree mesquite" association, on greasewood deserts, and in ponderosa pine forests, at 7000 feet altitude, flowering and fruiting in August and September. The corollas are said to have been "light-blue" on Norris 16960 and "purple" on Norris 17654.

McGregor (1977) records this species in its typical form from Baca County, Colorado, Curry, Harding, Quay, and Union Counties, New Mexico, and Bailey and Dallam Counties, Texas.

Material of this species has been misidentified and distributed in many herbaria as V. bipinnatifida Nutt. On the other hand, the Cox & Dunn 1365, distributed as V. ciliata, actually is V. ambrosifolia Rydb., while Bennett, Torke, Wieder, & Dunn 647 is V. bipinnatifida Nutt., Gustafson s.n. [Jan. 8, 1932] is V. xhybrida Voss, and Dechamps 4012 and Webster 4466 are V. wrightii A. Gray. The Barkley, Webster, & Rowell 7659, considered to be V. ciliata by Beaman, actually is V. bipinnatifida Nutt.

Additional citations: MEXICO: Hidalgo: Norris 16960 (N). Nuevo León: Norris 17654 (N). Zacatecas: Dunn, Bennett, Wieder, & Torke 22577 (Au, N).

#### VERBENA CLOVERAE Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 149. 1977.

The corollas are said to have been "lilac" on Lundell & Lundell 15052, "purplish" on Lundell & Lundell 10112, and "purple" on Lundell & Lundell 9795, 9886, & 10072.

Additional citations: TEXAS: Bexar Co.: Crockett 248 (Ld). Brooks Co.: Lundell & Lundell 10072 (Ld). LaSalle Co.: Alvarez, Guajardo, Salazar, & McCart 7614 (Ld). San Saba Co.: Seigler 1483 (Au—285682). Starr Co.: Lundell & Lundell 9795 (Ld), 9886 (Ld); R. Ruryon 2611 (Au—290494). Webb Co.: Crockett 6447 (Ld); Gentry & Barclay 18439 (Ld). Zapata Co.: Lundell & Lundell 10112 (Ld), 15052 (Ld).

#### VERBENA COCCINEA Raf.

Additional bibliography: Moldenke, *Phytologia* 23: 193. 1972.

The Prince Paul of Wurtemberg 335, distributed as V. coccinea, actually is Stachytarpheta mutabilis (Jacq.) Vahl.

#### VERBENA CORYMBOSA Ruiz & Pav.

Additional bibliography: Moldenke, *Phytologia* 36: 149. 1977; Markgraf & D'Antoni, *Pollen Fl. Argent.* 99. 1978.

#### VERBENA CRITHMIFOLIA Gill. & Hook.

Additional bibliography: Moldenke, *Phytologia* 36: 149. 1977.

The O'Donell & Meyer 5220, distributed as this species, actually represents a rather broad-leaved form of V. hookeriana (Covas & Schnack) Moldenke.



Additional citations: ARGENTINA: Mendoza: Barkley 19Ar803 (Au--122054).

**VERBENA CUMINGII** Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 150. 1977.

Additional citations: CHILE: Coquimbo: Zöllner 7872 (W--2787331).

**VERBENA xDEAMII** Moldenke

Additional bibliography: Mohlenbrock, *Guide Vasc. Fl. Ill.* 366. 1975; Moldenke, *Phytologia* 36: 135, 150, 228, 305, & 306. 1977; Mohlenbrock & Ladd, *Distrib. Ill. Vasc. Fl.* [247] & 276. 1978.

**VERBENA DELTICOLA** Small

Additional bibliography: Moldenke, *Phytologia* 36: 150. 1977.

Recent collectors report the flowers of this species as fragrant and have found it growing in juniper and oak forests and "on wooded calcareous slopes in association with Quercus, Juniperus, and Pinus cembroides", flowering in September. The corollas are said to have been "purple" on Norris 17303 and "pink-lavender with a paler eye" on Lundell 10758.

Material has been misidentified and distributed in some herbaria as V. wrightii A. Gray.

Additional citations: TEXAS: Cameron Co.: C. L. Lundell 10758 (N). MEXICO: Coahuila: Riskind, Henrickson, Wendt, Chiang, & Johnston 11858 (Ld). Hidalgo: Norris 17303 (N).

**VERBENA DEMISSA** Moldenke

Additional bibliography: Moldenke, *Biol. Abstr.* 64: 4787. 1977; Moldenke, *Phytologia* 36: 151. 1977.

Additional citations: ECUADOR: Azuay: Asplund 17801 (Ld).

**VERBENA DISSECTA** Willd.

Additional bibliography: López-Palacios, *Fl. Venez. Verb.* 575 & 653. 1977; Moldenke, *Phytologia* 36: 151. 1977.

Recent collectors describe this plant as growing to 50 cm. tall and have found it in flower in October. The corollas are said to have been "purple" on Legname & Cuezco 10426c.

The Vasconcelos Neto 3241, distributed as V. dissecta, actually is V. rigida Spreng.

Additional citations: ARGENTINA: Catamarca: Brizuela 375 (Au--122075, 754 (Au--289527. Salta: Legname & Cuezco 10426c (Au). Santiago del Estero: Cuezco 2404 (Au--122072); Ruiz-Huidobro 3108 (Au--122074). Tucumán: Terrible 338 (Au--289529).

**VERBENA DOMINGENSIS** Urb.

Additional bibliography: Moldenke, *Phytologia* 36: 151--152 &

277. 1977.

Additional citations: CUBA: Matanzas: Rugel 121 (Ld). HISPAN-  
IOLA: Dominican Republic: Ekman H.13581 (Ld). Haiti: Ekman H.  
1569 (Ld).

**VERBENA EHRENBERGIANA** Schau.

Additional bibliography: Moldenke, *Phytologia* 36: 145, 152, &  
277 (1977) and 38: 499. 1978; Moldenke, *Biol. Abstr.* 66: 1277.  
1978.

Hernández and his associates refer to this plant as a "regular"  
annual herb 50 cm. tall, with "green" fruit, and encountered it in  
"selva mediana subperennifolia, secundaria, suelo arcilloso arenoso,  
asociación cafetal in zona cafetalera", at 140 meters alti-  
tude.

The G. L. Fisher s.n. [Jacala, Aug. 12, 1947], previously cited  
by me as typical V. ehrenbergiana, actually represents var. rich-  
ardsonii Moldenke

Additional & emended citations: MEXICO: México: C. A. Ehrenberg  
713 [Macbride photos 174114] (Z--photo of type). Veracruz: Her-  
nández A. & al. 154 (N).

**VERBENA EHRENBERGIANA** var. **RICHARDSONII** Moldenke, *Phytologia* 38:  
499. 1978.

Bibliography: Moldenke, *Biol. Abstr.* 66: 1277. 1978; Moldenke,  
*Phytologia* 38: 499. 1978.

Collectors have found this plant in flower and fruit in May,  
June, and December. The Fisher collection, cited below, was previ-  
ously erroneously cited by me as typical V. ehrenbergiana Schau.

Citations: MEXICO: Hidalgo: G. L. Fisher s.n. [Jacala, Aug. 12,  
1937] (N). Tamaulipas: Richardson 216 (Ld), 293 (Ld), 1116 (Ld),  
1234 (Ld--type, Ld--isotype, Ld--isotype).

**VERBENA ELEGANS** H.B.K.

Additional bibliography: Moldenke, *Phytologia* 36: 141, 142,  
152--153, & 455. 1977.

Sanders reports this species found as "scattered clones in  
mesic oak-hickory woods on limestone outcrops in red-brown loamy  
clay soil" and describes it as having procumbent stems, to 1 m.  
long, rooting at the nodes, the tips ascending, flowering in May.  
The corollas are said to have been "pink-purple on Sanders 74028."

Additional citations: MEXICO: Hidalgo: Pringle 6908 (Ld).  
Querétaro: Turner 76-15 (Ld). San Luis Potosí: Sanders 74028  
(Mi).

**VERBENA ELEGANS** var. **ASPERATA** Perry

Additional bibliography: Moldenke, *Phytologia* 36: 153. 1977;  
O. Stern, *Stern's Nurs. Guide Mir. Gard.* 18. 1977.

Illustrations: O. Stern, *Stern's Nurs. Guide Mir. Gard.* 18  
[in color]. 1977.

This may very well be the recently introduced verbena referred by me in a previous installment of these notes under V. peruviana f. rosea Moldenke. Its trade name is "Pink Princess" Trailing Verbena and it is offered by Stern's Nursery, Geneva, New York at \$2.25 per 2-inch plant, 100 for \$82.50. It is best adapted to hanging baskets, but must be watered daily (in very hot climates twice daily) and will then bloom from spring to fall. Frequent pinching back of the stems and added feeding every two weeks will enable it to be kept indoors over winter "to save for another year's cascade of blooms".

Additional citations: CULTIVATED: New Jersey: Moldenke & Moldenke 31430 (Ld).

**VERBENA xENGELMANNII** Moldenke

Additional bibliography: Mohlenbrock, Guide Vasc. Fl. Ill. 367. 1975; Moldenke, Phytologia 36: 153—154 & 221. 1977; Mohlenbrock & Ladd, Distrib. Ill. Vasc. Pl. [247] & 276. 1978.

Additional citations: INDIANA: Fulton Co.: Friesner 23110 (Au—122108). MISSOURI: Saint Louis: Engelmann s.n. [St. Louis, Aug. 1843] (Au--122806).

**VERBENA EPHEDROIDES** Cham.

Additional synonymy: Verbena ephedroides var. ephedroides [Cham.] ex Troncoso, Darwiniana 21: 178. 1977.

Additional bibliography: Moldenke, Phytologia 36: 159. 1977; Troncoso & Bacigalupo, Darwiniana 21: 178. 1977.

**VERBENA EPHEDROIDES** var. **ENTRERIENSIS** Troncoso in Troncoso & Bacigalupo, Darwiniana 21: 178. 1977.

Bibliography: Troncoso & Bacigalupo, Darwiniana 21: 178. 1977; Troncoso & Bacigalupo, Biol. Abstr. 66: 3705. 1978.

This variety differs from the typical form of the species in having the leaves on its flowering branches shortly linear, 3—10 mm. long, the bracts 2—2.8 mm. long, surpassing the lower half of the calyx, the corolla-limb spreading, 4.5—6 mm. in diameter, the lobes 1.5—2 mm. wide, and the mericarps larger, 2—2.5 mm. long, 0.7—0.8 mm. wide.

The variety is based on A. Burkart 25405 from Río Feliciano, dept. La Paz, Entre Ríos, Argentina, deposited in the San Isidro herbarium. It is said to inhabit "an pajonales y bañados". The author cites also from Entre Ríos Lorentz 45 and s.n. [C. del Uruguay, prox. Ao. La China] and Nicora 6391 in the San Isidro, Córdoba, Buenos Aires, and Washington herbaria.

**VERBENA FASCICULATA** Benth.

Additional bibliography: Moldenke, Phytologia 36: 154. 1977.

Additional citations: PERU: Department undetermined: G. W. Barclay s.n. (W—2779832).

## VERBENA FILICAULIS Schau.

Additional bibliography: Moldenke, *Phytologia* 36: 154 (1977) and 40: 261. 1978.

The following collections, previously cited by me as typical *V. filicaulis*, actually represent what is now known as var. *pinnatisecta* (Schau.) Moldenke: Dusén 15679, Hatschbach 2672, W. Hoehne 527, Löfgren s.n. [Pinheiros, Nov. 2, 1893; Herb. Com. Geogr. & Geol. 1560; Herb. Inst. Bot. S. Paulo 15713], and Sellow 20 [Macbride photos 17439], the last-mentioned being the type collection of the new variety.

Additional citations: BRAZIL: Paraná: Hatschbach 11756 (Ld). Santa Catarina: Smith & Reitz 12482 (Au--249873).

VERBENA FILICAULIS var. AUSTRALIS (Moldenke) Moldenke, *Phytologia* 40: 261. 1978.

Synonymy: *Verbena australis* Moldenke, *Phytologia* 2: 419--420. 1948.

Bibliography: Moldenke, *Phytologia* 2: 419--420. 1948; Moldenke, *Castanea* 13: 117. 1948; Moldenke, *Known Geogr. Distrib. Verbenac.*, [ed. 2], 93 & 197. 1949; Moldenke, *Alph. List Cit.* 4: 1250. 1949; *Stellfeld, Trib. Farmac.* 19 (10): 166. 1951; *E. J. Salisb., Ind. Kew. Suppl.* 11: 262. 1953; *Angely, Fl. Paran.* 12: 17. 1958; Moldenke, *Résumé* 109 & 470. 1959; *Angely, Fl. Paran.* 16: 78 (1960) and 17: 46. 1961; Moldenke, *Phytologia* 8: 380 (1962) and 8: 461. 1963; *Angely, Fl. Anal. Paran.*, ed. 1, 570. 1965; Moldenke, *Fifth Summ.* 1: 177 (1971) and 2: 912. 1971; Moldenke, *Phytologia* 22: 465 (1972), 23: 214 (1972), and 40: 261. 1978.

This variety differs chiefly from the typical form of the species in its distinctly pilose stems, the plant often not nigrescent in drying. Recent collectors have found it growing in wet places, flowering in November, describing it as a "subshrub". The corollas are said to have been "blue" on Braga & al. 328.

Citations: BRAZIL: Paraná: Braga, Moreira, & Lange 328 (Ld, W--2369350, Z); Dusén 13190 (F--photo of type, N--isotype, N--photo of type, S--type, Si--photo of type, Z--photo of type).

VERBENA FILICAULIS var. PINNATISECTA (Schau.) Moldenke, *Phytologia* 40: 261. 1978.

Synonymy: *Verbena pinnatisecta* Schau. in A. DC., *Prodr.* 11: 549. 1847.

Bibliography: Schau. in A. DC., *Prodr.* 11: 549. 1847; Schau. in *Mart., Fl. Bras.* 9: 192. 1851; *Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1179* (1895), *imp. 2, 2: 1179* (1946), and *imp. 3, 2: 1179*. 1960; Moldenke, *Phytologia* 9: 119 & 120. 1963; Moldenke, *Fifth Summ.* 2: 690. 1971; Moldenke, *Phytologia* 40: 261. 1978.

This variety is based on Sellow 20, probably from Minas Gerais, and Riedel s.n. from wet swampy places at or near Mugy das Cruces, São Paulo, Brazil, deposited in the De Candolle Herbarium at Geneva. All the collections cited below were previously cited by me

under typical V. filicaulis before the present variety was recognized as a valid taxon characterized by its more husky habit throughout and larger leaves with their divisions noticeably wider.

Collectors have encountered this plant in brejo (sedge meadows), swampy fields, and river margins, at 800 meters altitude, flowering from September to December. The corollas are said to have been "violet" in color when fresh on Hatschbach 2672 and "lilac" on Hatschbach 40474.

Citations: BRAZIL: Minas Gerais: Sellow 20 [Macbride photos 17439] (Kr--photo of cotype, Kr--photo of cotype, N--photo of cotype, N--photo of cotype, W--photo of cotype, Z--photo of cotype). Paraná: Dusén 15679 (Ca--501671, Mu, N, S, S, W--1481764); Hatschbach 2672 (N), 40474 (Z). São Paulo: W. Hoehne 527 (N); Löfgren s.n. [Pinheiros, Nov. 2, 1893; Herb. Com. Geogr. & Geol. 1560] (N, Sp--15713).

#### VERBENA FLAVA Gill. & Hook.

Additional bibliography: Moldenke, *Phytologia* 36: 154. 1977. Ammann encountered this plant at 700 meters altitude.

Additional citations: ARGENTINA: Neuquen: Ammann 113 (N).

#### VERBENA GALAPAGOSENSIS Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 154--155 & 458. 1977; Van der Werff, *Bot. Notiser* 130: 96--97. 1977.

Van der Werff (1977) maintains that this taxon is conspecific with V. townsendii Svenson, which he regards as a very variable species.

#### VERBENA GLABRATA H.B.K.

Additional bibliography: García Barriga, *Fl. Med. Colomb.* 2: 514. 1975; López-Palacios, *Fl. Venez. Verb.* 560, 569, & 653. 1977; Moldenke, *Phytologia* 36: 155, 235, & 458. 1977; Van der Werff, *Bot. Notiser* 130: 96--97. 1977.

López-Palacios, in a personal communication to me, reports that "El ejemplar Cecilia Torres 53 del herbario de Guayaquil tiene esta nota: 'Calma los cólicos estomacales; hígado; contra las inflamaciones vaginales; como purgante.'"

Additional citations: ECUADOR: Pichincha: Asplund 17227 (Ld).

#### VERBENA GLABRATA var. TENUISPICATA Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 155 & 458. 1977; Van der Werff, *Bot. Notiser* 130: 96--97. 1977.

Van der Werff (1977) maintains that this taxon is conspecific with V. townsendii Svenson, which he regards as a very variable species.

#### VERBENA GOODINGII Briq.

Additional bibliography: Moldenke, *Biol. Abstr.* 64: 6574. 1977; Moldenke, *Phytologia* 36: 124, 141, 147, 156--157, & 463 (1977) and 39: 161. 1978.

Recent collectors report this species as "an infrequent perennial in granitic sand on open flats with Coleogyne, Yucca baccata, Gutierrezia, Hymenoclea, Mirabilis, etc.", "frequent in sandy arroyos with Ephedra, Yucca schindigera, Y. baccata, Ferocactus, Haplopappus, etc.", "in sandy arroyos with Prunus fasciculata, Rhus trilobata, Ephedra, Yucca schidigera, Haplopappus, etc., infrequent", "infrequent perennial in gravelly limestone soil of wash with Prunus fasciculata, Cowania, Rhus trilobata, Brickellia multiflora, Asclepias asperula, Artemisia nova, etc.", "infrequent on rocky granitic north-facing slopes with Pinus monophylla, Yucca baccata, Juniperus, Salvia, Haplopappus, Opuntia, etc.", and "a common perennial with Pinus monophylla, Juniperus, Eriogonum, Agave, Haplopappus, Yucca, Ephedra, etc., as well as in gravelly soil, at 4000--5000 feet altitude, flowering from April to July, fruiting in May and July. The corollas are said to have been "light-blue" on Henrickson 4734, "blue" on Prigge 1530, "lavender, drying blue" on Henrickson 9219, "reddish-blue, drying blue" on Henrickson 10213, "pinkish, drying blue" on Henrickson 10114, and "purple" on Prigge & Henrickson 163.

Additional citations: CALIFORNIA: San Bernardino Co.: Henrickson 4734 (Ld), 9219 (Ld), 10114 (N), 10213 (N), 11157 (Ld); Prigge 1530 (N); Prigge & Henrickson 163 (Au); Thorne 43322 (Mi).

VERBENA GOODINGII var. NEPETIFOLIA Tidestr.

Additional bibliography: Moldenke, Phytologia 36: 124, 147, & 156--157 (1977) and 39: 161. 1978.

Recent collector have found this plant growing in volcanic sand in Idria-Franseria association with volcanic rock, at 2400--3000 feet altitude, flowering and fruiting in April.

Additional citations: MEXICO: Baja California: Gentry & Cech 8997 (W--2810945). MOUNTED CLIPPINGS: Tidestrom's original description (W).

VERBENA GRACILESCENS (Cham.) Herter

Additional bibliography: DiFulvio, Kurtziana 10: 70 & 71, fig. lg. 1977; Moldenke, Phytologia 36: 157--158. 1977; "J. W. S.", Biol. Abstr. 64: 5978. 1977.

Additional illustrations: DiFulvio, Kurtziana 10: 70, fig. lg. 1977.

DiFulvio (1977) reports the chromosome number in this species as  $x = 7$  and so concludes that Schnack's plant, earlier reported on in this series of notes, where  $x = 21$ , was a hexaploid.

Material of V. gracilescens has been misidentified and distributed in some herbaria as V. gracilis Cham. [= V. intermedia Gill. & Hook.], a totally dissimilar species.

Additional citations: ARGENTINA: San Luis: Varela 452 (Au--122121). Santa Fé: Ruiz Huidobro 3418 (Au--122120, Au--122122).

VERBENA HALEI Small

Additional bibliography: McGregor & al., Fl. Great Plains 568. 1977; Moldenke, Biol. Abstr. 63: 1851. 1977; Moldenke, Phytologia 36: 216--218, 236, 249, 277, 300, 303--306, & 464. 1977; K. E. Rogers, Sida 7: 78. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

Recent collectors refer to this species as "abundant in full sun, sandy clay soil", in "lay-loam of roadsides", "frequent in dry sandy soil associated with Chloris cucullata, Gutierrezia dracunculoides, and Verbesina encelioides", and "abundant at edge of pavement with bur-clover and Angallis arvensis". Rogers (1977) found it "Frequent along roads and trails. Native" in Forrest and Perry Counties, Mississippi. McGregor (1977) records it from Cotton County, Oklahoma.

The corollas are said to have been "lavender-purple" on Duncan 20214, "purple" on B. Miller 34, R. Miller 16, and Lundell & Lundell 10308 & 10398, "purple to blue or rarely light-pink" on Massey 545, "lavender" on D. S. Correll 37274, Correll & Correll 39002, Hutchins 453, and Lundell & Lundell 10139, "bluish-lavender" on Ellison & Ellison 1010, "blue" on Hutchins 1049, "purple-blue" on Thieret 36996, "pale blue-purple" on Runyon 4282, and "pink or lavender" on Lundell & Lundell 10344. Parks s.n. [December 29, 1946] exhibits leaves on one sterile stem very much like those seen on V. runyoni Moldenke; hybridity may be involved.

The Wieder, Dunn, Bennett, & Torke 99, distributed as V. halei, actually is V. carolina L., while H. M. Parker 647 is V. menthaefolia Benth., Wallace, LeDoux, & Dunn 197 is V. neomexicana var. hirtella Perry, Dunn, Torke, Bennett, & Wieder 22610 is V. pinetorum Moldenke, Fleetwood 9459 and R. Runyon 4872 are V. runyoni Moldenke, and Bennett, Torke, Wieder, & Dunn 612 is V. xutha Lehm.

Additional citations: SOUTH CAROLINA: Aiken Co.: Ellison & Ellison 1010 (Au--296225, Ld). GEORGIA: Sapelo Island: Duncan 20214 (Mi). LOUISIANA: Calcasieu Par.: Crockett 6763 (Ld). Lafayette Par.: Thieret 36996 (Ld). OKLAHOMA: Atoka Co.: J. Taylor 18533 (Ld). Bryan Co.: Taylor & Taylor 10900 (Ld). Love Co.: Taylor & Taylor 16262 (Ld). TEXAS: Atascosa Co.: C. E. Miller 51-481 (Au--122265). Bastrop Co.: Duval 214 (Au--291627); Lundell & Lundell 10344 (Ld). Bexar Co.: Burr 454 (Au--122247). Brazos Co.: Correll & Correll 39002 (Ld); Gould 5436 (Au--122266); Massey 545 (Ld); B. Miller 34 (Mu); R. Miller 16 (Mu); E. J. Palmer 11715 (Au--122267); Parks s.n. [4-6-46] (Au--122270), s.n. [December 29, 1946] (Au--122271). Cameron Co.: R. Runyon 4676 (Au--290518), 4720 (Au--290499), 4857 (Au--290529), 4873 (Au--290475), 4892 (Au--290495). Dallas Co.: Lundell & Lundell 10398 (Ld). Duval Co.:

Alvarez, Guajardo, Salazar, & McCart 7671 (Ld). Fannin Co.: D. S. Correll 37274 (Ld). Frio Co.: Lundell & Lundell 10139 (Ld). Galveston Co.: Crockett 8361 (Ld). Garza Co.: Hutchins 453 (Ld), 1049 (Ld). Guadalupe Co.: I. G. Patterson 118 (Ld). Hardin Co.: Crockett 1020 (Ld). Hidalgo Co.: Crockett 8005 (Ld). Jeff Davis Co.: Worthington 2787 (Ld). Jefferson Co.: Crockett 677 (Ld), 912 (Ld), 6923 (Ld), 6950 (Ld), 8413 (Ld). Karnes Co.: J. C. Johnson 822 (Au--122258). Kleberg Co.: R. Runyon 4282 (Au--290477). Llano Co.: Ohlenbusch 71 (Au--219548); Taylor & Taylor 13194 (Ld). Red River Co.: Taylor & Taylor 10689 (Ld). Travis Co.: Birge 2961 (Au--122202); Lundell & Lundell 10308 (Ld); York 49001 (Au--122196). Mustang Island: Gillespie 63 (Au--286070). MEXICO: Nuevo León: Roberts 57 (Au--297431).

#### VERBENA HASTATA L.

Additional synonymy: Verbena paniculata ♀ pinnatifida (Lam.) Schau. in A. DC., Prodr. 11: 546. 1847. Verbena paniculata ♀ pinnatifida Lam. ex Buek, Gen. Spec. Syn. Candoll. 3: 495. 1858.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 325 (1826), ed. 2, 418 & 419 (1830), and ed. 3, 553. 1838; Shostack, Flow. & Pl. 278--279. 1974; Mohlenbrock, Guide Vasc. Fl. Ill. 366 & 367. 1975; Palmer & Fowler, Fieldb. Nat. Hist., ed. 2, 287 & 777. 1975; Burk, Journ. Appl. Ecol. 14: 517. 1977; Greller, Bull. Torrey Bot. Club 104: 176. 1977; Hehre, Rhodora 79: 237. 1977; Mc Gregor & al., Fl. Great Plains 281, map 1122. 1977; G. L. Mill., Bull. Torrey Bot. Club 104: 387. 1977; Moldenke, Phytologia 36: 218--224, 239, 282, 303, 307, 451, & 461. 1977; Noblick, Annot. List Herb. Spec. M. Mitch. Assoc. 179. 1977; Speta, Candollea 32: 145 & 155. 1977; J. Taylor, Cat. Vasc. Aquat. Wetl. Pl. Okla. [Herb. SE. Okla. St. Univ. Publ. 1:] 48, 70, & 74. 1977; Thompson & Heineke, Trans. Ill. Acad. Sci. 70: 126. 1977; Brink & Mayer, Phytologia 38: 494. 1978; Burke, Biol. Abstr. 65: 771. 1978; Frankel, Bull. Torrey Bot. Club 105: 154. 1978; Mohlenbrock & Ladd, Distrib. Ill. Vasc. Pl. [246] & 276. 1978; Moldenke, Biol. Abstr. 65: 71. 1978; A. L. Moldenke, Phytologia 39: 184. 1978.

Additional illustrations: Palmer & Fowler, Fieldb. Nat. Hist., ed. 2, 287. 1975.

Sweet (1826) calls V. hastata the "halberd-leaved vervain" and says that it was introduced into British gardens in 1710 from Canada; V. paniculata he calls the "panicled vervain" and avers that it wasn't introduced from North America until 1810. Hehre (1977) records it from Gardiner's Island, New York, citing Hehre 302. Barber refers to it as "infrequent on thickly overgrown edges of open sandy creek banks", at 1650 feet altitude, in Kansas. Swanson reports it "uncommon" in Houston County, Minnesota, where he found "several plants growing on an old stump in submerged community in 1--1.5 m. of water north of a forested island



bordered on all sides by the Phalaris and hardwood dominated island" with "Salix community dominating the ends, Ulmus, scattered Phalaris, and mixed shrubs"; a photograph of the habitat accompanies his no. 1288. In Wisconsin he found it growing 1.7 m. tall on a sand spit dominated by Salix interior; a photograph of this habitat accompanies his no. 1829.

Burke (1977) reports that Verbena hastata was among those species not found in the Arcadia Wildlife Sanctuary in Northampton, Massachusetts, after the oil spill there in 1971 although it had been there before that date. Frankel (1978) reports it again from Westchester County, New York. Noblick (1977) cites the following collections from Nantucket County, Massachusetts: Albertson s.n., Collector undetermined s.n., G. B. Gardner s.n. [July 22, 1909], and Smurrocks & Shurrocks s.n., all deposited in the Maria Mitchell Association herbarium. Mohlenbrock (1975) reports the species in Illinois from "Wet woods, wet prairies, wet waste ground, common; in every co[unty]". Thompson & Heineke (1977) report it from Jackson County, Illinois.

Material of V. hastata has been misidentified and distributed in some herbaria as "V. braziliensis Vell." On the other hand, the Higgins 11495, J. Taylor 23131, Taylor & Taylor 12289, and Taylor & Wright 23930, distributed as typical V. hastata, actually represent var. scabra Moldenke, while J. Taylor 23015 is V. urticifolia L. and J. Taylor 22823 is V. xutha Lehm.

Additional & emended citations: NEW JERSEY: Hunterdon Co.: Moldenke & Moldenke 31462 (Ld). Ocean Co.: Moldenke & Moldenke 31533 (Lc). County undetermined: Knieskern s.n. (Mi). PENNSYLVANIA: Tioga Co.: Moldenke & Moldenke 31139 (W--2777781). Union Co.: Moldenke & Moldenke 31150 (W--2777778). VIRGINIA: Clark Co.: Artz & Krouse s.n. [27 Aug. 1971] (N). ILLINOIS: Henderson Co.: Taylor & Taylor 12052 (Ld). WISCONSIN: Fond du Lac Co.: Taylor & Taylor 12072 (Ld). Isanti Co.: Chandonnet s.n. [22 juillet 1899] (Mi). LaCrosse Co.: Swanson 1829 (N). Vernon Co.: Ziegler 513 (Ld). MINNESOTA: Houston Co.: Swanson 1024 (N), 1288 (N), 2572 (Ld). Kansas: Barber Co.: Barrell 111-73 (W--2802775).

#### VERBENA HASTATA f. ROSEA Cheney

Additional bibliography: Mohlenbrock, Guide Vasc. Fl. Ill. 366. 1975; Moldenke, Phytologia 36: 223. 1977.

#### VERBENA HASTATA var. SCABRA Moldenke

Additional bibliography: Moldenke, Phytologia 36: 220, 221, 223-224, & 239. 1977; A. L. Moldenke, Phytologia 39: 184. 1978.

Higgins encountered this plant in Populus-Tamarix communities on sandhills, flowering and fruiting in September.

Material of this variety has been misidentified and distributed

in some herbaria as V. brasiliensis Vell., and, of course, as typical V. hastata L.

Additional citations: MINNESOTA: Yellow Medicine Co.: Taylor & Taylor 12289 (Ld). NEBRASKA: Chase Co.: Taylor & Taylor 9017 (Ld). UTAH: Utah Co.: Flowers s.n. [Utah Lake, Aug. 10, 1924] (Mi). OKLAHOMA: Choctaw Co.: Taylor & Wright 23930 (Ld). Marshall Co.: J. Taylor 23131 (Ld). Woodward Co.: Correll & Correll 36351 (Ld). TEXAS: Potter Co.: Higgins 11495 (N).

#### VERBENA HIRTA Spreng.

Additional bibliography: Hocking, Excerpt. Bot. A.28: 171. 1976; Moldenke, Phytologia 36: 224—226 & 308. 1977.

Hatschbach encountered this species on "campo sujo", flowering in February, the corollas said to have been "lilac" when fresh.

Additional citations: BRAZIL: Paraná: Hatschbach 41166 (Ld).

#### VERBENA HIRTA var. GRACILIS Dusén

Additional bibliography: Moldenke, Phytologia 36: 225—226 & 308. 1977.

Hatschbach has encountered this plant in brejo (sedge meadow), flowering in October.

Additional citations: BRAZIL: Paraná: Hatschbach 40449 (Ld).

#### VERBENA HISPIDA Ruiz & Pav.

Additional synonymy: Verbena hispidula R. & P., in herb.

Additional bibliography: Sweet, Hort. Brit., ed. 3, 553. 1839; Perez-Arbelaez, Pl. Util. Colomb., ed. 1, 441 (1947) and ed. 2, 745. 1956; García Barriga, Fl. Med. Colomb. 2: 511. 1975; Moldenke, Phytologia 36: 226 & 292 (1977) and 41: 132. 1978; Moldenke, Biol. Abstr. 65: 71. 1978.

Sweet (1839) calls this species the "hispid vervain" and states that it was introduced into British gardens from Peru in 1816.

#### VERBENA HOOKERIANA (Covas & Schnack) Moldenke

Additional synonymy: Verbena critnifolia O'Donnell & Meyer, in herb.

Additional bibliography: Moldenke, Phytologia 36: 226—227. 1977.

Additional citations: ARGENTINA: Catamarca: Hessling & Barkley 19Ar619 (Au—122309, Au—122310); Lagname & Vervoort 45 (Ld); O'Donnell & Meyer 5220 (N).

#### VERBENA xHYBRIDA Voss

Additional bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 4: 707 (1922) and ed. 2, 2: 742. 1961; Hartm. & Kester, Pl. Prop., ed. 3, 103 & 646. 1975; Palmer & Fowler, Fieldb. Nat. Hist., ed. 2, 286—287 & 777. 1975; Walls, Compl. Book Greenh. Gard. 278.

1975; Cleene & De Ley, Bot. Rev. 42: 452. 1976; El-Kifl, El-Dessouki, & El-Khouly, Zeit. Angew. Zool. 63: 1--18. 1976; Greenwood, Proc. Linn. Soc. N. S. Wales 101: 240. 1977; López-Palacios, Fl. Venez. Verb. 559--563 & 653, fig. 131. 1977; Moldenke, Phytologia 36: 227--228, 277, 283, & 286. 1977; Nagy & Albert, Act. Phytopath. Acad. Sci. Hung. 12: 303--306. 1977; W. J. Park, Park Seeds Fls. & Veg. 1978: 90. 1977; A. R. Robbins, How Grow Annuals, ed. 2, 44, 82, 85, 181, 186, 200, [211]--216, 284--288, 290, 291, 296, & ad. 1977; Arora, Biol. Abstr. 66: 2513. 1978; Arora, Cytologia 43: 91, 92, 94, & 95, fig. 1B. 1978; Nagy & Albert, Biol. Abstr. 66: 1654. 1978; Pirone, Diseases. & Pests Ornament. Pl., ed. 5, 527. 1978; W. H. Warren, Garden 2 (4): 15. 1978.

Additional illustrations: Palmer & Fowler, Fieldb. Nat. Hist. ed. 2, 286. 1975; Walls, Comp. Book Greenh. Gard. 278. 1975; López-Palacios, Fl. Venez. Verb. [561], fig. 131. 1977; W. J. Park, Park Seeds Fls. & Veg. 1978: 90 [in color]. 1977; A. R. Robbins, How Grow Annuals, ed. 2, [211] & ad. 1977.

Robbins (1977) describes this hybrid as comprising two general types, a tall type with plants 12--15 inches tall and a dwarf type with plants 6--12 inches tall. The seeds should be planted 10 inches apart; germination time is 10--15 days. They will begin to bloom in 10 weeks, bloom until frost, and are generally half-hardy. Indoor or coldframe starting is not required and they can be transplanted, but there is usually no self-sow, and fall-sow is not recommended. The corolla colors include white, pink, rose, crimson, and many shades of blue from light to very dark, and pure lavender, mostly combined with white. Of the Hybrida grandiflora type there are some 50 varieties; the color is usually not completely fixed, so "a color listed in a catalogue as rose, for instance, may have every shade from almost white to deep pink flowers". She lists particularly: Annapolis Blue, a blend of light, medium, and dark blue flowers with a small white eye; Marilyn, a fiery cerise; Salmon Pink, soft salmon-pink; Snowy White, white; Beauty of Oxford Hybrids, clear rose-pink to deep rose-red with white eye; Lavender Glory, lavender-blue, with creamy-white eye; Sutton's Blue, deep royal-blue; and Royal Bouquet, of different more rigid upright growth to 18 inches, in many colors.

Of Dwarf Verbena she lists 4 main types: (1) Gigantea, 10-inch plants with semi-doubled ruffled flowers tightly clustered in a ball -- Ruffled White, with pure white, and Ruffled Pink, with delicate salmon-pink corollas; (2) Dwarf Sparkle: neat compact 8--10-inch plants completely covered with flowers -- Amethyst, mid-lavender-blue with white eye; Blaze, bright-scarlet heads 3 inches across; Crystal, white; Delight, coral-pink suffused with salmon; Sparkle, scarlet with white eye; Splendor, royal-purple with white eye; (3) Multiflora or Bush: 10--12 inches tall and a foot or more in diameter -- Firelight, solid red without any eye; Roselight, rose-pink with white eye; Salmon Queen, salmon-pink; Snow Queen, pure-white; Starlight, with blue with cream eye; (4) Rainbow:

early-flowering, dwarf, upright, 8--10 inches tall, mixed colors, mostly eyed. She gives detailed culture directions, suggested dates for planting, care and cultivation, uses, and planting combinations with other garden flowers.

Cleene & De Ley (1976) report that xV. hybrida is susceptible to infection by crown-gall, Agrobacterium tumefaciens. Greenwood (1977) reports infestation by Aulacaspis pentagona on the stems and leaves.

Pinkus says of his no. 3, cited below, that it is a "rangy purple" in color, while his no. 4 is "red and a rather nice ornamental plant".

Park (1977) offers 3 general types of this verbenas: (1) Sparkle type (neatest in habit) with Amethyst, Blake [illustrated], and Sparkle Mixed, (2) Bush type with Regalia Mixture and Spirit of '76 [illustrated], and (3) Gigantea Dwarf with Springtime Mixture [illustrated].

López-Palacios (1977) lists the phytochemistry as "en la V. hybrida, delfinidina-3,5-diglicósido, delfinidina-3monoglicósido y glucosa (?) en las flores". He cites from Venezuela the following collections: Federal District: Lasser 3471, 3480; Schnee 936.

Mérida: López-Palacios 2212; Trujillo 6284, 8047. Táchira: Fernández 896. Trujillo: Ruiz-Terán & López-Palacios 7602. In a personal communication to me he reports the following vernacular names from Colombia and Venezuela: "verbena de jardín", "verbena extranjera", and "virginia".

Pirone (1978) lists the following diseases and pests as attacking the garden verbenas: flower-blight (Botrytis cinerea), powdery mildew (Erysiphe cichoracearum), stem-rot (Macrophomina phaseoli), root-rot (Pellicularia filamentosa, Phymatotrichum omnivorum, and Theilaviopsis basicola). In addition, the species listed by him under Verbena as a genus probably also apply here.

Material of this hybrid has been misidentified and distributed in some herbaria as V. ciliata Benth.

Additional citations: ARIZONA: Pima Co.: Gustafson s.n. [Jan. 8, 1932] (Mi). CULTIVATED: Louisiana: Pinkus 3 (2), 4 (2). Texas: Lundell & Lundell 9763 (Id).

#### VERBENA xILLICITA Moldenke

Additional bibliography: Mohlenbrock, Guide Vasc. Fl. Ill. 367. 1975; Moldenke, Phytologia 36: 228--229. 1977; Mohlenbrock & Ladd, Distrib. Ill. Vasc. Fl. [247] & 276. 1978.

Mohlenbrock (1975) says that in Illinois this hybrid occurs in "Low ground; scattered throughout the state".

Additional citations: ILLINOIS: Pike Co.: Moldenke & Moldenke 31561 (Lc, Id).

#### VERBENA INCISA Hook.

Additional bibliography: Sweet, Hort. Brit., ed. 3, 553. 1839;

Moldenke, *Phytologia* 36: 229--230, 240, 283, & 285. 1977.

Sweet (1839) calls this species the "cut-leaved vervain" and asserts that it was introduced into English gardens in 1836 from Santa Fé, Argentina.

The Ekman H.12615, distributed as V. incisa, actually is V. tenuisecta Briq.

Additional citations: ARGENTINA: Formosa: I. Morel 419 (Au--122313). Santa Fé: Terrible 366 (Au--122314).

#### VERBENA JORDANENSIS Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 230. 1977.

Additional citations: BRAZIL: Santa Catarina: Smith & Reitz 12479 (Au--249878).

#### VERBENA LACINIATA (L.) Briq.

Additional synonymy: Glandularia laciniata (Lam.) Speta, *Candollea* 23: 155. 1977.

Additional bibliography: Sweet, *Hort. Brit.*, ed. 1, 1: 325 (1826) and ed. 3, 553. 1839; Moldenke, *Phytologia* 36: 230--232, 241, & 290. 1977; Speta, *Candollea* 32: 146 & 155. 1977; Moldenke, *Phytologia* 38: 386 & 401 (1978) and 39: 99. 1978.

Lindeman & Haas encountered this plant "in blown up sand at landward foot of isolated rock on the beach" and their no. 3758 is said by them to have had its corollas "purple (10P6/8)".

Sweet (1826) calls this species the "Erinus-like vervain" and asserts that it was introduced into English gardens from Peru in 1820.

Speta (1977) reports the presence of "Stapel quadratischer Plättchen" in the cell nuclei of this species as in V. canadensis (L.) Britton, which see for further details.

Additional citations: ECUADOR: Chimborazo: Asplund 20463 (Ld); Fagerlind & Wibom 837 (Ld). BRAZIL: Paraná: Lindeman & Haas 3758 (Ut--320413).

#### VERBENA LACINIATA var. CONTRACTA (Lindl.) Moldenke

Additional synonymy: Verbena erinoides  $\beta$  sabini D. Don ex Loud., *Hort. Brit.*, ed. 2, 553. 1832.

Additional bibliography: Loud., *Hort. Brit.*, ed. 2, 553. 1832; Sweet, *Hort. Brit.*, ed. 3, 553. 1839; Moldenke, *Phytologia* 36: 231--232. 1977.

Sweet (1839) calls this plant "Sabine's vervain" and asserts that it was introduced into English gardens from Chile in 1830.

#### VERBENA LASIOSTACHYS Link

Additional bibliography: Sweet, *Hort. Brit.*, ed. 1, 1: 325 (1826) and ed. 3, 553. 1839; Moldenke, *Phytologia* 36: 232--233 & 277. 1977.

Sweet (1826) calls this species the "woolly-spiked vervain" and dates its introduction to cultivation in English gardens from

California as 1823; V. prostrata, the "prostrate vervain", he says was introduced from "North America" in 1794.

It should be noted here that the V. prostrata var. glandulosa of Dunkle is a synonym of V. robusta Greene.

The Dunkle 8548, distributed as V. lasiostachys, actually is V. robusta Greene.

#### VERBENA LILACINA Greene

Additional bibliography: Moldenke, *Phytologia* 36: 233. 1977.

Davidson found this plant growing "in a narrow, shady, steep, rocky (metamorphic) canyon in sandy stream channel with some pockets of spring-fed water still remaining, associated with Trixis californica, Viguiera lanata, Verbesina peninsularis, Encelia californica asperifolia, Acalypha californica, and Simmondsia chinensis."

Additional citations: MEXICO: Baja California: Davidson 5495 (N).

#### VERBENA LITORALIS H.B.K.

Additional & emended synonymy: Verbena caracasana H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 223. 1817. Verbena caracasana Humb. & Bonpl. ex Steud., Nom. Bot. Phan., ed. 1, 872. 1821. Verbena caracasana Humb. ex Spreng. in L., Syst. Veg., ed. 16, 2: 748. 1825. Verbena caracasana H.B.K. ex Cham., Linnaea 7: 255. 1832. Verbena caracasana Humb. & Bonpl. ex Steud., Nom. Bot., ed. 2, 2: 750. 1841. Verbena caracasana Humb. & Kunth ex D. Dietr., Syn. Pl. 3: 601. 1843. Verbena caracasana Kunth ex Schau. in A. DC., Prodr. 11: 542, in syn. 1847. Verbena littoralis var. caracasana (H.B.K.) Briq., Ann. Conserv. & Jard. Bot. Genève. 7-8: 292. 1904. Verbena littoralis var. leptostachya Schau. ex Briq., Ann. Conserv. & Jard. Bot. Genève. 7-8: 292, in syn. 1904. Verbena littoralis var. caracasana Briq., Ann. Conserv. & Jard. Bot. Genève. 7-8: 292. 1904; Moldenke, Prelim. Alph. List Inv. Names 47, in syn. 1940. Verbena littoralis var. caracasana (Kunth) Briq. ex Moldenke, Suppl. List Inv. Names 25, in syn. 1947. Verbena littoralis var. caracasana Briq. ex Moldenke, Résumé 369, in syn. 1959. Verbena caracasana H.B.K. ex Moldenke, *Phytologia* 34: 278, in syn. 1976.

Additional bibliography: Sweet, Hort. Brit., ed. 3, 768. 1839; Kuntze, Rev. Gen. Pl. 2: 510. 1891; Rojas Acosta, Cat. Hist. Nat. Corrient. 206. 1897; Perez-Arbelaez, Pl. Util. Colomb., ed. 1, 441 (1947) and ed. 2, 745. 1956; García Barriga, Fl. Med. Colomb. 2: 512-513. 1975; Dantas Barreto, Fontes, Ramos Lopes, Rainha, Rozeira, Da Silva, Pinto da Silva, & Teles, Agron. Lusit. 37: 167-188. 1976; Dantas Barreto, Fontes, Ramos Lopes, Rainha, Rozeira, Da Silva, Pinto da Silva, & Teles, Biol. Abstr. 63: 1849. 1977; López-Palacios, Fl. Venez. Verb. 559, 560, 563-571, 653, &

656, fig. 132 & 133. 1977; Moldenke, Biol. Abstr. 64: 4787. 1977; Moldenke, Phytologia 36: 233--237, 277, 281, 298, & 462. 1977; Van der Werff, Bot. Notiser 130: 96. 1977; Dodson & Gentry, Selbyana 4: 578, 580, 581, 605, & 628, pl. 272C. 1978; Mejias, Act. Bot. Venez. 13: 304. 1978; Moldenke, Biol. Abstr. 65: 71. 1978; Moldenke, Phytologia 38: 259. 1978.

Additional illustrations: García Barriga, Fl. Med. Colomb. 2: 513. 1975; López-Palacios, Fl. Venez. Verb. [561], fig. 132. 1977; Dodson & Gentry, Selbyana 4: 581, pl. 272C. 1978.

Sweet (1839) avers that this species was introduced into cultivation in British gardens from South America in 1832.

Recent collectors have encountered this plant in cleared fields and "trochas of finca", at the "upper edge of marsh meadow", and in subxerophytic microthermic habitats, at altitudes of 1020--3603 meters, flowering and fruiting in May, October, and December, and refer to it as 2 meters tall. The corollas are said to have been "purple" on Kirkbride 2428 and Sousa & Diego 1471, "blue" on Breedlove 10855, 12618, & 14429, Contreras 2635 & 3088, Kral 27566, Ruiz Huidobro 3883, and Ton 1054, "rose" on Toni 5663, "lavender-purple" on Howell 8882, "violet, ca. white in tube" on MacBryde 949, and "tube violet, limb lilac" on Cuatrecasas 22877.

Mejias (1978) records the species from Monagas, Venezuela, and lists the vernacular name, "verbena". Other collectors list "verbena del litoral". López-Palacios, in a personal communication to me, says "'Verbena', 'Verbena blanca', a los que deben agregarse los de 'Verbena chiquita' y 'Espina de raya', que García-Barriga, o.c.: 511 y 512 señala para V. hispida R. & P., taxa no señalada en Colombia y de imposible ocurrencia en los Llanos Orientales. Las dos citas que allí se aducen para tierras altas, corresponde la una, Pérez-Arbelaez 1207 a Ve. valerianoides HBK, y la otra, Triana 3685 a V. trifida HBK."

Cuatrecasas 22877 seems to represent an extra large-leaved form, while Howell 8882 exhibits uniformly very small leaves and Howell 8959 extra stiff leaves. López-Palacios, in a letter to me dated May 16, 1977, says that his no. "4332", cited by me in a previous installment of these notes, should be "4232". In his 1977 work he cites the following collections from Venezuela: Aragua: Benítez 911; Chardon 182; Fernández 543; Holt 376; Moldenke & Moldenke 19550; Montilla 11; Trujillo s.n. Barinas: Karsten s.n. Falcón: Agostini & Agostini 1130; Lasser & Foldats 2987. Federal District: Alston 5430; Bailey & Bailey 352; Burkart 16019; Eggers 13053; Fernández 823; Funck 570; Humboldt & Bonpland 638; Kuntze 1263; Lasser 725; Linden 334; Moritz 811; Pittier 9732; Potter 5100; Schnee 405; Tamayo 737; Vogl 182. Lara: Benítez 236; Mocquerys 893; Saer 829; Smith V. 147; Trujillo 2587. Mérida: Breteler 3056; Gehriger 219, 533; Ginés 4685; Hanbury-Tracy 24, 256; Jahn 535; Lasser 415; Lasser & al. 4467; Linden 334; López-Palacios 2035, 3175; López-Palacios &

Bautista 3431; Oberwinkler 12196; E. Reed 610; Ruiz-Terán 172, 5988; Ruiz-Terán & López-Figueiras 8548; Ruiz-Terán & López-Palacios 1903, 6617; Trujillo 7755, 7866, 8012, 8124, 8346; Vareschi & al. 1610. Miranda: Agostini 172, 487; Barros s.n.; Benítez 722; Holt 441; Moldenke & Moldenke 19562. Portuguesa: Burkart 17069. Sucre: Funck 54, 325, 637. Trujillo: Burkart 16815; De Bellard s.n.; Ginés 4312; Ruiz-Terán & López-Palacios 7400. Yaracuy: Foldats 2047; Trujillo & Fernández 768. Zulia: Mocquerys 893; Plée 56. State undetermined: Grosourdy s.n. He comments that "aunque no haya registro de otros estados, con seguridad existe en todos ellos." He also notes that Troncoso regards Mocquerys 893 as *V. glabrata* H.B.K.

Dodson & Gentry (1978) cite Dodson & al. 5695 from Los Ríos, Ecuador, while Walker (1976) cites Walker 8103 & 8127 from Okinawa.

Material of *V. litoralis* has been misidentified and distributed in some herbaria as *V. "hispidula* R. & P." On the other hand, the Stutzenbaker 205, distributed as *V. litoralis*, actually is *V. brasiliensis* Vell., while Correll & Correll 39002 is *V. halei* Small, J. Taylor 17625 is *V. parvula* Hayek, and Meebold 26897 is *V. scabra* Vahl.

Additional citations: MEXICO: Chiapas: Breedlove 10855 (Ld), 12618 (Ld), 14429 (Ld); Ton 1054 (Ld). Jalisco: R. Kral 27566 (W--2825923). Michoacán: Hinton 12869 (N). Tamaulipas: Richardson 199 (Ld), 371 (Ld). Veracruz: Sousa & Diego 1471 (Ld). GUATEMALA: El Petén: Contreras 2635 (Au--228054), 3088 (Au--228026). COSTA RICA: San José: J. Taylor 17446 (Ld). COLOMBIA: Magdalena: Kirkbride 2428 (N). Valle del Cauca: Cuatrecasas 14447 (W--2773000), 20663 (W--2817213), 22877 (W--2817657). ECUADOR: Los Ríos: MacBryde 949 (W--2812896). GALAPAGOS ISLANDS: Albemarle: Howell 8959 (W--2814446). Charles: Howell 8882 (W--2814445). PERU: Cuzco: Brunel 135 (W--2788546). BRAZIL: Minas Gerais: Toni 5663 (N). CHILE: Tarapaca: Zöllner 9609 (Ld). ARGENTINA: Córdoba: Balegno 893 (Au--122323). Corrientes: Krapovickas, Cristóbal, Arbo, Maruflak, Maruflak, & Irigoyen 16634 (Ld); Ruiz Huidobro 3883 (N). Formosa: Krapovickas, Mroginski, & Fernández 19562 (Ld). MOUNTED CLIPPINGS: Walker, Fl. Okin. & South. Ryuk. 884. 1976 (W).

#### VERBENA LITORALIS var. ALBIFLORA Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 237. 1977.

López-Palacios, in a personal communication to me, comments that "Moldenke dice en *Phytologia* 10: 76 (traduzco): "Se le registra con el nombre vernaculo de 'Verbena blanca' que inadvertidamente di para la especie típica en mi Supplementary list of common and vernacular names en 1940". Pero resulta que en Colombia se llama 'Verbena blanca' a la típica *litoralis* para distinguirla de ciertas *Stachytarphetae* (principalmente *S. cayennensis*) a las que se denomina 'Verbena negra'."



Additional citations: MEXICO: Chiapas: Breedlove 9458 (Ld).

**VERBENA LOBATA** Vell.

Additional bibliography: Moldenke, *Phytologia* 36: 237—238 & 308. 1977.

Hatschbach & Landrum refer to this plant as an herb with lilac corollas and found it growing in wet soil of capoeira, flowering in October.

Additional citations: BRAZIL: Paraná: Hatschbach & Landrum 40425 (Ld).

**VERBENA LONGIFOLIA** Mart. & Gal.

Additional bibliography: Moldenke, *Phytologia* 36: 238. 1977.

Contreras refers to this species as an herb of wet land. The corollas are said to have been "lilac" on Contreras 6152 and "white to pale-pink" on Ernst 2355a. The plant has been found in flower and fruit in January and September. Material has been misidentified and distributed in some herbaria as V. officinalis L.

Additional citations: MEXICO: Oaxaca: Ernst 2355a (W--2798517). GUATEMALA: El Petén: Contreras 6152 (Ld).

**VERBENA LONGIFOLIA** f. **ALBIFLORA** Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 238. 1977.

This plant has been found in flower and fruit in July and materials has been misidentified and distributed in some herbaria as V. officinalis L.

The corollas on Ernst 2355a, cited under typical V. longifolia (above), are said to have been "white to pale-pink" when fresh, so this collection may better be listed under the present form.

Additional citations: GUATEMALA: El Quiché: Contreras 5247 (Ld, Ld).

**VERBENA MACDOUGALII** Heller

Additional bibliography: Moldenke, *Phytologia* 36: 238—239. 1977.

Barrell encountered this plant in association with Rhus trilobata and Glycyrrhiza in crevices of volcanic country rock outcroppings, at 8000 feet altitude, flowering in August.

Additional citations: COLORADO: Conejos Co.: W. A. Weber 7865a (Au--122329). Gunnison Co.: Barrell 218-65 (W--2809834). NEW MEXICO: Otero Co.: Correll & Correll 39216 (Ld). ARIZONA: Apache Co.: Crutchfield 2089 (Ld).

**VERBENA MACROSPERMA** Speg.

This taxon is now regarded as synonymous with V. sulphurea var. intermedia Kuntze, which see.

**VERBENA MARITIMA** Small

Additional bibliography: Moldenke, *Phytologia* 36: 239—240 & 453.

1977; Poppeton, Shuey, & Sweet, Fla. Scient. 40: 384. 1977; Craig, Proc. Fla. State Hortic. Soc. 90: 109. 1978.

Recent collectors describe this species as a sprawling plant growing in open sandy soil, flowering in March. The corollas are said to have been "dark-red" on B. M. Davis s.n. [Apr. 9, 1933] and "lavender" on Correll & al. 49514. Craig (1978) reports finding the plant on about 3 percent of the coastal dunes sites studied by him in southeastern and southwestern Florida. His work is mis-dated "1977" on its title-page.

Additional citations: FLORIDA: Palm Beach Co.: Correll, Correll, Austin, & Eckenwalder 49514 (N). Volusia Co.: B. M. Davis s.n. [Apr. 9, 1933] (Mi).

#### VERBENA MEDICINALIS Rojas

Additional bibliography: Moldenke, Phytologia 36: 240. 1977.

Rojas Acosta (1897) calls this plant the "verbena del incordio", but fails to provide us with a description.

#### VERBENA MEGAPOTAMICA Spreng.

Additional bibliography: Moldenke, Phytologia 36: 240. 1977.

The V. Maruffak 134, distributed as V. megapotamica, actually is V. phlogiflora Cham.

#### VERBENA MENDOCINA R. A. Phil.

Additional bibliography: Moldenke, Phytologia 36: 240—241. 1977; Markgraf & D'Antoni, Pollen Fl. Argent. 20 & 99. 1978

Markgraf & D'Antoni (1978) describe the pollen of this species as "Tricolporate, scabrate. Grain prolate-spheroidal, 26 x 25 um. Exine 1.5 um thick. Pore lalongate 6 x 2 um, protruding, margo 6 um wide, colpus narrow. Polar A 0.5, amb sub-angular", based on Lagiglia 29 from Mendoza, Argentina. It is suspected that "um" here is intended to be "mu".

#### VERBENA MENTHAEFOLIA Benth.

Additional bibliography: Moldenke, Phytologia 36: 241, 244, & 277. 1977.

Breedlove encountered the very small-leaved form of this species on "slopes with Quercus, Cnidioscolus, Guazuma, Disopyros, Luehea, and Plumeria", at 1000 meters altitude, flowering and fruiting in August. The corollas are said to have been "blue" on Breedlove 27018.

Additional citations: MEXICO: Chiapas: Breedlove 10457 (Ld), 11161 (Ld), 27018 (Ld, N). Durango: H. M. Parker 647 (Ld). México: Pringle 8534 (Ld).

#### VERBENA xMOECHINA Moldenke

Additional bibliography: monlenbrock, Guide Vasc. Fl. Ill. 366. 1975; Moldenke, Phytologia 36: 242 & 307. 1977; Mohlenbrock & Ladd, Distrib. Ill. Vasc. Pl. [247] & 276. 1978.

[to be continued]

NOTES ON MIKANIA (COMPOSITAE) - V

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MIKANIA ANGULARIS H. & B., Pl. Aeq. 2: 87. 1809.

Type: Ecuador, Gonanama, Humboldt & Bonpland 3434 (P)

M. armigera Poepp., Poepp. & Endl. Nov. Gen. ac Spec.  
3: 52. 1845.

Type: Perú, Cuchero, Poeppig D (F!, isotype)

M. laxa DC., Prodr. 5: 200. 1836.

Type: Perú, Poeppig 1218 (W, F-photo!)

Mikania angularis is a rarely collected plant of Perú, Ecuador and Colombia. It is very similar in many respects to M. vitifolia DC., but easily distinguished by its corolla teeth being distinctly greater in length than the true throat. Mikania vitifolia has corolla teeth and throat about the same length. Robinson (1922), in his key to Mikania of Perú, separated M. angularis from M. laxa on the direction of divergence of the basal lobes of the leaves and pappus color. Comparison of these two plants showed that the direction of basal lobe divergence varied on the same plant and cannot be considered as an accurate distinguishing character. Separating M. laxa from M. angularis on the basis of a rufescent pappus is arbitrary at best, since, according to Steyermark (1953), the reddish color of the pappus may be due to aging or drying in some particular manner, and the character cannot be accepted as trustworthy. Apparently there is no character that consistently separates M. laxa from M. angularis, the two are therefore considered conspecific.

Specimens examined: PERU: Cuzco: Piuipiui, 720 m, September 28, 1966, C. Vargas C. 17793 (US). Huanuco: Huanuco, near Monzon River, Weberbauer 3640 (F). Junin: La Merced, Hacienda Schunke, 4000 ft., August 27-Sept. 1, 1923, J. F. Macbride 5290 (F, GH, US).

MIKANIA BANISTERIAE DC., Prodr. 5: 193. 1836.

In connection with monographic work in Mikania it was necessary to determine the correct status of a number of Peruvian species with close affinities with M. banisteriae. Steyermark (1953) was the first to recognize the extreme polymorphism in this complex which is characterized by considerable variability in tomentum on stems, petioles, leaves, rachis and in leaf-shape. Among the more constant characters useful in keying and delimitation are the nearly glabrate ovate-oblong involucre scales with rounded apices, ovate exterior bract usually borne slightly beneath and about one-half the length of the involucre, corolla tube and throat about the same length, the throat being abruptly and broadly campanulate (about as wide as high), and corolla teeth about the same length as the throat. Peruvian plants, other than those previously treated by Steyermark (1953) and all proposed by Robinson, included here are M. macbridei, M. rugosa, M. bullata and M. trichodes. The latter three species had types housed at B which are presumed to be destroyed, making direct comparison difficult. In Robinson's key (1922) to Mikania of Perú, these three species are closely allied to M. lanuginosa and M. ruiziana (both = M. banisteriae) and inseparable, with material available for study, by the characters used in the key, making correct disposition somewhat provisional. However, an examination of type fragments of these three species at GH reveals constant and adequate differences from M. banisteriae and they should be maintained as distinct. Mikania macbridei, with ample material for study including the type, does not appear to be distinct from M. banisteriae. Each name will be discussed in turn below.

MIKANIA MACBRIDEI Robinson, Contrib. Gray Herb. 73: 27. 1924.

Type: PERU: Junin: La Merced, Hacienda Schunke, ca 4000 ft. August 27-September 1, 1923, J. F. Macbride 5728 (F!)

According to Robinson (1924), this is a well-marked species with all but the youngest leaves covered with a very curious white veil-like covering which upon closer examination proves to be a fungal mycelium. Examination of the holotype showed that it exhibited all of the reliable diagnostic characteristics of M. banisteriae mentioned above. The only distinguishable character is the presence of the fungus which naturally does not justify retention of specific status. It is unfortunate that this Mikania named in honor of J. Francis Macbride, who greatly furthered the botanical knowledge of Perú, be no more than a specimen of M. banisteriae infected with a fungus. The plants cited below, all determined and annotated in the hand of B. L. Robinson, have on the basis of the presence of a whitish fungal mycelium been referred

to M. macbridei and are otherwise indistinguishable from M. banisteriae and should therefore be considered that species.

Specimens examined: PERU: Junin: Chanchamayo Valley, 1500 m, July 1929, Carlos Schunke 475, 476 (both F); Chanchamayo Valley, Quimiri, 1500 m, June 1929, Carlos Schunke 26 (F,GH) (The heads of this collection are extremely immature and/or severely infected by a fungus.)

To further compound the above problem, additional specimens from Junin, Perú, also have been identified as M. macbridei (= M. banisteriae). These have what appears to be a fungal mycelium, though not to the extent of the above specimens, or possibly they have a fine velvety pubescence. The material is certainly different from what was known as M. macbridei (= M. banisteriae), possessing a more open inflorescence with the heads somewhat clustered toward the tips of the branches. Heads are at most 5 mm in length and appear normal in all respects. Mikania banisteriae has heads 8 mm or more in length. The exterior bract in these specimens is much shorter, ca 1 mm long. The corolla is also smaller, ca 3 mm long, with the tube gradually expanding into a funnellform throat. (See above for further characters of M. banisteriae.) As the material is not referable to any known species, it is described below as new.

MIKANIA JUNINENSIS Holmes & McDaniel, sp. nov.

Suffrutex volubilis; foliis ovatis, ad 8.5 cm longis et 4.5 cm latis, apice acutis vel rotundatis, basi rotundatis vel obtusis, marginibus integris; inflorescentiis paniculatis, capitulis ca 5 mm longis, corollis ca 3-3.3 mm longis, dentibus limbi anguste triangularis, ca 1 mm longis; achaeniis ca 2 mm longis; pappi setis ca 30, ca 3 mm longis, barbellatis.

Subligneous vine; stems terete, velvety-tomentulose, internodes ca 7 mm long; leaves ovate, ca 8.5 cm long and 4.5 cm wide, margins entire, apices acute to rounded, bases rounded to obtuse, upper surfaces glabrate, pinnately nerved, the major nerves with dense white appressed pubescence, lower surfaces crisped-hairy mainly on the nerves, the veins exserted, lighter than above, petiole ca 1-2 cm long, velvety-tomentulose. Inflorescence a rather open panicle with the heads clustered near the tips of the oppositely borne branches, ca 30 cm long and 15 cm in diameter, branchlets terete, velvety-tomentulose. Heads 3-4 mm long, exterior bract ovate-oblong, ca 1-1.2 mm long, glabrate, apices rounded, irregularly ciliate, borne well beneath the involucre. Involucral scales oblong, ca 3 mm long, glabrate, apices rounded. Corolla ca

3-3.3 mm long, greenish-white, tube ca 1-1.2 mm long, gradually expanded into the turbinate throat, throat ca 2.3-2.5 mm long, teeth lanceolate to narrowly triangular, ca 1.3 mm long. Achene ca 2 mm long, olivaceous, pappus bristles ca 30, ca 3 mm long, barbellate.

Type: PERU: Junin: Pichis Trail, Porvenir, 1500-1900 m, July 3-4, 1929, Killip & Smith 25912 (GH-holotype, F-isotype).

Paratype: PERU: Junin: Pichis Trail, Dos de Mayo, 1700-1900 m, July 2-3, 1929, Killip & Smith 25797 (GH).

As previously stated, the pubescence of this species is difficult to distinguish from a fungal mycelium. In color it is white and easily rubbed off. However, this condition appears to have in no way affected the plant and is not used in separating this plant from all other Peruvian species of Mikania.

MIKANIA RUGOSA Robinson, Contrib. Gray Herb. 61: 20. 1920.

Type: PERU: Puno: Ramospata, between Sandia and Chunchumayo, 2400-2500 m, July 27, 1902, Weberbauer 1323 (B-destroyed?, GH-photo & fragm.!).

Mikania rugosa may be distinguished from M. banisteriae by its somewhat hexagonal stem and densely tawny-tomentulose involucre. Mikania banisteriae has terete stems and glabrate involucral scales. In all other characters the two plants are suspiciously alike.

MIKANIA BULLATA Robinson, Contrib. Gray Herb. 61: 13. 1920.

Type: PERU: Puno: between Tambo Ichubamba and Tambo Yuncacoyo, on the way from Sandia to Chunchumayo, 1800-2000 m, Weberbauer 1085 (B-destroyed?, GH-photo & fragm.!).

Robinson (1922) separates Mikania bullata from M. ruiziana and M. lanuginosa (both = M. banisteriae) by color and texture of pubescence, leaf shape and character of the leaf surfaces. As previously noted, these characters cannot be used with any degree of certainty in this complex. However, this species differs from M. banisteriae in the scabrid nature of its upper leaf surface and the linear to oblanceolate exterior that is one-half or more the length of the involucre. These two traits appear to be consistent on the small fragments of the type seen and justify retention of the name.

MIKANIA TRICHODES Robinson, Contrib. Gray Herb. 61: 22. 1920

Type: PERU: Huanuco: Huamalies, mountains to the SW of Monzon, 2500-2900 m, Weberbauer 3395 (B-destroyed?, GH-photo & fragment!)

Separated from Mikania banisteriae by its scabrous stem and very prominent interpetiolar ring or fold connecting opposite petioles. Other than these characteristics, exceeding near M. banisteriae and doubtfully distinct, but under the above stated conditions, better treated at present as distinct.

MIKANIA CRISTATA Robinson, Proc. Am. Acad. 47: 6. 1911.  
(Contrib. Gray Herb. 39: 195. 1911.)

Type: Costa Rica: La Palma, 1459 m, A. Tonduz 12583 (US!)

Formerly unknown outside of Costa Rica, this species has recently been collected in Chiriqui, Panamá. The ovate leaves with cordate bases, twining habit, corymbose inflorescence and heads about 10 mm long resemble the more prevalent Mikania cordifolia (L. f.) Willd., a species with which M. cristata is often confused. The latter species is characterized by its large, stipular-like nodal appendages, terete glabrous stems, and linear corolla teeth that are about three times the length of the throat. Mikania cordifolia has exceedingly small nodal appendages which are not at all prominent, tomentulose to tomentose hexagonal stem and corolla teeth slightly longer than the throat. This species makes an interesting addition to the known species of Mikania from Panamá.

Specimens examined: COSTA RICA: Alajuela: La Palma de San Ramon, Sept. 21, 1928, A. M. Brenes 6323 (NY); Cartago: Cerro de la Muerte, 3000 ft, Aug. 24, 1962, R. M. King 5394 (MICH, TEX, US); roadside 8 km se of Tapanti, 1500 m, June 18, 1967, R. W. Lent 1057 (MO); San José: La Palma, 1459 ft, Sept. 1898, A. Tonduz 7421 (US); near Finca La Cima, above Los Lotes, n of El Copey, Dec. 21-22, 1925, P. C. Standley 42612 (US); La Palma, 5600 ft. Jan. 28, 1972, R. M. King 6426 (US); Prov. unknown: Very Blanca de Sarapiquí, n slope of Central Cordillera, A. F. Skutch 3176 (MO, US) & 3655 (MO, TEX). PANAMA: Chiriqui: Cerro Respínga, above town of Cerro Punta, 8400 ft, Aug. 8, 1972, W. G. & J. D. D'Arcy 6564 (MO); Boquete, Cerro Horqueta, 5000-6000 ft, Aug. 8, 1967, J. D. Dwyer 7689 (MO).

Another species possessing large foliaceous stipular-like enations is reported from Guatemala by Williams (1975).

He incorrectly states that this species, Mikania stipulifera, is the only one in Central America possessing large foliaceous enation, apparently being unaware of M. cristata. King and Robinson (1977) state that M. stipulifera has no described differences, implying that the two are synonymous. The two are quite similar vegetatively and in form of the inflorescence but examination of an isotype (Glassman 1648, WIS) showed the two species to be amply distinct. They may be distinguished as follows:

Corolla teeth ovate-lanceolate, as long as or slightly longer than the throat, the teeth with two pairs of veins, one near the margins, the other inward and parallel to the first.....M. stipulifera.

Corolla teeth linear, the throat extremely short, almost appearing non-existent, corolla teeth with one pair of veins.....M. cristata.

To be included as a synonym of Mikania stipulifera is M. stipulata Standl. & Wms. of Clewell, Ceiba 19: 206. 1975.

MIKANIA GUACO H. & B., Pl. Aeq. 2: 84. 1809.

Type: Colombia: Magdalena River between Mahates & Angostura, Humboldt & Bonpland 1447 (P).

M. amara var. guaco (H. & B.) Baker in Mart. Fl. Bras. 6: 237. 1876.

Willoughbya guaco (H. & B.) Kuntze, Rev. Gen. 1: 372. 1891.

M. attenuata DC., Prodr. 5: 195. 1836.

Type: Peru: "in montibus Huanacocensis", Haenke s. n. (G-DC-microfiche!, GH-photo!)

M. cuneata Sch.-Bip., Bonplandia 4: 54. 1856 (nomen nudum).

Type: Peru: San Govan, Lechler 2477 (F-isotype!)

M. brachiata Poepp. in Poepp. & Endl., Nov. Gen. & Sp. 3: 53. 1854.

Type: PERU: San Martín: in forests at Tocache, Poeppig 2041 (W, F-photo & frag.!)



M. olivacea Klatt, Bull. Soc. Roy. Bot. Belgique 31:  
195. 1892 (1893).

Type: Costa Rica: forets de Buenos-Aires, 2300 m, Pittier 4433  
(BR, GH).

Mikania guaco is a widespread species well marked by its leaf bases prominently cuneately decurrent upon the petioles. It has affinities with a difficult group of plants with corymbose inflorescences and sessile ternately disposed heads. Robinson (1922) in his key to the species of Mikania in Perú separated this species from M. brachiata on head size, the former with heads ca 10 mm long, the latter with heads 8 mm or less in length. Our repeated attempts to distinguish these two plants on that basis have failed. Examination of Peruvian material of this group showed that head size varied from 7-10 mm, with no definite discontinuity between the two extremes. A portion of the type material of M. brachiata has heads 9-10 mm long and by Robinson's (1922) key would be referred to M. guaco. No character or group of characters could be found which would consistently separate the two plants. In all other aspects such as the cuneate leaf bases, disposition of heads and presence of hirsute stigmas the plants are suspiciously alike. They are therefore considered to be the same species under the older name M. guaco.

Peruvian specimens examined: Ayacucho: Aina between Huanta and Río Apurímac, 750-1000 m, May 7, 1929, Killip & Smith 22793 (GH, US). Cuzco: Quispicanchis, María Patai, Cadena, 1100 m, July 24, 1957, C. Vargas C. 11677 (US); Villcabamba, Hacienda on Río Chincayo, 6000 ft., July 17-26, J. F. Macbride 5190 (F); Huánuco: Huánuco, down river 2.5 hrs to 1 day's travel from Tingo María, 7000 ft., July 14-15, 1937, Charles M. Belshaw 3104 (F, GH, US); Fundo Honolulu, cerca a Tingo María, Carretera Huánuco-Tingo María, 600-700 m, August 8, 1947 Ramon Ferreyra 2258 (US); Tingo María, shore of Río Mozon, August 12, 1940, Erik Asplund 12974 (F); Pozuzo, 800-900 m, 1908-1914, A. Weberbauer 6774 (F, GH, US). Loreto: Boqueron Padre Abad, 470 m, Felix Woytkowski 34376 (F); Divisoria, cerca a Chinchono, entre Tingo María i Pucallpa, 1500-1600 m, July 21, 1948, Ramon Ferreyra 4314 (US) and 4292 (US); Florida, Río Putumayo, at mouth of Río Zubineta, 180 m, May-July 1931, G. Klug 2172 (F, GH); Contamana, near road to Oriente, 160-180 m, July 26, 1970, McDaniel 14057 (IBE); Maynas. Dtto. Iquitos. Quebrada Aucaya, trocha de Nuevo Union, May 21, 1973, McDaniel & Rimachi 17171 (IBE, NATC), La carretera de Momoncillo near Río Momón, March 11, 1973, McDaniel & Rimachi 17007 (IBE), along Río Amazonas s of Iquitos, August 18, 1972, Thomas B. Croat 19307 (GH, IBE), lower Río Nanay, May 29, 1929, L. Williams 542 (F, GH), Río Nanay near Iquitos, between Bellavista and Sta. Clotilde, ca 110 m, June 18, 1970,

McDaniel 13576 (IBE), 5 km sw of Iquitos, July 15, 1972, Croat 18144 (IBE), Iquitos, ca 100 m, Aug. 2-8, 1929, Killip & Smith 27386 (F, GH, US), Iquitos, San Juan, 120 m, Oct. 12, 1929, L. Williams 3721 (F, GH), Iquitos, 120 m, April 9, 1930, L. Williams 8197 (F, GH). Madre de Dios: Parque Nac. del Manu, Cocha Cashu, forest in vicinity oxbow lake of Río Manu, between Panagua & Tayakome, Aug. 17-24, 1974, Robin B. Foster 3483 (IBE). San Martín: Zepalacio, near Moyobamba, 1200-1600 m, Dec. 1933, G. Klug 3412 (US); Mariscal Cáceres. Dtto. Tocache Nuevo. Quebrada Luis Sálas, 5 km ne Puerto Pizana, Aug. 1, 1973, J. Schunke V. 6584 (IBE).

MIKANIA HUANUCOENSIS Holmes & McDaniel, sp. nov.

Suffrutex volubilis; foliis ellipticis, ad 5.5 cm longis et 2.5 cm latis, apice acutis vel attenuatis, basi cuneatis; paniculis capitulis in spicas; capitulis 10-11 mm longis; corollis ca 5 mm longis, dentibus limbi obtusis; achaeniis ca 4.5 mm longis; pappi setis ca 40-45, 5 mm longis, barbellatis.

Suffrutescent liana to 10 m tall, stems striate-sulcate, fistulose, glabrous, internodes to ca 4 cm long. Leaves elliptic, to ca 5.5 cm long and 2.5 cm wide, margins entire-revolute, apices acute to acuminate, bases cuneate, upper surfaces very lightly sericeous toward the margins, obscurely pinnately nerved, with 2 pairs of secondary nerves arising within the basal half of the leaf, these arching toward the apex, lower surfaces glabrate to lightly pilose, the major nerves exserted, petiole ca 0.5-0.7 cm long, lightly sericeous. Inflorescence paniculate, to ca 14 cm long and 8 cm wide, the ultimate branchlets spicate, borne oppositely, to ca 8 cm long, branchlets striate, lightly glandular. Heads ca 10-11 mm long, loosely disposed, exterior bract linear to narrowly elliptic, to ca 1.5 mm long, glandular. Involucral scales oblong, ca 6 mm long, glabrate, glandular, apices rounded, puberulent. Corolla ca 5 mm long, white, glandular, tube ca 3 mm long, gradually expanding into the throat, throat ca 2 mm long, teeth obtuse, ca 0.5 mm long, glandular. Achene ca 4.5 mm long, glandular toward summit, dark olivaceous, ribs white. Pappus bristles ca 40-45, white, ca 5 mm long, barbellate, somewhat thickened toward the tips.

Holotype: PERU: Huánuco: Río Negro, pampa of fern, 1000 m, flowers white, 8-10 m tall, January 14, 1961, Felix Woytkowski 6192 (MO).

Mikania huanucoensis, known only from the type, has a spicately disposed inflorescence with heads 10-11 mm long. Leaves are elliptic, pinnately nerved, at most 5.5 cm long,

cuneate at the base and acute to acuminate at the apex. Internodes are short, normally less than 4 mm long.

Among the Peruvian species of Mikania the new species approaches nearest M. szyszyłowiczii Hieron., a species with rounded leaf apices and heads 5-7 mm long. Mikania psilostachya, a very widespread species, has a similar inflorescence, including heads of about the same size (10-11 mm) as M. huanucoensis, but is very scabrous, a character not at all evident in the latter species. Mikania psilostachya also has the corolla throat about three times or more as long as the tube, while the new species has a throat slightly longer than the tube.

MIKANIA MICROPTERA DC., Prodr. 5: 196. 1836.

Type: Brazil: Bahia, Blanchet 1710 (G-DC-microfiche!, MO!)

M. scandens var. microptera (HBK.) Baker in Mart. Fl. Bras. 6: 259. 1876.

M. hexagona Robinson, Proc. Am. Acad. 47: 196. 1911.

Type: Venezuela: near Tovar, 1700 m, 1854-55, A. Fendler 626 (GH).

Mikania microptera, readily identified by its distinctly hexagonal stems with narrow sub-herbaceous wings, is a little collected plant with an interesting distribution. This species, previously known from Bahia, Brazil (type) and Amazonian Perú and nearby Bolivia, has recently been confirmed as occurring in Africa (which will be fully documented in a forthcoming treatment of the Old World species of Mikania). Additional studies have confirmed the occurrence of this species in Parana and Amapa, Brazil, the Guianas and Venezuela. Comparison of M. microptera with the Venezuelan endemic, M. hexagona, showed the two uncomfortably close, apparently inseparable except by distribution. No differences can be noted in Robinson's (1911) original description or later (1922) work concerning these two plants. The two were never noted as being similar by Robinson and appear to be separated primarily on phytogeographic grounds; the same species was thought to be unlikely to occur in two widely separated areas. Unfortunately, these areas were more often artificial than vegetational or physiographic and the discontinuities more likely due to inadequate collecting. This is clearly shown in comparable cases in Robinson's (1934) later treatment of M. hookeriana DC. and M. vitifolia DC. and in Steyermark's (1953) treatment of M. banisteriae DC. With the increased knowledge of the

distribution of M. microptera in Brazil, the Guianas, Peru, Bolivia, Venezuela, and Africa, there can be little doubt that the name M. hexagona should be considered nothing more than a synonym of M. microptera.

South American specimens examined: BOLIVIA: Santa Cruz: Prov. Florida, Bermejo, valley of Río Bermejo, 30 km e of Samaipata, 800 m, Sept. 9-11, 1947, R. F. Fosberg 28640 (US). La Paz: near Yungas, 6000 ft., 1885, H. H. Rusby 1645 (F, K, MICH, US). BRAZIL: Amapá: Río Araguari, Sept. 11, 1961, Pires, Rodrigues & Irvin 50868 (NY, US). Paraná: Campina Gde do Sul, Rod. Br-2, Ribeirão do Cedro, Sept. 17, 1961, G. Hatschbach 8295 (RB). Location unknown: Riedel 913 (GH, P). GUYANA: Mazaruni-Potaro: upper Mazaruni River, Sept. 22-Oct. 6, 1922, J. S. De La Cruz 2121 (F). North West: Amakura River, March 23-30, 1923, J. S. De La Cruz 3445 (F, US). Exact Location unknown: 1837, Schomburgk 321 (F, K). PERU: Loreto: Gamitanacocha, Río Mazan, 100-125 m, Feb. 28, 1935, J. Schunke 386 (US). Exact Location unknown, Poeppig 2335 (P). SURINAM: Saramacca: in vic. cataractarum Raleigh fluminis Sup. Coppename, Sept. 11, 1961, W. H. A. Hekking 1008 (US). VENEZUELA: Delta Amacuro: downstream from mouth of Yarakita River, Río Amacuro, Sierra Imtaca, 65-80 m, Nov. 9, 1960, Steyermark 87453 (NY, UC).

MIKANIA OCHROLEUCA Robinson, Contrib. Gray Herb. 80: 38. 1928.

Type: Brazil: Seringal S. Francisco, Rio Acre, July 1911, E. Ule 9886 (K).

The discovery of this plant in Perú is noteworthy since it was previously known only from the type collected in adjacent Brazil. The species is characterized by its spicately disposed heads and triangular leaves with hastate bases. Although the type material was not seen, the material cited below matches well the original description and the description and drawings of Barosso (1959).

Specimen examined: PERU: Cuzco: Quispicanchis, entre Inambari y 15 Mil, 500-650 m, Sept. 3, 1965, C. Vargas C. 16528 (US).

MIKANIA SIMPSONII Holmes & McDaniel, Phytologia 37: 473. 1977.

Type: PERU: Loreto: Maynas. Dtto. Alto Nanay. trail near Santa María de Nanay, March 4, 1968, Donald R. Simpson 781 (US).

A well marked species with whorled leaves of ovate shape and long tapering apices. It was previously known only from the type; additional species cited below extend its

distribution into Colombia as well as the department of Amazonas, Perú.

Specimens examined: COLOMBIA: Putumayo: Rfo San Miguel o Sucumbios, Santa Rosa y los alrededores, 380 m, April 7-8, 1942, R. E. Schultes 3628 (GH); Umbria, 0°54' N, 76°10' W, 325 m, October-November, 1930, G. Klug 1825 (F, GH); Rfo San Miguel en el afluyente izquierda Quebrada de la Hormiga, 290 m, December 17, 1940, J. Cuatrecasas 11145 (F). PERU: Amazonas: Quebrada Huampamí, Rfo Cenepa, 700-800 m, March 12, 1973, E. Ancuash 126 (IBE).

MIKANIA SZYSZYLOWICZII Hieron., Bot. Jahrb. 36: 475. 1906.

Type: PERU: Cajamarca: near Tambillo, von Jelski 681 (B-destroyed?, GH-fragment, F-photo!).

Mikania szyszyłowiczii is a relatively little known plant of the eastern slopes of the Peruvian Andes, and now adjacent Ecuador, known to occur to about 3000 m elevation. It is a somewhat woody, glabrous liana to subshrub and the only known Peruvian Mikania with spicately disposed heads possessing ovate to obovate leaves with rounded apices and cuneate bases. The Ecuadorian specimen, the first of this species from outside Perú, is annotated as this species by Julian A. Steyermark. This note is added here because no published record of its occurrence in Ecuador is available. The herbarium label, handwritten in pencil, is nearly unreadable, but interpreted as accurately as possible.

Specimens examined: ECUADOR: Zamora Ibaico (?), 2250-2300 m, July 17, 1946, R. Espinosa 663 (F). PERU: Amazonas: Bongara, Jalco zone, 3 km s of Pomacocha, June 20, 1962, Wurdack 976 (US). Huanuco: Carpish, above Acomayo, July 17, 1964, Hutchinson & Wright 5949 (F, US). Junin: La Merced, August 1947, Soukup 3370 (F). San Martín: Zepalacio, near Moyobamba, December 1933, G. Klug 3412 (F, MO).

MIKANIA BROOKSII Holmes & McDaniel, sp. nov.

Suffrutex volubilis; foliis ovatis, ad 8 cm longis et 6 cm latis, apice acutis ad acuminatis, basi obtusis ad truncatis, marginibus integris; inflorescentiis corymbosis; capitulis ca 7 mm longis; corollis ca 3.5 mm longis, dentibus limbi deltatis, ca 0.3 mm longis; acheniis ca 3 mm longis; pappi setis ca 40-45, ca 3.5 mm longis, scaberulis.

Subligneous liana, stems terete, somewhat puberulent-scabrid, sparsely glandular, internodes to ca 10 cm long. Leaves ovate to broadly ovate, to 8 cm long and 5 cm wide,

bases obtuse to truncate, apices acute to acuminate, above somewhat scabrid, with whitish pustules, the major veins crisped-puberulent, pinnately nerved with 2 pairs of secondary nerves separating within the basal 1/3 of the leaf, the primary and secondary veins prominent, the others obscure, margins entire, below lighter, puberulent, all veins exerted, petiole ca 5-6 mm long, tomentulose-puberulent, thickish. Inflorescence a panicle of oppositely borne corymbs, ca 11 cm long and 8 cm in diameter, each corymb ca 2 cm long and 4 cm in diameter, branching dichotomously, branchlets terete, densely crisped-puberulent, glandular. Heads sessile to very shortly pedicellate, ternately disposed, ca 7 mm long, exterior bract ovate-obovate to broadly elliptic, 2.5 mm long, somewhat petiolate, apices rounded, irregularly ciliate, the midvein prominent, 1/2-1/3 the length of the involucre, sparingly glandular. Involucral scales elliptic-oblong, 4-4.5 mm long, apex rounded, somewhat pubescent toward the base and apex, 3-5 obscurely visible veins present. Corolla violet, ca 3.5 mm long, tube and throat indistinguishable, teeth deltoid, ca 0.3 mm long, glandular. Achene (slightly immature) ca 3 mm long, greenish. Pappus bristles ca 40-45, white, ca 3.5 mm long, scabrid, thinner toward the tips. Stigmatic appendages densely hirsute.

Holotype: PERU: Loreto. Prov. Maynas. Dtto. Iquitos. Rfo Momón (trib. Rfo Nanay), Santa Rosa, January 3, 1978, McDaniel, Rimachi & Brooks 21387 (IBE). (fragment and photos to be distributed).

Mikania brooksii is closely related to M. parviflora (Aubl.) Karts. as shown by the ternately disposed, mostly sessile heads and more or less ovate petiolate exterior bracts. The new species is distinguished by its much shorter petioles of about 5-6 mm long and smaller heads about 7 mm long. Mikania parviflora has heads ca 9-10 mm long and petioles greater than 10 mm long, normally to ca 5 cm long. Mikania brooksii is also closely related to M. pycnadenia Robinson, but lacks the multitude of dense orange-reddish punctate glands of that species.

MIKANIA ALATA (Mey.) DC., Prodr. 5: 197. 1836.

The discovery of a plant (McDaniel & Rimachi 18963) meeting the salient diagnostic characters of Mikania alata (Mey.) DC. (sensu Barroso, 1959) prompted investigation into the legitimacy of the epithet alata. The name M. alata is based upon Kleinia alata G. F. W. Mey., Prim. Fl. Esseng. 249. 1818. The decision of DeCandolle to merge the dubious genus Kleinia in Mikania is apparently based upon description alone, since no type or authentic material was cited or has

been located. Undoubtedly, without seeing a specimen, it was placed in the genus Mikania on the premise that it could be that genus, but the presence of 4-5 involucre scales, plus an exterior bract, left much doubt as to its true identity, hence the use of a question mark by DeCandolle. Other than the possible difference in the number of involucre scales, which if true could make the plant something other than a species of Mikania, the plant called M. ?alata has no described differences from the well-known, widespread and polymorphic M. micrantha HBK. Robinson (1934), noting the similarities of the descriptions of these two plants, refused to accept the slightly older epithet alata in place of micrantha. This was based on the lack of type or authentic material and possibly the discrepancy in number of involucre scales. Until such time as type material is discovered and available, the name M. alata is, as Robinson (1934) pointed out, best treated as a doubtful synonym of M. micrantha.

Baker (1876) treated Mikania alata as a variety of M. scandens (L.) Willd. His description of var. alata is nearly identical to that of M. alata of DeCandolle. In addition he cited as specimens, Spruce 983, 458, and 1615. Barroso (1959) citing Spruce 983, treated it as a distinct species, separating it from M. micrantha by the lack of glands on the achenes and by the winged angles of the achenes, both not characteristic of M. micrantha. Examination of Spruce 983 (F), which is essentially identical to McDaniel & Rimachi 18963, certainly showed the plant to be different from M. micrantha, mainly in having slightly larger heads and involucre scales and with the corolla teeth ca the same length as the throat proper (M. micrantha has corolla teeth much shorter than the throat proper). However, the winged condition of the achenes appears mainly on the immature ones and under careful examination the achenes are sparsely glandular, especially toward the summit.

Since the plant referred to as M. scandens var. alata by Baker and M. alata (Mey.) DC. (sensu Barosso), although distinct from any known species of Mikania is, as best be determined, not a proper use of the basionym alata, and hence must be renamed. Since we reached this decision, we have both had the opportunity to see the plant in the field further confirming its very ample distinctiveness. We therefore describe it as new below.

MIKANIA RIMACHII Holmes & McDaniel, sp. nov.

Suffrutex volubilis; foliis ovatis, ad 14 cm longis et 10 cm latis, apice acuminatis, basi cordatis vel rotundatis, marginibus integris; inflorescentiis corymbosis cymis; capitulis ca 7 mm longis; corollis ca 3.5 mm longis, dentibus

limbi triangularibus, ca 1 mm longis, achaeniis ca 3 mm longis; pappi setis ca 32, ca 3.5 mm longis, barbellatis.

Liana, stems terete, weakly striate, glabrous, distinctly ligneous and lenticellate near base, internodes to 11 cm or more long. Leaves broadly ovate, to ca 14 cm long and 10 cm wide, margins entire, apices acuminate, bases shallowly cordate or rounded, upper surfaces glabrous, palmately 5-7 nerved, lower surfaces sparsely muricate, lighter than above, petioles to ca 6 cm long, glabrate. Inflorescence a somewhat cymose corymb, to ca 10 cm long and 13 cm in diameter, branchlets angular-winged, lightly puberulent, reddish, pedicels ca 4 mm long, exterior bract lanceolate to ovate, ca 2.5-3 mm long, glabrate to lightly puberulent, often reddish, apices acute to acuminate, borne at the top of the pedicel. Heads 6.5-7.5 mm long. Involucral scales linear-oblong, ca 5.5-6.5 mm long, glabrate to sparsely puberulent, especially at the base, with 1-3 obscure nerves, stramineous in color, apices acute. Corolla ca 3.5 mm long, white, tube ca 1.7 mm long, throat campanulate-funnelform ca 1.8 mm long, teeth ca 1-1.1 mm long, ca the same length to slightly longer than the length of the throat proper, triangular. Achene ca 3 mm long, glabrous, olive green, ribs with narrow subherbaceous wings. Pappus bristles ca 32, thin, white, ca 3.5 mm long, barbellate.

Holotype: PERU: Loreto. Prov. Maynas. Dtto. Indiana. ca 3 km up Río Amazonas from Indiana on opposite bank, open sandy alluvial area subj. to inundation, May 26, 1978, McDaniel (Rimachi, Holmes & Bruza) 21646 (IBE) (isotypes to be distributed to AMAZ, F, MO, NATC, NY, USM and numerous other herbaria).

Paratypes: BRAZIL: Para. Shore of the Amazon opposite Santarem, twiner hanging in great masses, July, 1850, Spruce 983 (F, GH); PERU: Loreto. Prov. Maynas. Dtto. Mazán. Río Napo near Mazán, overflowed bank, 110 m, January 29, 1932, Ynes Mexia 6467 (F, GH, MICH, MO, NO, NY, PH, TEX, UC). Dtto. Iquitos. Río Amazonas se of Iquitos across from Padre Isla, near sacarita de Yanayacu, July 5, 1974, McDaniel & Rimachi 18963 (IBE, NATC, other duplicates to be distributed), Iquitos, Ushpa-Caña, across Río Itaya, 100-120 m, August 20, 1968, McDaniel 10879 (IBE, NATC).

Mikania rimachii is similar to the more common M. micrantha. It can be distinguished by the somewhat less cordate leaves, linear-oblong involucral scales of about 5.5-6.5 mm long, corolla teeth about the same length or slightly longer than the throat proper and achene with narrow subherbaceous wings on the angles (ribs), most readily discernible on the immature achenes. Mikania micrantha has ovate-



oblong involucre scales about 3-4 mm long, corolla teeth about one-half the length of the throat proper and lacks the narrow subherbaceous wings on the angles of the achenes. In the field the new species may be distinguished from M. micrantha by its thicker, somewhat fleshy, moderately cordate to rounded at the base leaves, the ligneous older stems, and the cream white corolla. Mikania rimachii may be distinguished from M. cordifolia and M. microptera, both with similar foliage, inflorescence, and corolla teeth about as long or longer than the throat proper, by its lack of hexagonal stems, characteristic of the latter two species.

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## BOOK REVIEWS

Alma L. Moldenke

"RARE TROPICAL TREES OF SOUTH FLORIDA" by Elbert L. Little, Jr., 22 pp. & 6 b/w plates of line drawings & photographs. Conservation Research Report No. 20, U. S. D. A. Forest Service, Washington, D. C. 20250. Distributed by U. S. Government Printing Office, Washington, D. C. 20402. 1976. 45 cents paperbound.

Since this area "has the greatest collection of rare native trees anywhere in the Continental United States [ca. 100 spp.]... this compilation of about 60 species of rare tropical trees of the three southernmost counties summarizes their distribution and shows their occurrence within parks and other preserves." The leafy and flowering or fruiting twig drawings are excellent. Dendrologist Little's recent volume on the distribution maps of Florida trees makes an excellent companion for this booklet.

"BEHOLD MAN — A Photographic Journey of Discovery Inside the Body" by Lennart Nilsson & Jan Lindberg with text translated by Ilona Munck, 254 pp., 283 color & 45 b/w photographs & 41 line drawings. Little, Brown & Co., Toronto, New York & Boston, Massachusetts. 1974. \$25.00.

Only a highly skilled and artistic photographer could make this "book journey" such an awe-inspiring treat as parts are seen system by system through interference, electron and optical microscopes with very dramatic light effects. Several of the exquisite fetal views will be recognized as from the pages of "LIFE" magazine and "A Child is Born" of some years back. The accompanying text and legends explain and/or describe the plates with many interesting tidbits of information. The esophagus or gullet is skipped in food passage from the pharynx to the stomach on p. 22, "cartilage and connective tissue" appear on p. 121, chromosomes "split" instead of replicate on p. 30, the explanation for "outward resemblance between embryos of different animal species" says nothing on p. 84. Whether such slips are due to the original authors in Swedish or to the translator I could not check. A Swedish edition of the book appeared a year prior to this translation. For the student of the life sciences, for the bio-scientist of so many kinds, for the local and school libraries and for the coffee table this book is an excellent choice.

"RUST FUNGI on Legumes and Composites in North America" by George B. Cummins, xii & 424 pp., 338 groups of b/w line drawings. University of Arizona Press, P. O. Box 3398, Tucson, Arizona 85722. 1978. \$8.95 paperbound.

This descriptive manual is for 22 genera and their 355 species in the Uredinales that parasitize many members of the two largest dicot families including important crops and some pest plants. The keys to genera and species seem clearcut and workable. The illustrations are helpful because they have all been drawn precisely to scale on graph paper. Beneath each are given the scientific name, author with source and sometimes synonymy, technical description, host(s) and distribution, and location of the type. This book is a careful text for mycologists and mycology students, teachers, agriculturists, inspectors and farmers with advanced training.

"GUIDE TO THE POISONOUS AND IRRITANT PLANTS OF FLORIDA" by Kent D. Perkins and Willard W. Payne, 88 unnumbered pp. Circular 441, Florida Cooperative Extension Service, University of Florida, Gainesville, Florida 32611. 1978. Paperbound.

In tabular form for 500 vascular native, naturalized, introduced or cultivated plants entries are arranged alphabetically by scientific name with common name, family and bibliographic references, toxic parts and irritants, kind of plant, effects and remarks. This information has been culled from over 630 sources and arranged very efficiently. As an important educational and potentially life-saving effort "single copies are free to residents of Florida and may be obtained from the County Extension Office. Of course, this study is useful in other subtropical areas where so many of these plants also grow.

"THE ILLUSTRATED BIRD" edited by Maggie Oster & designed by Sonja Douglas, 80 pp., 36 color & 7 b/w full plates, 2 color & 57 b/w illus. Tree Communications Edition for Dolphin Books, Doubleday & Co., Inc., Garden City or New York, N. Y. 10003. 1978. \$6.95 paperbound oversize.

This beautiful publication should prove a treasure trove for bird and art lovers, especially since 30 different well-known birds are shown in color plates very beautifully by many great artists over a great span of time and styles. Descriptive text adds literature sources, lore and natural history in charming fashion.

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*Designed to expedite botanical publication*

Vol. 41

January 1979

No. 4

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SUPPLEMENTARY NOTES ON THE AMERICAN SPECIES

OF STRYCHNOS. XVII.

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Botanical Garden.

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Introduction

The first comprehensive treatment of American species of Strychnos was that of Progel in Martius, Flora Brasiliensis (11). It covered 27 Brazilian species now recognized as valid (including four now known under different names).

A monograph of American species by myself & J. Monachino published in 1942 (6) covered 44 species recognized as valid.

The second comprehensive paper, Supplements VIII and IX, by myself & R. Barneby was published in 1969 (7 and 8). In these two papers, published together, we summarized information which had appeared in short articles between 1943 and 1965 (Supplements I to VII inclusive) and for the first time studied carefully the fruits which are so important for characterization of several species. As a result of intensive field work from

1948 to 1963 largely by Adolpho Ducke and my former field assistant, Ricardo de Lemos Fróes, immense amounts of new material (1202 collections), many in fruit, were examined in 54 herbaria. This paper covered 71 species and 2 varieties, of which only one species (*S. longisepala*) has since been reduced to synonymy. This is the most comprehensive paper on the American members of the genus ever published.

A third extensive paper was published by me in 1972 (9) summarizing knowledge acquired in studies that lasted from 1941 to 1948 and again from 1963 onward. No new species were described and no nomenclatural innovations were proposed in this paper, but it is a compact and useful treatment and I am using it extensively in routine work. Incidentally, in this paper I prepared for the first time up to that date List of Exsiccatae and Keys based on flowers as well as on sterile and fruiting material.

In the present paper I plan to bring up to date the information accumulated in Supplements XII to XVII inclusive. In this period 525 new collections were examined, seven new species were described (for a list of them, see Appendix VIII), extension of ranges were recorded for 78 species and several species collected in flower or in fruit for the first time had been described. As of today 77 species and 2 varieties are recognized by us as valid. This is my last fairly extensive paper on American species of *Strychnos* and is supplementary to that published in *Lloydia* in 1972. There is no duplication of information in these two papers. They are the only two which are needed for routine work on the genus and there will not be sufficient new information available for at least 10-15 years to justify writing another extensive paper. Having reached 80 years recently it is unreasonable to expect that I will live that long. Naturally as long as I live I probably will routinely identify new collections, publish the description of new species, etc. It is most unfortunate that up to date I did not get a promise from Rupert Barneby to continue working on the genus extensively.

The next extensive paper should cover American species for Flora Neotropica (family *Strychnaceae* as interpreted by Hutchinson). This should be published when at least one half of the species ( $\pm 5$ ) which are presently known only from a single collection will have been recollected and at least one half of species ( $\pm 7$ ) known only from flowering or fruiting material will be fully known. I hope the person who will write the account of *Strychnos* for *Flora Neotropica* will have extensive field experience on the Amazon which is the center of the genus in the Western Hemisphere. Adolpho Ducke had the same opinion, that *Strychnos* should not be studied by taxonomists without extensive



field experience on the Amazon. (5: 8). This does not apply to Rupert Barneby. As he was working with me on Strychnos since 1963 onward he could write the genus for Flora Neotropica without field work on the Amazon and without visiting various herbaria.

In addition to the two above-mentioned papers which bring the information on Strychnos up to date, three things will facilitate the future monographer for Flora Neotropica.

1. up-to-date identifications of all specimens annotated by me in 54 herbaria.
2. two up-to-date card files, one listing all collections seen by me by species and another by collectors.
3. special files with posted information for each species.

According to my formal agreement with New York Botanical Garden the card files and special file cannot be sent on loan but will be available at NY to qualified persons.

Special mention should be made of the specimens of Strychnos which were received recently from Ceplac, Itabuna, Bahia, collected mostly by T. S. Santos. This is a most interesting collection as, with the exception of specimens collected by Fróes in my service in 1943 and extensive collection of R. P. Belém who collected with financial support and at my request, we have practically no material of Strychnos from this area. From the collection of R. P. Belém, we described 5 new species and one more is described in this paper. These are mostly endemic to coastal forests of Bahia, some extending probably to neighboring coastal Espirito Santo and/or Pernambuco. These are S. romeu-belenii, S. bahiensis, S. setosa, S. atlantica, S. recognita and S. alvimiana.

The State of Bahia is of particular interest as far as Strychnos is concerned as, in addition to the species mentioned above in the northern part of Bahia along the rivers, some Amazonian species (S. peckii, S. mitscherlichii var. mitschlerlichii and S. mattogrossensis) occur. In the southern part of Bahia near the boundary line with Espirito Santo are some species extending north from Rio de Janeiro and Espirito Santo (S. trinervis and S. gardneri). In the western dry part of Bahia in cerrados, caatingas, chapadas, etc., are found species which abound in Central Brazil (S. rubiginosa and S. parvifolia).

In the studies of American species of Strychnos I was fortunate that two excellent taxonomists (N. Y. Sandwith and Adolpho Ducke) were also interested and actively engaged in the

study of this genus. (See their papers 1, 2, 3, 4, 5, 12 and 13). They referred to our work both in print (3:1 and 5:6) and in private correspondence (now on deposit with my files at Smithsonian Institution) and except for minor disagreements with Ducke we saw eye to eye in understanding of various species. I was also very fortunate that since 1963 Rupert Barneby was my co-author. His advice in difficult cases was especially helpful. My former assistant, Ricardo de Lemos Fróes, probably unequalled by anyone as a collector in the Brazilian Amazonia, continually searched for Strychnos until his untimely death on Nov. 14, 1961. This is the reason why so few new species were found in that region.

Supplement to the Keys published in Lloydia, 1972 (9)

Comprehensive keys based on flower characters were published in 1972 (9: 209-213, 234-235, 241-243, and for fruit or sterile material 254-261). The proper time to prepare new keys will come when the 7 new species described subsequently are known both in flower and in fruit. In the meantime a supplement to the above keys is given describing how the new species can be distinguished from species included in the keys.

Sect. Strychnos

32a. S. croatii Krukoff & Barneby - Suppl. #14 - Phytologia 33:313. 1976.

It closely resembles S. erichsonii in vegetative characters. It has axillary inflorescences but its flowers are not yet known. The blades of S. erichsonii have dots, sometimes obscure, and are universally puberulent with very short adpressed hairs below; they are usually tuberculate to blistered above, whereas in S. croatii the blades have no dots, are essentially glabrous in all parts (occasionally puberulent on principal nerves near the base below) and are usually not tuberculate to blistered above.

S. croatii is immediately distinguished by its larger fruits, up to 8 not 3.5 cm in diam as in S. erichsonii. It is very likely that the ranges of the two species do not overlap as S. croatii is probably confined to Panama (to the south of the Canal Zone) and the adjacent Chocó in Colombia.

38a. S. ecuadoriensis Krukoff & Barneby - Suppl. #16 - Phytologia 39:276. 1978.

Known only from Napo, Ecuador (alt. +340 m). Its fruits are not yet known. The following combination of characters distinguishes S. ecuadoriensis from all known species of

section Strychnos: inflorescences axillary, style glabrous, calyx-lobes linear-lanceolate and corolla-tube glabrous inside. The sterile specimens are distinguished by the following characters: leaf-blades are essentially glabrous above and beneath, dull, membranaceous to chartaceous, not verrucular above or below, not barbate and without a membranaceous pocket beneath in axils of the inner principal nerves, essentially 3-plinerved.

Sect. Rouhamon (Aublet) Progel

44a. S. cayennensis Krukoff & Barneby - Suppl. #13 - Phytologia 27:101. 1973.

Known only from Montagne Boeuf Mort, Saül, French Guiana. Mature fruits are not known. S. guianensis, to which S. cayennensis is closely related, is extremely polymorphic in vegetative characters but it always has a glabrous style and ovary. Of the 4 species of Sect. Rouhamon with pilose style, S. hirsuta, unlike S. cayennensis has hirsute leaves, S. cogens and S. goiasensis have glabrous ovary, while S. melinoniana has leaves with principal nerves raised above (not deeply impressed).

Sect. Breviflorae Progel

53a. S. setosa Krukoff & Barneby

Probably endemic to coastal Bahia and adjacent Expirito Santo. Fruits are not known. This is immediately distinguished from all species of Sect. Breviflorae as its branchlets, petioles and blades beneath (especially on principal nerves) are hirsute with long (up to about 1 mm) rusty straight hairs. In vegetative characters it very closely resembles S. toxifera of Sect. Strychnos.

57a. S. recognita Krukoff & Barneby - Suppl. #13 - Phytologia 27:103. 1973.

Probably confined to the States of Bahia and Expirito Santo. Fruits are not known. In the diagnosis S. recognita was compared to S. fulvotomentosa, which it resembles in its terminal inflorescence and short style, characters common to members of Sect. Breviflorae. It differs from S. fulvotomentosa in its densely congested inflorescence and in the deeply impressed primary and secondary nerves of the mature leaf-blades. Leaves of this type are unknown elsewhere in Sect. Breviflorae but are very closely matched by leaves of S. solimoesana, an allopatric (Amazonian) member of Sect. Strychnos with the axillary inflorescences of its group.

- 66a. S. alvimiana Krukoff & Barneby - Supplement #13 -  
Phytologia 27:105. 1973.

Probably endemic to coastal Bahia and adjacent Expirito Santo. The corolla is not yet known. Related to S. nigricans and S. cerradoensis but immediately distinguished by the extremely long calyx (4-4.5 mm), the tube +0.8 mm, and the narrowly lance-acuminate lobes +3.-3.5 x 0.4-1.6 mm, minutely puberulent along margins, otherwise glabrous. Shells of fruit of this species are very thick (+5 mm), as is the case with the two species last mentioned, and the Central American S. brachistantha.

71. S. schunkei Krukoff & Barneby - Suppl. #12 - Phytologia 27:53. 1972.

Known only from San Martín, Peru. Of 25 known species of Sect. Breviflorae 13 (S. fendleri, S. atlantica, S. rubiginosa, S. fulvotomentosa, S. acuta, S. brasiliensis, S. grayi, S. brachistantha, S. nigricans, S. cerradoensis, S. recognita, S. alvimiana and S. setosa) do not occur in the Amazon basin and of these only S. acuta resembles somewhat S. schunkei in its vegetative characters.

S. parviflora is immediately distinguished from S. schunkei by its axillary inflorescences; S. poeppigii, S. schultesiana and S. malacosperma by their glabrous linear-lanceolate calyx-lobes, 2.5--3 mm long; S. castelnaeana and S. progeliana by their leaves densely pubescent beneath; S. parvifolia by its leaf-blades being conspicuously verrucular on nerves and veinlets and often subciliate; S. pachycarpa and S. neglecta by the corolla-tube equal or longer than the lobes; S. oiapocensis by its inflorescences being congested and in spherical clusters even at anthesis; S. mattogrossensis by its lanceolate to ovate-acuminate calyx-lobes, 0.9--1.5 x 0.4--0.5 mm, corolla-tube 0.75--0.9 mm, anthers 0.55-0.6 mm long, leaf-blades beneath usually with membranaceous pockets in axils of the inner principal nerves; moreover it is a woody vine provided with tendrils and spines.

S. schunkei is related to S. tarapotensis from which it is immediately distinguished by much larger leaf-blades (2.3--6 x 1--2.8 cm) and the absence of membranaceous pockets beneath in axils of the inner principal nerves.

#### TENDRILS AND SPINES

##### I. Section Strychnos L.

Spineless bush-ropes with tendrils (S. pseudo-quina is a

tree devoid of tendrils and the only species of this section armed with spines). Tendrils were not seen in S. lobelioides and S. ecuadoriensis but expected to occur.

In identifying specimens it is helpful to remember that if spines are present then the specimen is of Sect. Breviflorae unless it is of S. pseudo-quina or of a new species.

## II. Section Rouhaman (Aublet) Progel

Spineless bush-ropes or small woody vines with tendrils (S. hirsuta is a small shrub devoid of tendrils and spines, whereas S. progeliana is a shrub and the only species in this section armed with spines, tendrils in this species not seen). Tendrils were not seen also in S. goiasensis, S. cayennensis and S. duckei but expected to occur.

## III. Section Breviflorae Progel subsection Breviflorae

Spineless bush-ropes with tendrils (S. parviflora, S. castelnaeana, S. fulvotomentosa, S. acuta; small or large woody vines with spines and tendrils (S. atlantica, S. rubiginosa, S. parvifolia, S. recognita and S. grayi); shrubs devoid or with very rudimentary tendrils, armed with spines (S. oiapocencis); shrubs or small vines armed with spines and devoid of tendrils (S. progeliana, S. fendleri and S. brasiliensis). In S. setosa neither tendrils nor spines were seen.

S. parvifolia in the southern part of its range and certain forms of an extremely variable S. brasiliensis are difficult to tell apart. If a given specimen has tendrils then it is of S. parvifolia.

## Section Breviflorae Progel subsection Eriospermae Krukoff & Barneby

Spineless bush-ropes with tendrils (probably S. pachycarpa and S. neglecta on which neither tendrils nor spines were seen); bush-ropes with both spines and tendrils (S. brachistantha, S. nigricans, S. mattogrossensis, S. schultesiana and S. malacosperma); small vines armed with spines and devoid of tendrils (S. cerradoensis, S. alvimiana, S. poeppigii and S. tarapotensis). In S. schunkei neither tendrils nor spines were seen.

### Types of tendrils and species armed with spines

In Supplement XI (Phytologia 22: 226-231. 1971) we published a study by Rupert Barneby of tendrils of different species. Below is given additional information for species for which this information was not available. Only specimens deposited at NY

were examined. See also Phytologia 33: 306. 1976 for Richard Wunderlin's discussion of tendrils in Bauhinia and Strychnos. I list here also all species in which spines were seen.

### I. SECTION STRYCHNOS L.

3. colombiensis - Type II - Dudley 11486.
4. asperula - Type II - Maguire 56779.
9. araguaensis - Type I - Harvey et al. 10811, Prance 25307.
25. pseudo-quina - tendrils none (a tree with spines and without tendrils).
26. xinguensis - Type I - Prance 22506.
30. lobeliodes - tendrils expected to occur; not seen as yet.
- 32a. croatii - Type I - Forero 1310, 1524.
- 38a. ecuadoriensis - tendrils and spines not seen.

### II. SECTION ROUHAMON (AUBLET) PROGEL

44. goiasensis - tendrils expected to occur; not seen as yet.
- 44a. cayennensis - tendrils expected to occur; not seen as yet.
45. duckei - tendrils expected to occur; not seen as yet.
51. progeliana - tendrils not seen; shrub armed with spines.

### III. SECTION BREVIFLORAE PROGEL SUBSECTION BREVIFLORAE

52. oiapocencis - Oldeman 2614 deposited at P has a weak solitary tendril opposed to a developed leaf.
53. fendleri - small tree devoid of tendrils and armed with spines.
- 53a. setosa - neither tendrils nor spines seen.
55. rubiginosa - provided with tendrils and spines.
- 57a. recognita - some of the tendrils are opposed to developed leaf, while others are modified from one of the first branches of the cymose inflorescence; the only American species of Strychnos with stems armed with spines.
59. brasiliensis - shrub devoid of tendrils and armed with spines.

### SUBSECTION ERIOSPERMAE KRUKOFF & BARNEY

61. pachycarpa - probably spineless bush-ropes with tendrils; neither tendrils nor spines seen.
62. neglecta - probably spineless bush-ropes with tendrils; neither tendrils nor spines seen.
66. cerradoensis - armed with spines and devoid of tendrils.
- 66a. alvimiana - vine armed with spines and devoid of tendrils.
68. malacosperma - small bush-ropes provided with tendrils and spines.
70. tarapotensis - small shrub armed with spines and devoid of tendrils.
71. schunkei - neither tendrils nor spines seen.

## CHEMICAL STUDIES OF AMERICAN SPECIES OF STRYCHNOS

In 1972 G. B. Marini-Bettolo and N. G. Bisset published account of chemical studies on the alkaloids of the American species (9:195-202). A list of Strychnos species studied chemically since the early thirties was also published in the same paper covering 36 species and 1 variety (p. 207).

Below is given a supplementary list of species which were studied chemically since 1972 and those which were not studied as yet.

## SECT. STRYCHNOS L.

- |      |  |   |
|------|--|---|
| 2.   | <u>ramentifera</u> Ducke                                     | -not studied as yet.  |
| 3.   | <u>colombiensis</u> Krukoff & Barneby                        | - " " " "   |
| 4.   | <u>asperula</u> Sprague & Sandwith                           | - " " " "   |
| 8.   | <u>barnhartiana</u> Krukoff                                  | - " " " "   |
| 9.   | <u>araguaensis</u> Krukoff & Barneby                         | - " " " "   |
| 10.  | <u>brachiata</u> Ruiz & Pavon                                | -Marini-Bettolo et al.<br>See Suppl. XIV, p.322.  |
| 15.  | <u>bahiensis</u> Krukoff & Barneby                           | -not studied as yet.  |
| 16.  | <u>eugeniaefolia</u> Monachino                               | - " " " "   |
| 17.  | <u>krukoffiana</u> Ducke                                     | - " " " "   |
| 18.  | <u>medeola</u> Sagot   | -Marini-Bettolo et al.<br>See Suppl. XIV, pp.<br>310 & 322.                               |
| 26.  | <u>xinguensis</u> Krukoff                                    | -not studied as yet.  |
| 27.  | <u>amazonica</u> Krukoff                                     | -Marini-Bettolo et al.<br>See Suppl. XIV. See<br>pp. 312 & 322 for<br>additional studies. |
| 29.  | <u>froesii</u> Ducke   | -Marini-Bettolo et al.<br>See Suppl. XIV. See<br>pp. 312 & 322 for<br>additional studies. |
| 30.  | <u>lobelioides</u> Krukoff & Barneby                         | -not studied as yet.  |
| 32a. | <u>croatii</u> Krukoff & Barneby                             | - " " " "   |
| 34.  | <u>pubiflora</u> Krukoff                                     |   |
| 35.  | <u>bredemeyeri</u> (Schultes) Sprague<br>& Sandwith          | - " " " "   |
| 36b. | <u>mitscherlichii</u> var. <u>pubescentior</u> -<br>Sandwith | - " " " "   |
| 38.  | <u>dariensis</u> Seemann                                     | " " " "   |
| 38a. | <u>ecuadoriensis</u> Krukoff & Barneby                       | - " " " "   |

## SECT. ROUHAMON (AUBLET) PROGEL

- |      |                                      |                      |
|------|--------------------------------------|----------------------|
| 42.  | <u>bicolor</u> Progel                | -not studied as yet. |
| 43.  | <u>panurensis</u> Sprague & Sandwith | - " " " "            |
| 44.  | <u>goiasensis</u> Krukoff & Barneby  | - " " " "            |
| 44a. | <u>cayennensis</u> Krukoff & Barneby | - " " " "            |
| 45.  | <u>duckei</u> Krukoff & Monachino    | - " " " "            |

## SECT. BREVIFLORAE PROGEL SUBSECTION BREVIFLORAE

49.	<u>parviflora</u> Spruce	-not studied as yet.
51.	<u>progeliana</u> Krukoff & Barneby	- " " " "
52.	<u>oiapocencis</u> Froes	- " " " "
53.	<u>fendleri</u> Sprague & Sandwith	-Marini-Bettolo et al. See Suppl. XIV, p.316 & Suppl. XV, pp.21 & 22.
53a.	<u>setosa</u> Krukoff & Barneby	-not studied as yet.
55.	<u>rubiginosa</u> DeCandolle	- " " " "
57a.	<u>recognita</u> Krukoff & Barneby	- " " " "
60.	<u>grayi</u> Grisebach	- " " " "

## SECT. BREVIFLORAE SUBSECTION ERIOSPERMAE KRUKOFF &amp; BARNEBY

62.	<u>neglecta</u> Krukoff & Barneby	-not studied as yet.
63.	<u>brachistantha</u> Standley	- " " " "
64.	<u>nigricans</u> Progel	- " " " "
65.	<u>mattogrossensis</u> S. Moore	- " " " "
66.	<u>cerradoensis</u> Krukoff & Barneby	- " " " "
66a.	<u>alvimiana</u> Krukoff & Barneby	- " " " "
67.	<u>schultesiana</u> Krukoff	- " " " "
68.	<u>malacosperma</u> Ducke & Froes	- " " " "
69.	<u>poepigii</u> Progel	- " " " "
70.	<u>tarapotensis</u> Sprague & Sandwith	- " " " "
71.	<u>schunkei</u> Krukoff & Barneby	- " " " "



## Discussion of species

For information on scientific names of species, synonyms and basionyms, type localities, description of species, ecology and the chemical studies, the reader is referred to the last extensive paper on Strychnos (9).

In this paper I brought up-to-date the distribution of species and compiled Supplement to the Key published in the above referred to paper.

I. Sectio Strychnos.-T: S. nux-vomica L.

1. Strychnos chlorantha Progel in Martius, Fl. Bras.6(1):273. 1868.  
Distribution: Guatemala (Alta Verapaz); Costa Rica (Guanacaste, Puntarenas, Alajuela, Heredia and Limón); Panama (San Blas, Panamá). Doubtless occurs also in El Salvador, Honduras and Nicaragua. Known from 17 collections.
2. Strychnos ramentifera Ducke, Bull. Mus. Hist. Nat. Paris. II. 4:745. 1932.  
Distribution: Amazonian Brazil (basins of Rio Tapajós and Rio Gurupí, also near Belém and near Breves, and along the road Belém-Brasilia, km 67-93 in State of Pará; basins of the middle Rio Juruá, Rio Javari, and Rio Jutaí in State of Amazonas, and basin of the upper Rio Turí in State of Maranhão); Surinam. Doubtless occurs in French Guiana, Colombia and Peru. Known from 19 collections.
3. Strychnos colombiensis Krukoff & Barneby, Mem.N.Y. Bot. Gard. 12(1):21. 1965.

Distribution: Panama (Colón); Colombia (Chocó, Valle and Nariño); Peru (Cuzco, Loreto, Amazonas). Doubtless found in Ecuador. Known from 9 collections.

4. Strychnos asperula Sprague & Sandwith, Kew Bull. 1927: 131. 1927.  
 Peru: Madre de Dios: Parque Nacional del Manu, Río Manu, vicinity of Cocha Cashu Station, Robin B. Foster 5007 (Aug. 28, 1976, frts.) (F).

This is the first collection of this species in fruit and the first record for Peru where it was expected to occur. In my second monograph of American spp. of Strychnos (9:215) I stated: "this species doubtless occurs also in Peru and Bolivia in the region adjacent to the State of Acre."

The collectors note on the label: upland forest, liana, ripe fruit lemon yellow, eaten by Ateles and Cebus albifrons.

Fruits globose, yellowish, smooth, not sculptured, small (+ 2-1/2 cm in diam); pericarp thin, + 2 mm, seeds about 3 per fruit.

Distribution: Amazonian Brazil (basins of the middle Rio Juruá

and Rio Tonantins in State of Amazonas; basin of the upper Rio Purús in State of Acre, and basin of Rio Madeira in the Territory of Rondônia; Peru (Madre de Dios). Doubtless occurs also in Bolivia in the region adjacent to the State of Acre. Known from 7 collections.

5. Strychnos romeu-belenii Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 22. 1969.  
Distribution: Coastal Bahia, Brazil and probably extending to coastal Espirito Santo. Known from 6 collections.
6. Strychnos rondeletoides Spruce ex Bentham, Jour. Linn. Soc. 1: 104. 1856.  
Distribution: Very widely distributed in the Amazon basin, in Brazil, Venezuela (Bolívar and Amazonas), Colombia (Vaupés and Amazonas), Peru (Loreto) and Bolivia (basin of Río Mapiro, La Paz). In Brazil it has been collected in the State of Amazonas (basins of Rio Maués, of Rio Madeira, of the upper and lower Rio Negro, of Rio Jutai, of Rio Tonantins, of the middle Juruá and of the upper Rio Solimões); in the State of Pará (basins of Rio Tocantins, Trombetas, Pacajá and Muirapiranga, also along the road Belém-Brasília (km 64-92), near Portel and near Gurupá), and in the State of Mato Grosso on Serra do Roncador. Not yet collected in the Territory of Roraima or in the State of Acre where it doubtless occurs. Outside of the Amazon basin, it has been collected in the basin of Río Orinoco (State of Bolívar, Venezuela). Known from 122 collections.
7. Strychnos macrophylla Barbosa Rodrigues, Vellozia, ed. 2, 1: 33, pl. 2, fig. A. 1891.  
Distribution: Vicinity of Manaus (basin of the lower Rio Negro, Amazonas, Brazil) and basin of Rio Urubú, about 100 km to the northeast of Manaus, where it is common. Known from 20 collections.
8. Strychnos barnhartiana Krukoff, Brittonia 4:268. 1942.  
Distribution: Amazonian Brazil (basin of Rio Oiapoque in the Territory of Amapá; basin of Rio Xingú, and near Gurupá on the Rio Amazonas in State of Pará; basins of the upper Rio Negro, of Rio Tonantins, of Rio Içá, and of the upper Rio Solimões in State of Amazonas). Doubtless occurs also in adjacent Colombia, Peru and French Guiana. Known from 18 collections.
9. Strychnos araguaensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 24. 1969.  
Distribution: Amazonian Brazil (on Ilha do Marajó, Pará, basin of Rio Araguaia in the States of Pará and Goiás and basin of Rio Xingú in the State of Mato Grosso). Known from 13 collections.

10. Strychnos brachiata Ruiz & Pavón, Fl. Per. 2:30. 1799.

Distribution: Widely dispersed from sub-Andean Peru eastward to Furos de Breves in State of Pará, Brazil; Venezuela (on the upper Apure); Colombia (Boyacá, Putumayo); Peru; Bolivia (La Paz), and Brazil (basin of Rio Macacoari in Territory of Amapá, in Furos de Breves, on Rio Jarí in State of Pará, at the mouth of Rio Solimões (near Manaus), and in the basin of the middle Rio Juruá and Purús in State of Amazonas and in the State of Acre. Known from 26 collections.

11. Strychnos trinervis (Velloso) Martius, Syst. Mat. Med. Bras. 121. 1843.

Brazil: Santa Catarina: Ule 97 (US) (San Francisco), 1209 (US) (Blumenau); R. M. Klein 6987 (US) (Moro Costa da Laguna).

Distribution: Confined to the eastern states of Brazil (Paraíba, Pernambuco, Bahia, Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo, Paraná and Santa Catarina) and Bolivia (Santa Cruz). Doubtless occurs also in the States of Alagoas, Sergipe, Goiás and Mato Grosso in Brazil. Known from 141 collections.

12. Strychnos panamensis Seemann, Bot. Voy. Herald 166. 1854.

Mexico: Chiapas: T. Croat 40194 (MO) (road from Palenque to Bonampak, + 400 m), 43838 (MO). Guatemala: Zacapa: + 150 m, T. Croat 41877 (MO). Nicaragua: Matagalpa: Cordillera Dariense, + 1400 m, David Neill 3012 (MO). Costa Rica: Puntarenas: Ronald Liesner 3135 (MO) (Osa Peninsula), T. Croat 44412 (MO) (Las Cruces), Wm. Burger 10655 (F) (along Rio Barú). Panama: Canal Zone: Gene Montgomery s.n. (6/4-1976) (MO); Panama: Al Gentry 1952 (MO); Darién: Le Clezio 1 (1973) (MO).

First record of the species from Zacapa, Guatemala and Matagalpa (Nicaragua).

Distribution: Pacific coast of tropical Mexico (Sinaloa, Nayarit, Tepic, Guerrero, Oaxaca and Chiapas); Guatemala (San Marcos, Quetzaltenango, Retalhuleu, Suchitepéquez, Escuintla, Zacapa, Zacatepéquez and Santa Rosa); El Salvador (Ahuachapán, Santa Ana and San Salvador); Honduras (Yoro); Nicaragua (Matagalpa and Jinotega); Costa Rica (Guanacaste, Puntarenas, Alajuela and Limón); Panama (Coclé, Chiriquí, Canal Zone, Panamá and Darién); Colombia (Chocó, Magdalena, Santander, Antioquia and Caldas); Venezuela (Zulia, Falcón, Mérida, Barinas and Apure). Known from 191 collections.

13. Strychnos tabascana Sprague & Sandwith, Kew Bull. 1927: 128. 1927.

Mexico: Veracruz: Las Tuxtlas, G. Martínez C. 2297 (F).

Distribution: Mexico (Veracruz, Tabasco, Chiapas, Oaxaca); Belize; Guatemala (Petén, Alta Verapaz, Izabal); Honduras (Sta Bárbara, Cortés, Atlantida); and Costa Rica (Guanacaste, San

José, Alajuela). Doubtless found also in Nicaragua. Known from 82 collections.

14. Strychnos divaricans Ducke, Bull. Mus. Hist. Nat. Paris II. 4: 746. 1932.

Distribution: Surinam, French Guiana, and Brazil. In Brazil it has been collected in Pará (Jurity Velho near the boundary line with State of Amazonas and in the basin of Rio Tapajós, Rio Tocantins and of Rio Guama); Maranhão (basin of the upper Rio Pindaré), and Pernambuco. Doubtless occurs also in Territory of Amapá and in the States of Amazonas, Piauí, Ceará, Rio Grande do Norte and Paraíba. Known from 13 collections.

15. Strychnos bahiensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 29. 1969.

Brazil: Bahia: Maraú a Ubaitaba, T. S. Santos 128 (10/10-1968).

Distribution: Low coastal forests in State of Bahia and probably extending to Espírito Santo. Known from 18 collections.

16. Strychnos eugeniifolia Monachino, Phytologia 4: 209. 1953.

Distribution: Surinam, French Guiana, and Brazil (basin of Rio Oiapoque in Territory of Amapá). Known from 9 collections.

17. Strychnos krukoffiana Ducke, Trop. Woods 90: 27. 1947.

Distribution: In the vicinity of Manaus, Amazonas, Brazil. Known from two collections from the same plant.

18. Strychnos medeola Sagot ex Progel in Mart. Fl. Bras. 6(1): 282. 1868.

Distribution: Surinam, French Guiana and Amazonian Brazil (basins of Rio Tocantins, Rio Tapajós, Rio Xingú, Rio Trombetas and various other localities in State of Pará; basin of Rio Amapari and Rio Jarí in Territory of Amapá; and near Parintins in State of Amazonas). Known from 43 collections.

19. Strychnos toxifera Robert Schomburgk ex Bentham, Jour. Bot. Hook. 3: 240. 1841.

Distribution: Panama (Canal Zone, San Blas and Darién); Venezuela (upper Rio Orinoco, at Cassiquiare and Cerro Sefato in the State of Amazonas, also in Delta Amacuro and Aragua); the three Guianas; Colombia (Chocó, Antioquia, Vichada and Putumayo); Ecuador (Oriente, in the basin of Río Pastaza), and in Brazilian Amazonia, where collected in Territory of Roraima (Serra do Divisor, top of hill, 900 m); in State of Acre (basin of the upper Rio Juruá); in State of Amazonas (basins of the middle Juruá and of the upper Rio Solimões and in the basin of the lower Rio Negro). Doubtless occurs also in adjacent Amazonian

Peru and Bolivia. Known from 79 collections.

20. Strychnos tomentosa Benthams, Jour. Linn. Soc. 1: 104. 1856.

Distribution: Venezuela (Federal District, Aragua, Sucre and Lara), the three Guianas and Brazil (basins of Rio Tapajós and Rio Tocantins, and various other localities in State of Pará; Territory of Amapá; basin of Rio Branco in Territory of Roraima; basins of Rio Solimões and Igarapé Jandiatube and vicinity of Lago Camatian in the State of Amazonas and basin of Rio Pindaré and other localities in the State of Maranhão). Known from 60 collections.

21. Strychnos diabolii Sandwith, Kew Bull. 1931: 486. 1931. Guyana: Mazaruni River, P.J.M. Maas 2533.

Distribution: Venezuela (Amazonas); Guiana; Brazil (Territory of Roraima). Known from 10 collections.

22. Strychnos javariensis Krukoff, Brittonia 4: 279. 1942.

Distribution: Western part of the Amazon basin, Brazil (Amazonas), and Colombia (Putumayo; Amazonas); its range probably more or less similar to the range of S. castelnaeana. In State of Amazonas, Brazil it has been collected in the basins of the upper Rio Solimões, of Rio Içá, of the lower Rio Javari and of the middle Rio Juruá. Doubtless occurs in adjacent Peru. Known from 21 collections.

23. Strychnos sandwithiana Krukoff & Barneby, Mem. N. Y. Bot. Gard. 20(1): 36. 1969.

Peru: Loreto: Maynas, Rio Nanay, Al. Gentry 15643 (MO). This is the first record of the species from Loreto.

Distribution: Amazonian Brazil (basins of Rio Maués, of Rio Urubu, of the upper and lower Rio Negro, of Rio Tonantins, of Rio Içá, of the upper Rio Solimões, of the middle Rio Juruá in the State of Amazonas and in the basin of Rio Tocantins in State of Pará); Colombia (Amazonas); and Peru (San Martín, Loreto). Known from 38 collections.

24. Strychnos jobertiana Baillon, Adansonia 12: 367. 1879.

Distribution: Venezuela (Amazonas); Colombia (Vaupés, Putumayo and Amazonas); Ecuador; Peru (Amazonas, Loreto, Huánuco, Cuzco); French Guiana and Brazil. In Brazil it has been collected in Territory of Amapá, in State of Pará (basins of Rio Tapajós and Rio Tocantins) and in State of Amazonas (basins of the upper and lower Rio Negro, of Rio Tonantins, of the middle Rio Juruá, of the lower Rio Javari and of Rio Solimões). Doubtless occurs also in Amazonian Bolivia. Known from 102 collections.

25. Strychnos pseudo-quina A. St. Hilaire, Mém. Mus. Paris 9: 340. 1822.  
Distribution: Central Brazil (Mato Grosso, Goiás, Maranhão, Bahia, Minas Gerais and São Paulo) and adjacent Paraguay. Known from 306 collections.
26. Strychnos xinguensis Krukoff, Brittonia 4: 283. 1942.  
Distribution: Brazil: Pará (basins of Rio Tocantins, Rio Xingú, upper Rio Tapajós and Rio Trombetas); Bolivia (basin of Rio Guaporé). Known from 7 collections.
27. Strychnos amazonica Krukoff, Brittonia 4: 284. 1942.  
Distribution: Amazonian Brazil (basin of Rio Jarí in Territory of Amapá; Oriximina in State of Pará; basins of Rio Maués, of the lower Rio Negro, of Rio Madeira, of the middle Rio Juruá, of Igarapé Jandiatuba and of the upper Rio Solimões in State of Amazonas; near Rio Branco in State of Acre and in Territory of Rondônia); Peru (Loreto), and Colombia (Putumayo). Known from 43 collections.
28. Strychnos solimoesana Krukoff, Brittonia 4: 280. 1942.  
Distribution: Brazil (basin of the upper Rio Solimões, Rio Tonantins and Rio Negro in the State of Amazonas); Colombia (Amazonas). Doubtless occurs also in Amazonian Peru. Known from 16 collections.
29. Strychnos froesii Ducke, An. Acad. Bras. Ci. 23: 209. 1951.  
Distribution: Amazonian Brazil (basins of the lower Rio Tapajós and of the lower Rio Xingú in State of Pará and near Manaus in the basin of the lower Rio Negro in State of Amazonas). Known from 17 collections.
30. Strychnos lobelioides Krukoff & Barneby, Mem. N.Y. Bot. Gard. 12(1): 44, fig.2. 1965.  
Distribution: Known only from the type collection from Rio Vaupés, Colombia.
31. Strychnos peckii B. L. Robinson, Proc. Amer. Acad. 49: 504. 1913.  
Belize: T. Croat 24206 (MO). Costa Rica: Puntarenas: Osa Peninsula, Ronald Liesner 3206 (MO).  
Distribution: Widely dispersed in South and Central America, Guatemala (Izabal); Belize; Costa Rica (Limón, Puntarenas); Panama (Darién), and doubtless also in Honduras and Nicaragua; Venezuela (Miranda, Aragua, Apure and Amazonas); Colombia (Bolívar, Antioquia, Meta, Putumayo, Vaupés, Amazonas, Valle (near the Pacific coast), and Nariño); Peru (Huanuco, San Martín); Ecuador (Oriente); Bolivia (La Paz, basin of Rio Mapiro); the three Guianas; and Brazil where widespread: State of Pará (near Belém, near Bragança, near Breves, in the basin of Rio Araguaia near the

southern border of the State, and in the basin of Rio Tapajós); State of Amazonas (in the basins of the upper and lower Rio Negro, of the middle Rio Juruá, of Rio Jutáí, of Rio Tonantins and of Rio Icó); State of Mato Grosso (various localities); Territories of Roraima and Rondônia; and States of Maranhão and Bahia. In Brazil its range doubtless will be extended to include Territory of Amapá and State of Goiás, as well as some of the States situated between Maranhão in the north and Bahia in the South. Known from 172 collections.

32. Strychnos erichsonii Richard Schomburgk, Reisen 3: 1082. 1848, nomen; ex Progel in Mart. Fl. Bras 6(1): 274. 1868. Peru: Loreto: Al. Gentry 18530 (MO) (Rio Nanay).  
Distribution: Venezuela (Bolívar; the three Guianas; Brazil; Colombia (Valle, Vaupés, Amazonas and Putumayo), and Peru (Loreto). In Brazil collected in Territory of Amapá (incl. the basin of Rio Oiapoque), State of Pará (near Belém and in the basin of Rio Tocantins and of Rio Guama), Territory of Roraima, State of Amazonas (basin of the upper Rio Negro, of Rio Maués, of Rio Tonantins, of the middle Rio Juruá, of Rio Purús and of the upper Rio Solimões), and in States of Mato Grosso and Maranhão. Known from 186 collections.
- 32a. Strychnos croatii Krukoff & Barneby, Phytologia 33: 313. 1976.  
Colombia: Chocó: Rio Munguido, alt. 50 m, Forero 1524.  
Distribution: Panama (Colón, Panamá, San Blas, Darién; Colombia (Chocó). Known from 20 collections.
33. Strychnos gardneri A. DeCandolle in DeCandolle, Prodr. 9: 14. 1845.  
Distribution: Eastern and central Brazil (Maranhão, Ceará, Paraíba, Bahia, Mato Grosso (near Cuiabá), Goiás, Minas Gerais, Espírito Santo, Rio de Janeiro and São Paulo). Doubtless occurs in States of Rio Grande do Norte, Pernambuco, Alagoas and Sergipe. Known from 53 collections.
34. Strychnos publiflora Krukoff, Brittonia 4: 290. 1942.  
Distribution: State of Minas Gerais, Brazil (munic. Jaboticatubas, Santa Luzia and Buenópolis). Known from 4 collections.
35. Strychnos bredemeyeri (Schultes) Sprague & Sandwith, Kew Bull. 1927: 128. 1927.  
Venezuela: Rio Carum, afl. del Paragua, ± 360 m, F. Cardona 1228 (Herb. Ven. 59214).  
Cardona 1228 is a very important collection as it has shells of mature fruits. From this collection we know the approximate size of fruits and the thickness of their endocarp. It was collected in April 1945 from Rio Carum, tributary of Paragua,

Venezuela. It was cited in 7: 45. under a synonym of this species, Strychnos pedunculata, through an error as Cardona 1229. It is not cited in Exsiccatae and not in my card files. I borrowed specimens from Venezuela and checked on its identity. The above referred to errors are not being corrected. This specimen is cited in Exsiccatae and cards are now in the card files.

Years ago Ducke raised the question of the type locality of S. trinitensis Griseb., which is a synonym of S. bredemeyeri, suggesting that perhaps it is a valley of Rio Caura, a tributary of Rio Orinoco in Venezuela, rather than "Caura" on the Island of Trinidad. Sandwith rejected this suggestion in a very brief statement. I now quote C. Dennis Adams' letter of October 11, 1978 which settles this matter. "On the question about Strychnos trinitensis Griseb., there is no doubt whatsoever that Caura is a valid and well known locality in Trinidad and that Crueger would have collected there. If we question the authenticity of this locality, we question it for hundreds of our collections, as the Caura Valley, running north into the Northern Range from Tacarigua has been well explored. This makes it all the more strange that this species has not been collected here other than by Crueger. But that is our experience and each time we go collecting we bring in something that is either new or has not been seen for a long time."

Distribution: Island of Trinidad; Venezuela (Federal District, Sucre, Delta Amacuro and Bolívar); Guiana and Brazil (Territory of Roraima). Known from 20 collections.

36a. Strychnos mitscherlichii Richard Schomburgk, Reisen 2:451. 1848, var. mitscherlichii

Peru: Loreto: Maynas, Juan Revilla 1490.

Distribution: Venezuela (Bolívar); Colombia (Chocó, Valle, Putumayo and Amazonas-Vaupés); Ecuador (basin of Río Pastaza; upper Bobonaza); Guiana (Essequibo, Demerara and Berbice); Surinam; Brazil; Peru (Loreto, Amazonas), and Bolivia (basin of Rio Mapiro). In Brazil collected in State of Pará (basins of Rios Tocantins, Tapajós and Trombetas), State of Amazonas (basin of the upper Rio Solimões, basin of Rio Negro, and plateau between Rio Madeira and Rio Purús), State of Acre, Territory Rondônia, and States of Rio Grande do Norte and Bahia. Doubtless occurs also in States of Maranhão, Piauí, Ceará, Paraíba, Pernambuco, Alagoas and Sergipe. Known from 112 collections.

36b. Strychnos mitscherlichii var. pubescentior Sandwith, Brittonia 3: 91. 1938.

Distribution: Amazonian Brazil (basins of the tributaries of Rio Solimões, namely Rio Jutai, Igarapé Belém and lower Rio Javari in State of Amazonas) and Colombia (Vaupés and Amazonas). Known from 23 collections.



- 36c. Strychnos mitscherlichii var. amapensis Krukoff & Barneby, Mem. N. Y. Bot. Gard. 20(1): 48. 1969.

Distribution: Eastern Amazonian Brazil (basins of Rio Araguari and Rio Oiapoque in Territory of Amapá; near Catú and in basins of Rio Capim and Rio Guama in State of Pará). Doubtless occurs also in French Guiana. Known from 17 collections.

37. Strychnos solerederi Gilg in Engler, Bot. Jahrb. 25. Beibl. 60: 40. 1898.

Distribution: French Guiana; Colombia (Amazonas) and widely distributed throughout Amazonian Brazil where collected in State of Pará (basin of Rio Tapajós and in many other regions) and State of Amazonas (basins of the upper Rio Negro, Rio Tonantins, Rio Jutai and the upper Rio Solimões). Confidently expected in Mato Grosso (Brazil) and in Peru. Known from 44 collections.

38. Strychnos darrieniensis Seemann, Bot. Voy. Herald 166. 1854.

Peru: Loreto: Al. Gentry 18416 (Rio Itaya), T. Plowman 6678 and 6694 (Rio Ampiyacu).

Distribution: Very widely dispersed in Central and South America: Nicaragua; Costa Rica (Puntarenas); Panama (Veraguas, Colón and Canal Zone); Colombia (Valle, near the Pacific coast, Amazonas and between Misay and Timbiqui); Peru (Loreto and San Martín); Ecuador (Napo); Guiana (Essequibo); and Brazil (basins of Rios Amazonas, Jamundá, Tocantins, Tapajós and Trombetas in State of Pará; basins of Rios Negro, Solimões, Tonantins, Juruá, Jutai, lower Javari and upper Solimões in State of Amazonas; basin of Rio Acre in State of Acre; basin of Rio Araguaia in State of Mato Grosso; and in basin of Rio Branco in Territory of Roraima). Known from 89 collections.

- 38a. Strychnos ecuadoriensis Krukoff & Barneby, Phytologia 39: 276. 1978.

Distribution: Known only from the type collection in Ecuador (Napo).

II. Sectio Rouhamon (Aubl.) Progel in Mart. Flora Bras. 6(1): 275. 1868.

39. Strychnos guianensis (Aublet) Martius, Syst. Mart. Med. Bras. 121. 1843.

Colombia: Chocó: Rio Munguido, alt. 40 m, Forero 1489.  
Peru: Loreto: Juan Revilla 1857 (MO) (Rio Nanay), Al. Gentry 18343 (Maynas), 18471 (Rio Itaya).

This is a new record of this species for Chocó.

Distribution: Well distributed in the basin of the middle and upper Rio Orinoco and throughout the entire Amazon basin: Venezuela (Sucre, Barinas, Bolívar and Amazonas; Colombia (Chocó, Vaupés, Putumayo and Amazonas); Ecuador (Oriente and Napo-Pastaza); Peru (Rio Nanay and Rio Mazán in Lorero); and

the three Guianas. In Brazil well distributed in State of Pará (basin of Rio Trombetas, a northern tributary of the Amazon, along the Amazon River proper, in the basins of Rios Xingú, of Tapajós and Tocantins (the southern tributaries of the Amazon), and in the basins of various small rivers draining to the Baía de Marajó and the Atlantic Ocean, such as Rio Acara, Rio Guama and others); Territory of Amapá (basin of Rio Oiapoque); Territory of Roraima; State of Amazonas (in the basins of Rio Urubu, of the lower and the upper Rio Negro, including its tributaries Vaupés, Içana, Cubate, Aiary and Padauri, of Rio Maués, of Rio Madeira, of Rio Juruá, of Rio Jutai, of Rio Solimões and of Rio Javari); Territory Rondônia; and State of Mato Grosso (Rio Juruena). Known from 271 collections.

40. Strychnos glabra Sagot ex Progel in Mart. Fl. Bras. 6(1): 275. 1868.

Distribution: Venezuela: Guiana (Essequibo and Berbice); Peru (San Martín); French Guiana, and Amazonian Brazil (basin of Rio Jari in Territory of Amapá; basin of the upper Pará, Rio Tapajós, of Rio Guama and near Catú in State of Pará; basins of Rio Madeira, of the lower and upper Rio Negro and of Rio Solimões in State of Amazonas; between Boa Vista and Caracarai in Territory of Roraima). Doubtless also occurs in Surinam and Colombia. Known from 55 collections.

41. Strychnos subcordata Spruce ex Bentham, Jour. Linn. Soc. 1: 106. 1856.

Distribution: Amazonian Brazil (basin of Rio Oiapoque in Territory of Amapá; basins of the upper and lower Rio Negro, Rio Tonantins, Rio Içá, Rio Japurá, Rio Juruá, Rio Solimões and Rio Amazonas in the State of Amazonas); Peru, and Colombia (Putumayo). Doubtless also found in French Guiana. Known from 50 collections.

42. Strychnos bicolor Progel, Vidensk. Meddel. 1869: 31. 1869.

Distribution: Minas Gerais, Goiás, the Federal District, Mato Grosso and São Paulo in Central Brazil. Common in cerrados and on comparatively high elevations, as on Serra do Cipó. Known from 25 collections.

43. Strychnos panurensis Sprague & Sandwith, Kew Bull. 1927: 132. 1927.

Distribution: Panama (Panamá); French Guiana; Venezuela (Apure, Bolívar and Amazonas); Colombia (Chocó, Meta, Nariño, Putumayo, Vaupés and Amazonas); Peru (Loreto, San Martín and Junín); and Brazil (basin of Rio Amapari in Territory of Amapá; basins of the upper Rio Negro and of the middle Rio Juruá in State of Amazonas; and basin of the upper Rio Purús in State of Acre). Known from 65 collections.

44. Strychnos goiasensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 55, fig.C. 1969.

Distribution: Known only from the type collection in Goiás, Brazil.

- 44a. Strychnos cayennensis Krukoff & Barneby, Phytologia 27: 101. 1973.

Distribution: Known only from the type collection in Saül, French Guiana. This region according to Oldeman is probably one of South American forest refuges in geological periods with a drier climate, and novelties were found here.

45. Strychnos duckei Krukoff & Monachino, Lloydia 9: 68. 1946.

Distribution: Known from the type locality in State of Amazonas (Tabatinga, near Marco, a few dozen meters from the Colombian boundary), Brazil, where collected twice from the same plant. Doubtless occurs also in adjacent Colombia and Peru.

46. Strychnos hirsuta Spruce ex Bentham, Jour. Linn. Soc. 1: 106. 1856.

Distribution: Amazonian Brazil (basin of Rio Tapajós in State of Pará and basins of the lower Rio Negro, of Rio Maués, of Rio Madeira and Rio Solimões in State of Amazonas). Known from 26 collections.

47. Strychnos cogens Bentham, Jour. Bot. Hook. 3: 241. 1841.

Distribution: Venezuela (Bolívar and Amazonas); Guiana; French Guiana; and Amazonian Brazil (Serra Tepequem in Territory of Roraima; Parintins, basins of the upper and lower Rio Negro, Rio Purús and of Rio Solimões, including those of its tributaries Rio Tonantins, Igarapé Jandiatuba and Igarapé Belém in the State of Amazonas). Doubtless occurs also in adjacent Colombia and Peru, as well as in Surinam. Known from 34 collections.

48. Strychnos melinoniana Baillon, Bull. Soc. Linn. Paris 1: 256. 1880.

Distribution: The three Guianas and Amazonian Brazil where collected in Territory of Amapá (basin of Rio Oiapoque) and in State of Pará (basin of the middle Rio Tocantins, along the road Belém-Brasília (km 17-129), and near Portel). Known from 29 collections.

- III. Sectio Breviflorae Progel in Mart. Fl. Bras. 6(1): 277. 1868.

Subsectio Breviflorae

49. Strychnos parviflora Spruce ex Bentham, Jour. Linn. Soc. 1: 107. 1856.

Distribution: Amazonian Brazil (basin of Rio Tapajós in State of Pará; basins of the upper and lower Rio Negro, the

middle Rio Juruá, Rio Jutai, Rio Tonantins, lower Rio Javari, Igarapé Jandiatuba and upper Rio Solimões in State of Amazonas), and Peru (Loreto). Doubtless occurs also in adjacent Colombia. Known from 37 collections.

50. Strychnos castelnaeana Weddell in Castelnau, Exped. Am. Sud. 5: 22. 1851.

Distribution: Western part of the Amazon basin, centering around the border common to Peru, Brazil and Colombia. Collected in Brazil in State of Amazonas (basins of Rio Içá, Rio Japurá, Rio Javari and upper Rio Solimões) and Peru (Loreto). Doubtless occurs also in Colombia. Known from 99 collections.

51. Strychnos progeliana Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 58. 1969.

Distribution: Known only from the type collection from the basin of Rio Japurá, Amazonas, Brazil. Doubtless occurs also in adjacent Colombia and Peru.

52. Strychnos oiapocensis Froes, Bol. Técn. Inst. Agrôn. Norte 36: 143. 1959.

Distribution: French Guiana, Surinam and Territory of Amapá, Brazil. Known from 16 collections.

53. Strychnos fendleri Sprague & Sandwith, Kew Bull. 1927: 129. 1927.

Venezuela: Guarico: near Ortiz, Hector Rodriguez 68 (F).

Distribution: Venezuela, where widely distributed in the drier tropics (Nueva Esparta, Zulia, Falcón, Lara, Miranda, Guárico, Anzoátegui, Sucre and Bolívar); Brazil (Roraima). It likely occurs also in northern Colombia adjacent to Venezuela (Guajira). Known from 25 collections.

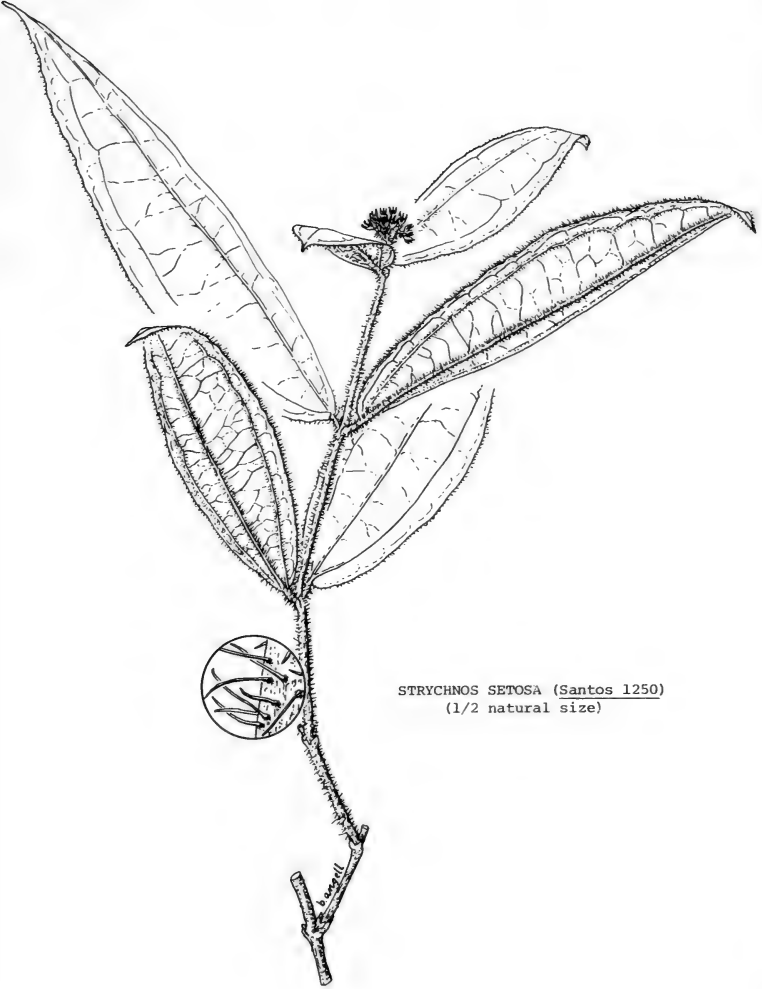
- 53a. Strychnos setosa Krukoff & Barneby sp. nov.

Ad sectionem Breviflorae referenda, sed inter illas ramulis petiolis inferiorique laminarum facie pilis rufis  $\pm 1$  mm longis hirsuta praestans.

Macroscopic: Petioles about 3 mm long; blades elliptic, 7-13 cm long, 2.5-5 cm broad, rounded to cuneate at base, acuminate and finally pointed at apex, dull on both surfaces, greyish-green on drying, chartaceous, 3-plinerved (principal nerves impressed above) with the inner pair opposite and diverging at or near base, reticulation faint above and prominulous below.

Microscopic: petioles hirsute with long (up to about 1 mm) rusty straight hairs; blades beneath hirsute with similar hairs on principal nerves and sparsely so on lesser veins, above sparsely hirsute on midrib, leaf-margins ciliate with long hairs.

Inflorescences terminal in congested cymes; calyx  $\pm 1.8$  mm long, the narrowly lance-subulate lobes glabrous dorsally, thinly setulose-ciliate; corolla  $\pm 2$  mm long, the lobes  $\pm 1.3 \times 0.5$



STRYCHNOS SETOSA (Santos 1250)  
(1/2 natural size)

mm, papillate dorsally and beyond middle ventrally, below middle internally barbate; anthers sessiloid narrowly triangular in outline 0.7 mm long, barbate at base (Flowers described from dried material).

The collector describes the plant as 2 m high with cream flowers. On the specimen examined there are no tendrils or spines.

Brazil: Bahia: Ipiauí, estrada a Jequié, T. S. Santos 1250 (31/10-1970) (NY-holotype).

Until the fruits of this species are collected its position is not certain, but it is probably of subsection Breviflorae.

We need fruits and bark of roots (for chemical assays).

54. Strychnos atlantica Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 61. 1969.

Brazil: Bahia: Sta Cruz de Cabrália, T. S. Santos 3012; Espirito Santo: T. S. Santos 2281 (NY, CEPEC) (Road Linares - Bananal).

T. S. Santos 2281 is the first collection in flower and the first record of this species from Espirito Santo. Unfortunately through error the sheet with flowers was sent back to CEPEC before they were described.

Distribution: Endemic probably to coastal Bahia and Espirito Santo. Known from 11 collections.

55. Strychnos rubiginosa A. DeCandolle in DeCandolle, Prodr. 9: 16. 1845.

Distribution: Eastern Brazil (largely in cerrados of Piauí, Ceará, Pernambuco, Bahia, Minas Gerais, Mato Grosso and Paraná). Known from 20 collections.

56. Strychnos parvifolia A. DeCandolle in DeCandolle, Prodr. 9: 16. 1845.

Distribution: This polymorphic and variable species has a very extensive range which is different however from those of all other members of the genus as it is found in special habitats. In State of Pará (Brazil) it is confined to patches of forests in savannas and to secondary forests (near Obidos, near Alenquer, near Santarem, on Serra de Pirocaua, and in the basins of Rio Tapajós and Rio Tocantins where it is common). Farther south in Brazil, it has been collected in Maranhão (on the Island of São Luiz, and near Imperatriz on the border of the States of Maranhão and Goiás), Goiás, Mato Grosso, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Bahia, Minas Gerais, Espirito Santo, Rio de Janeiro and São Paulo, usually in open situations. Also in Paraguay and Bolivia (in savannas of Santa Cruz). Known from 145 collections.

57. Strychnos fulvotomentosa Gilg in Engler, Bot. Jahrb. 25. (Beibl. 60): 40. 1898.

Distribution: Southeastern Brazil (Minas Gerais, Espirito Santo and Rio de Janeiro). Known from 32 collections.

- 57a. Strychnos recognita Krukoff & Barneby, Phytologia 27: 103. 1973.

Brazil: Bahia: Itacaré, T. S. Santos 165, 727; Espirito Santo: vale do Rio Doce, T. S. Santos 2055.

The holotype of this species from Itacaré, Bahia, is in mature flowers. T. S. dos Santos 727 from the type locality is the first collection with immature fruits and it is now evident that this species was correctly placed in subsect. Breviflorae as the testa is crustaceous (not composed of soft fibers). Mature fruits are probably small with thin shells. The species is endemic to coastal Bahia extending to adjacent coastal Espirito Santo.

It would be important to collect mature fruits in June or July and bark of roots for chemical assay as it has not been studied chemically.

Distribution: Probably endemic to coastal Bahia and Espirito Santo. Known from 13 collections.

58. Strychnos acuta Progel in Mart. Fl. Bras. 6(1): 280. 1868.

Distribution: Southeastern Brazil (Bahia, Espirito Santo, Rio de Janeiro, São Paulo and Minas Gerais). Known from 36 collections.

59. Strychnos brasiliensis (Sprengel) Martius, Flora 24. (Beibl. 2): 84. 1841.

Distribution: Southeastern Brazil (Minas Gerais, Rio de Janeiro, São Paulo, Paraná, Sta Catarina, Rio Grande do Sul); Paraguay; Argentina (Misiones, Corrientes), and Bolivia (Santa Cruz). Known from 306 collections.

60. Strychnos grayi Grisebach, Mem. Amer. Acad. II. 8: 519. 1862.

Distribution: Cuba (Pinar del Río, Isla de Pinos, Habana, Santa Clara, Camaguey and Oriente) and Hispaniola (Dominican Republic). Doubtless occurs in the Republic of Haiti. Known from 27 collections.

Subsectio Eriospermae Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20: 68. 1969.

61. Strychnos pachycarpa Ducke, Bol. Técn. Inst. Agron. Norte 3: 15. 1945.

Brazil: Amazonas: Manaus - Itacoatiara road, km 29,

Reserva Ceplac, forest on terra firme, latosol, growing in Q9, G. T. Prance & J. F. Ramos 23153 (Dec. 24, 1974 - frts.) (NY, INPA, MG, R, U, US, K, S. High liana in crown of forest, fruits orange.

This is the fourth collection of this species. It has been known previously from two Ducke collections from the same plant from the general vicinity of Manaus (in flower in October, and in fruit in December). The third collection (Oliveira 2794 (frts. in October) is from km 35 of Manaus - Itacoatiara road.

The young leaves of this species, not seen by me previously, resemble superficially those of S. asperula, fruits of which were not known until recently. Through error I placed this collection with S. asperula in Suppl. XIV (Phytologia 33: 308. 1974).

The shells of the fruit of this species are very thick and Ducke told me that he observed that it takes  $\pm 2$  years before such thick shells of Amazonian species disintegrate and germination takes place. It would be interesting to check this experimentally.

Distribution: Known from 4 collections from the general vicinity of Manaus, Amazonas, Brazil.

62. Strychnos neglecta Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 69. 1969.

Distribution: Known only from the type collection from the basin of Rio Japurá, Amazonas, Brazil. Doubtless occurs also in adjacent Colombia and Peru.

63. Strychnos brachistantha Standley, Field Mus. Publ. Bot. 12: 412. 1936.

Distribution: Mexico (Jalisco, Puebla, Veracruz and Tabasco); Belize (where common); Guatemala (Izabal, Huehuetenango, Alta Verapaz and Petén); Nicaragua (Zelaya); and Panama (Canal Zone). Known from 45 collections.

64. Strychnos nigricans Progel in Mart. Fl. Bras. 6(1): 280. 1868.

Distribution: Southeastern Brazil (Minas Gerais, Espirito Santo, Rio de Janeiro, São Paulo and Paraná). Known from 32 collections.

65. Strychnos mattogrossensis S. Moore, Trans. Linn. Soc. II. 4: 392. 1895.

Colombia: Chocó: munic. de Riosucio, H. León 638 (MO); Peru: San Martín: prov. Madre Mía, Jef. D. Boeke 1327 (MO); Brazil: Bahia: Belmonte, T. S. Santos 3141.

These are the first records of the species from Chocó



(Colombia) and San Martín (Peru).

Distribution: Colombia (Chocó, Guajiro, Magdalena, Bolivar), Venezuela (Zulia, Yaracuy, Tachira, Delta Amacuro, Bolivar, Amazonas), Peru (Loreto, San Martín, and Brazil where known from States of Pará, Amazonas (basins of Rio Madeira, Rio Negro, Rio Solimões, Rio Purús, Rio Juruá, Rio Japurá and Rio Ica), Mato Grosso, Maranhão, Ceará, Pernambuco, Rio Grande do Norte, Paraíba, and Bahia. Known from 72 collections.

66. Strychnos cerradoensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 72. 1969.

Distribution: Known only from the type locality in Minas Gerais, Brazil. Known from 2 collections.

66a. Strychnos alvimiana Krukoff & Barneby, Photologia 27: 105. 1973.

Brazil: Bahia: Itacaré road, T. S. Santos 1757.

Distribution: Probably endemic to coastal Bahia, possibly extending to Espírito Santo. Known from 6 collections.

67. Strychnos schultesiana Krukoff, Mem. N.Y. Bot. Gard. 12 (1): 78. 1965.

Distribution: Amazonian Brazil (basin of Rio Solimões in State of Amazonas) and Venezuela (Mérida and Barinas). Known from 9 collections.

68. Strychnos malacosperma Ducke & Froes, Bol. Técn. Inst. Agrón. Norte 30: 43. 1955.

Distribution: Known only from the type locality in Pará, Brazil. Known from 5 collections.

69. Strychnos poeppigii Progel in Mart. Fl. Bras. 6(1): 282. 1868.

Distribution: Peru (basins of Rios Marañón, Ucayalí, Huallaga and Nanay in Loreto and San Martín), and Brazil (basin of the lower Rio Trombetas, Rio Tocantins and near Rio Branco de Obidos in State of Pará; basins of the lower and upper Rio Solimões and of the middle Rio Juruá in State of Amazonas; and basin of Rio Acre in State of Acre). Doubtless occurs also in adjacent Colombia and Bolivia. Known from 39 collections.

70. Strychnos tarapotensis Sprague & Sandw., Kew Bull. 1927: 131. 1927.

Peru: Madre de Dios: B. Foster 2501 (F), 3243 (F), 6158 (F).

Distribution: Peru (basin of Río Marañón in Loreto, and basin of Río Huallaga in San Martín, where it is common, Amazonas, Madre de Dios; Brazil (basin of the middle Rio Juruá, in the State of Amazonas and basin of the upper Rio Purús in

the State of Acre). Doubtless occurs also in Bolivia in the region adjacent to the State of Acre. Known from 49 collections.

71. Strychnos schunkei Krukoff & Barneby, Phytologia 25: 53. 1972.

Distribution: Known only from the type collection from Peru (San Martín).

We shall mention here also specimens which may represent new species and which we did not describe as they were sterile. These are as follows:

21. S. cf. diaboli Sandwith, Kew Bull. 1931: 486. 1931.

For details see Supplement VIII (Mem. NYBG 20: 35. 1969). The 6 Guiana sterile specimens are still unmatched; in fact we did not have any new collection from Guiana since 1969.

Strychnos sp. nov. (?) Sect. Strychnos

Another possible undescribed species was collected in Colombia near the border of Venezuela. We mention this collection in the paper published in Lloydia 35: 208. 1972.

Strychnos sp. nov. (?) Sect. Strychnos

Still another possibly new species was collected in primary rain forest  $\pm$  500 m in Taisha, prov. Saotingo-Zamora, Ecuador. (Pennington & Cazalet 7514). It is represented by sterile sheets at K and NY. A single fruit which originally was with this collection apparently was lost at K as it was not found in the carpological collection or elsewhere in the Herbarium. The leaves of this collection cannot be matched with species known to occur in Ecuador and elsewhere. Below is a description of vegetative parts of this collection:

Macroscopic: branchlets blackish; petioles 1-1/2-2 cm long; blades usually elliptic, 15-18 cm long, 6-7.5 cm broad, obtuse to cuneate at base, usually long acuminate at apex, usually dull on both surfaces, chartaceous, 3-plinerved with the inner pair opposite and usually diverging at base, primary nerves impressed above, secondaries and veinlets not distinct, primary, secondaries and veinlets prominent below.

Microscopic: branchlets, petioles and blades (especially nerves) softly pubescent with curved hairs, blades essentially glabrous and without tubercles above.

APPENDICES

Appendices I to IV (inclusive) will be of interest to collectors as well as to workers on this genus, and Appendices V to VIII (inclusive) primarily to a future monographer.

APPENDIX IRegions where new species are expected

New species of Strychnos are not expected from the West Indies, Mexico and Central America in spite of the fact that at least Nicaragua is very poorly collected. Species of Strychnos are essentially lowland plants of rather broad distribution and endemics from high elevations are not expected.

New species are expected from the Amazon basin in Bolivia, Ecuador, Peru and Colombia, in Brazilian Amazonia largely from the southern part. The rain forest of poorly collected Chocó and of the western coast of South America in Colombia, Ecuador and Peru also might yield new species. Venezuela is amazing as time and again we find there species which were thought to be confined to the Amazon basin. This is probably largely due to Julian Steyermark who seems to pick up interesting localities.

APPENDIX IISpecies known from one collection (or two collections from the same plant)

17. S. krukoffiana Ducke (type from Flores near Manaus, Brazil).
30. S. lobeliodes Krukoff & Barneby (type from Vaupés, Colombia).
44. S. goiasensis Krukoff & Barneby (type from Goiás, Brazil; as it is Glaziou collection, the provenance is not certain).
- 44a. S. cayennensis Krukoff & Barneby (type from Saul, French Guiana).
45. S. duckei Krukoff & Monachino (type from Tabatinga, Amazonas, Brazil).
51. S. progeliana Krukoff & Barneby (type from Rio Japurá, Amazonas, Brazil).
62. S. neglecta Krukoff & Barneby (type from Rio Japurá, Amazonas, Brazil).
66. S. cerradoensis Krukoff & Barneby (two different collections) (type from Viçosa, Minas Gerais, Brazil).
71. S. schunkei Krukoff & Barneby (type from San Martín, Peru).

APPENDIX IIISpecies of which flowers (or at least corolla) are not yet known

28. S. solimoesana Krukoff (upper Rio Solimões and Rio Tonantins, Brazil, and Amazonas, Colombia).  
 32a. S. croatii Krukoff & Barneby (Panama, south of Canal Zone and Colombia, Chocó).  
 51. S. progeliana Krukoff & Barneby (known only from Rio Japurá, Brazil).  
 66a. S. alvimiana Krukoff & Barneby (coastal Bahia, Brazil).

APPENDIX IVSpecies of which fruits are not yet known

5. S. romeu-belenii Krukoff & Barneby (coastal Bahia, Brazil).  
 17. S. krukoffiana Ducke (Flores, Manaus, Brazil).  
 30. S. lobeliodes Krukoff & Barneby (Vaupés, Colombia).  
 38a. S. ecuadoriensis Krukoff & Barneby (Napo, Ecuador).  
 44. S. goiasensis Krukoff & Barneby (Goiás, Brazil).  
 45. S. duckei Krukoff & Monachino (Tabatinga, Amazonas, Brazil).  
 51. S. progeliana Krukoff & Barneby (Rio Japurá, Amazonas, Brazil).  
 57a. S. recognita Krukoff & Barneby (Bahia and Espírito Santo, Brazil).  
 62. S. neglecta Krukoff & Barneby (Rio Japurá, Brazil).  
 71. S. schunkei Krukoff & Barneby (San Martín, Peru).

In addition to these mature and well preserved fruits are needed of 5 species.

13. S. tabascana Sprague & Sandwith (Eastern Mexico and Central America).  
 28. S. solimoesana Krukoff (basin of the upper Rio Solimões, Rio Tonantins, Rio Purús and Rio Negro in Brazil, and Amazonas, Colombia).  
 35. S. bredemeyeri (Schultes) Sprague and Sandwith (Trinidad, Venezuela, Guiana and Brasil (Roraima)).  
 44a. S. cayennensis Krukoff & Barneby (Saúl, French Guiana).  
 55. S. rubiginosa DeCandolle (Eastern Brazil - Piauí, Ceará, Pernambuco, Bahia, Minas Gerais, Mato Grosso and Paraná).

APPENDIX VSpecies under which many synonyms, basionyms, etc. are listed

Taxonomic problems relating to the three species listed below were well thrashed out in correspondence with Sandwith and

Ducke and there was no disagreement among us that they are best treated as in our first monograph. We concluded that it is not advisable to separate even forms in these variable and polymorphic species:

39. S. guianensis (Aublet) Martius  
 56. S. parvifolia DeCandolle  
 59. S. brasiliensis (Sprengel) Martius

Under S. guianensis are listed 18 synonyms, basionyms, etc.

Under S. parvifolia are listed 12 synonyms, basionyms, etc. This is also a polymorphic species with distribution in certain specific habitats on the Amazon as well as in north-eastern Brazil, which fact was a matter of correspondence with Ducke and his field study. We finally agreed that even forms cannot be separated in this polymorphic species. We maintained, however, as a distinct species, the related S. rubiginosa A. DeCandolle.

S. brasiliensis with 13 synonyms, basionyms, etc., is one of the most variable species of American Strychnos as far as vegetative characters are concerned.

#### APPENDIX VI

##### Closely related species

63. S. brachistantha Standley  
 64. S. nigricans Progel  
 65. S. mattogrossensis S. Moore  
 66. S. cerradoensis Krukoff & Barneby

The members of this complex cannot be distinguished on vegetative characters. The critical differences are found some in flower, others in fruit and they may be summarized as follows:

63. S. brachistantha  
 (Mexico & Central America)  
 calyx-lobes 1-2x0.45-0.7 mm, lanceolate to narrowly ovate, (length-width ratio  $\pm 2-3:1$ ); corolla-tube<sup>1</sup>+0.6 mm, less than half as long as lobes, these  $\pm 1.4$  mm long; filaments  $\pm 0.3$  mm; anthers 0.6x0.4 mm, glabrous; fruits large (6-7 cm in diam), shell very thick ( $\pm 6$  mm thick).

<sup>1</sup>Characters shown in italics do not occur in other species.

64. S. nigricans  
(Southeastern Brazil  
Minas Gerais, Espirito  
Santo, Rio do Janeiro,  
São Paulo and Paraná)  
calyx-lobes deltate, 0.7-0.9x  
0.6-0.9 mm (length-width  
ratio  $\pm 1:1$ );  
corolla-tube  $\pm 1.3-1.4$  mm, not  
or not much shorter than its  
lobes, these 1.3-1.7 mm long;  
filaments 0.2-0.3 mm long;  
anthers 0.7-0.8x0.4-0.6 mm,  
barbate at base;  
fruits large ( $\pm 5.5$  cm in diam;  
shells very thick ( $\pm 5$  mm thick)).
65. S. mattogrossensis  
(Basins of the Amazon  
and Orinaco, also in  
Colombia (Chocó,  
Guajire), Venezuela  
(Zulia, Yaracuy;  
Tachira), and Brazil  
(Maranhão, Ceará, Rio  
Grande do Norte,  
Paraíba and Bahia).  
calyx-lobes lanceolate to ovate-  
acuminate, 0.9-1.5x0.4-0.5 mm  
(length-width ratio  $\pm 2-3:1$ );  
corolla-tube 0.75-0.9 mm, little  
more than half as long as the  
lobes (these 1/3-1.5 mm long);  
filaments 0.3-0.5 mm long;  
anthers 0.55-0.6x0.35-0.45 mm,  
glabrous;  
fruits very small ( $\pm 1.5$  cm in  
diam) shell very thin ( $\pm 0.5$  mm  
thin).
66. S. cerradoensis  
(Minas Gerais).  
calyx-lobes lanceolate, 1.6-1.8  
mm x 0.6 mm;  
corolla-tube  $\pm 0.6$  mm, less than  
half as long as lobes, these  
 $\pm 2$  mm long;  
filaments 0.3 mm; anthers 0.8x  
0.5 mm, glabrous;  
mature fruits not seen; shells  
very thick ( $\pm 5$  mm thick).

REMARKS:

1. The distribution is of great help in the identification of specimens of S. brachistantha, S. mattogrossensis and S. cerradoensis as their ranges do not overlap.
2. S. mattogrossensis is the only one which can be immediately distinguished by the fruits.
3. S. nigricans has 3 floral characters distinguishing it from other species in this complex: deltoid calyx-lobes, relatively long corolla-tube, and basally hairy anthers.

6. S. rondeletiioides Spruce
7. S. macrophylla Barbosa Rodrigues

These are closely related species and Ducke and I agreed, even before finding excellent characters in fruits, to recognize as separate species. S. rondeletiioides is mostly found on the varzea land along the shores of the rivers. Its leaves are narrower and usually dry an olive-ocher yellow. Furthermore, its fruit is very characteristic, ovoid or pyriform, wrinkled like a prune on drying, whereas S. macrophylla is usually found on terra firme, has leaves usually drying brownish with blackened petioles and its fruit is globose, larger, with thicker shells and not wrinkled on drying. For other differences between these two species, see Key (9:211) also Ducke's paper (5:20).

69. S. poeppigii Progel
70. S. tarapotensis Sprague & Sandwith

These two species cannot be distinguished on vegetative and fruit characters but there is no difficulty whatsoever once flowers are available. Inflorescences of S. poeppigii are congested cymes spherically clustered, and its calyx lobes are extremely long, usually + 2.5 m. In S. tarapotensis, inflorescences are in loosely flowered paniculate cymes not congested, and its calyx lobes are usually not longer than 1.5 m and only occasionally up to 2 m. Once we know more about their ranges of distribution, these likely will also be helpful in identification.

12. S. panamensis Seemann
13. S. tabasacana Sprague & Sandwith

I believe that they should best be left as distinct species rather than treating S. tabasacana as a subspecies. The extreme form of S. panamensis with a large glabrous corolla and large thin-shelled fruits are especially common in Panama. S. tabasacana with smaller pubescent corolla and probably in average smaller fruits with thicker shells are especially common in the State of Tabasco, Mexico. S. panamensis is a western species found from Mexico (Sinaloa) down to Panama, Colombia (Chocó, Magdalena, Santander, Antioquia and Caldas), and Venezuela (Zulia, Falcón, Mérida, Barinas and Apure).

S. tabasacana, on the other hand, is an eastern species found in Mexico from Veracruz down to Belize, Guatemala, Honduras and Costa Rica. It is doubtful that it extends to Panama but likely soon will be collected in Nicaragua. Identifying sterile collections from regions where these two species approach their boundaries is very difficult. I have no record however of any locality where the two species are found together.

39. S. guianensis (Aublet) Martius  
S. bicolor Progel

As lately as 1972 (9:235) S. bicolor was easily separated from closely related S. guianensis by leaf-blades beneath densely fulvous-velutinous, above grey-glaucous with conspicuous fulvous line on midrib. Their ranges were thought to be distinct, S. bicolor occurring in Minas Gerais, Goiás, the Federal District, Mato Grosso and São Paulo in central Brazil, whereas S. guianensis was known to be well distributed in the basin of the middle and upper Orinoco and throughout the entire Amazon basin. Abundant recent collections from Mato Grosso, Goiás, the Federal District and Minas Gerais indicate that the concept of S. bicolor has to be somewhat changed. Leaves of some specimens are almost glabrous beneath but still grey-glaucous above, and others almost glabrous beneath and even not grey-glaucous above. In Supplement XVI I suggested that eventually with the collection of abundant material in the critical area (northern limit of its distribution in the States of Mato Grosso and Goiás, etc.) S. bicolor might yet be reduced to the synonymy of S. guianensis or retained as a form with a much restricted range in the State of São Paulo and adjacent regions. I added that I was unable to do this as even though 25 collections of S. bicolor were seen by me, only a few are deposited at NY. Furthermore, field work is needed before this problem can be satisfactorily resolved.

Since then I studied this problem further and found probably the clue to the solution which should be further investigated in the field and by new collections. S. bicolor in critical areas seems to be confined to the cerrados and comparatively high mountains such as Serra do Cipó. We may find that in critical areas where the ranges of the two species overlap they are confined to the different ecological habitats. It is admitted that in these critical areas we likely will find plants with characters of these two distinct entities not so well marked as in the centers of their distribution. The same is found in the "critical" areas of S. panamensis and S. tabascana and of other closely related species.

33. S. gardneri A. DeCandolle  
34. S. pubiflora Krukoff

The corolla of S. gardneri is glabrous but that of S. pubiflora is pubescent without. As in the case with S. bicolor and S. guianensis (which are closely related) it is likely that these also are confined to two different ecological habitats. S. pubiflora is common in cerrados and/or on the lower parts of mountains in the State of Minas Gerais (Serra do Cipó, Serra de



Cabral, etc.) whereas S. gardneri has a very extensive range in eastern and central Brazil in dry virgin and secondary forests. Fruits of S. pubiflora should be checked by new collections, as on the insufficient material, both Ducke (5:30) and I suggested that perhaps those of S. pubiflora are smaller.

55. S. rubiginosa A. DeCandolle

56. S. parvifolia A. DeCandolle

Back in 1969 (7:63) we mentioned that we needed abundant new collections and also fruits of S. rubiginosa and we still lack them. We now have, however, definite indications that these two species are confined to different ecological habitats, S. rubiginosa being found in Eastern Brazil in sertão (cerrados, chapada, etc.) and on mountains such as Serra de Acuruá (Bahia), the type locality. For the ecological habitat of S. parvifolia see Appendix V of this paper. These two species, of course, are easily distinguished on vegetative characters. Blades of S. rubiginosa are densely pilosulous with fine and soft or moderately stiff, mostly erect but distally incurving hairs less than 0.7 mm long, the pubescence often being dense on both sides. In S. parvifolia the blades beneath are glabrous or subsetulose on midrib (wads of dense indumentum sometimes persistent), above glabrous or with curved hairs along midrib. For other differences see 9:246-247.

67. S. schultesiana Krukoff

68. S. malacosperma Ducke & Froes

S. malacosperma is known from 5 collections from the type locality, Colonia de Mulata near Monte Alegre, Pará, Brazil, and after many years of attempts we have given up hope of having additional topotypes.

S. schultesiana is known from 8 collections. The type is from Amazonas (Igarapé Belém), Brazil and the other collections are from Venezuela (Mérida and Barinas). We hope before long to obtain good fruiting and flowering material of this species and decide whether or not these species are distinct.

Fruit characters in Sect. Breviflorae are very important. Several pairs of species indistinguishable by vegetative and floral characteristics are easily distinguished by fruits. It is important to check whether the fruit characters of specimens collected in Venezuela will permit separation of S. schultesiana from S. malacosperma. I separated them in a Key (9:257) as follows:

Pericarp + 3 mm thick; fruits 5-8 (10) cm in diam; seeds 20-25. -

S. malacosperma

Pericarp 1 mm thick; fruits + 8 cm in diam; seeds many - S.

schultesiana

APPENDIX VIISpecies poorly understood

Two species, Strychnos progeliana and Strychnos neglecta, are known from the type collections made by Martius on Rio Japurá, Amazonas, Brazil, represented by specimens only at M. These are rather poor, the fruits are unknown, and these species were never recollected because Rio Japurá was not visited either by Ducke, myself, Fróes, Prance or other recent collectors. It would be most interesting to recollect these two species, especially in fruit. Incidentally, I consider the Japurá basin to be very rich in species of Strychnos as is the region of the Upper Rio Solimões near the Colombian border.

APPENDIX VIIISpecies described since the last extensive paper published in 1972 (Lloydia 35. 193-271)

- 32a. S. croatii Krukoff & Barneby, Suppl. #14 - Phytologia 33:313. 1976.
- 38a. S. ecuadoriensis Krukoff & Barneby, Suppl. #16 - Phytologia 39:276. 1978.
- 44a. S. cayennensis Krukoff & Barneby, Suppl. #13 - Phytologia 27:101. 1973.
- 53a. S. setosa Krukoff & Barneby, Suppl. #17 - Phytologia 1978.
- 57a. S. recognita Krukoff & Barneby, Suppl. #13 - Phytologia 27:103. 1973.
- 66a. S. alvimiana Krukoff & Barneby, Suppl. #13 - Phytologia 27:105. 1973.
71. S. schunkei Krukoff & Barneby, Suppl. #12 - Phytologia 27:53. 1972.

## List of Exsiccatae

The first list of Exsiccatae covering papers on *Strychnos*, including Supplement XI, was published in *Lloydia* 35(3): 262-270. 1972, the second covering Supplements XII, XIII and XIV in *Phytologia* 33: 319-322. 1976, the third covering Supplements XV and XVI in *Phytologia* 39: 281-282. 1978 and the present list covers Supplement XVII. Only numbered collections and those of which the dates of collection are recorded have been listed. Collections identified with doubt are not listed. If a collector gathered his collection together with others, only his name is cited in this list. Collections with Dr. Prance's numbers are cited under Prance.

Almeida, J., 128 (15).

Boeke, Jef. D., 1327 (65).

Burger, William, 10655 (12).

Cardona, F., 1228 (35).

Croat, T. B., 24206 (31), 40194 (12), 41877 (12), 43838 (12),  
44412 (12).

Forero, E., 1489 (39), 1524 (32a).

Foster, Robin, 2501 (70), 3243 (70), 5007 (4), 6158 (70).

Gentry, Al., 1952 (12), 15643 (23), 18343 (39), 18416 (38),  
18471 (39), 18530 (32).

Klein, R. M., 6/988 (11).

LeClezio, I (12).

León, H., 638 (65).

Liesner, R. L., 3135 (12), 3206 (31).

Maas, P. J. M., 2533 (21).

Martinez, C. G., 2297 (13).

Montgomery, Gene, s.n. (6/4-1976) (12).

Neill, David, 3012 (12).

Plowman, T., 6678 (38), 6694 (38).

Prance, G. T., 23153 (61).

Revilla, Juan, 1490 (36a), 1857 (39).

Rodriguez, Hector, 68 (53).

Santos, T. S., 165 (57a), 727 (57a), 1250 (53a), 1757 (66a),  
2055 (57a), 2281 (54), 3012 (54), 3141 (65).

Ule, E. H. G., 97 (11), 1209 (11).

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1. Ducke, Adolpho. O gênero Strychnos L. na Amazonia Brasileira. Bol. Téc. do Inst. Agr. do Norte, 3:1-23. 1945.
2. " " Plantas novas ou pouco conhecidas da Amazonia. Bol. Téc. do Inst. Agr. do Norte, 19:20-39. t. 7-9. 1950.
3. " " O gênero Strychnos no Rio de Janeiro, Bol. do Museu Nacional, 13. 1951.
4. " " A new curare-plant from the Brazilian Amazon. An. Acad. Bras. Ciências 23, 2:209-212. 1951.
5. " " O gênero Strychnos no Brazil, Bol. Téc. do Inst. Agr. do Norte 30:1-64. 1955.
6. Krukoff, B. A. and J. Monachino. The American species of Strychnos. Brittonia 4:248-322. 1942.
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13. " " Species minus cognitae. Hooker Icones Plantarum 3173-5. 1932 and 3223-5. 1933.

## NEOTROPICAL TRICLISIEAE AND ANOMOSPERMEAE

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It is satisfactory that good steady progress is being made in our knowledge of both tribes. Since the latest paper of this series (Supplement XIII) was published, 65 new collections were examined, adding to our knowledge of several species. Extensions of range were noted for 9 species, and two species, namely Caryomene grandifolia and Anomospermum andersonii, are described as new. The prize collection is of a new genus, Cionomene javariensis, with extraordinary staminate flowers which have the inner 3 sepals fused for the most part into a solid column. Two excellent collections in mature fruit of Anomospermum reticulatum ssp. idrobi from Panama permitted Barneby and me to finally ascertain the identity of numerous collections from Costa Rica collected by Humberto Barquero M. on various occasions in 1970, 1971 and in 1977. First collection of Abuta steyermarkii in fruit and of Abuta aris-teguietae appear to back up our understanding that these two are distinct species. For their full understanding we need staminate specimens of both species which are still not known.

The chemical work on neotropical Triclisiae and Anomospermeae by Dr. Michael P. Cava and his associates continues. A new oxoaporphine alkaloid - splendidine - has been recently isolated from stem wood of Abuta rufescens Aublet.<sup>(1)</sup> Its structure was proved by total synthesis. The promising results on this project with cancer on behalf of the Cancer Institute are being followed; large samples,  $\pm$  50 lbs. each, of Abuta rufescens, Sciadotenia toxifera and Abuta pahni were recently obtained by me and presently studied chemically by Dr. Cava. K. Thanikaimoni continues study of pollen. This study appears to be promising as there are several types of pollen in these tribes. The extensive paper on the wood anatomy of the two tribes by A. M. W. Mennega is still being revised by the author and unfortunately not yet published.

Unexpectedly progress in the study of chromosomes was made. Seeds of several species were distributed to three institutions. At MO seeds did not germinate; at NY the technique in use was found not to be giving results with chromosomes of Menispermaceae which are very small and difficult to separate. Recently I received a communication from Pacific Tropical Botanical Garden in Hawaii to the effect that Dr. Carr succeeded in counting chromosomes from rooting material of Elephantomene eburnea. These studies are of considerable interest as of the 16 known New World

genera of Menispermaceae, chromosomes were studied of only four genera (Calycocarpum, Menispermum, Cocculus and Cissampelos). The material for all these studies (chemical, of the wood anatomy, and some material for chromosome studies) were supplied by me.

The time is not ripe as yet for writing Menispermaceae for Flora Neotropica. The revision of the small genus Hyperbaena, which was under study by Mathias for more than 15 years, still is not published. Furthermore, it is expected that many new species will be collected. We already have at NY material of 7 species and of one subspecies which are probably new and which we do not want to describe because of the lack of sufficient material.

I am continuing to receive specimens of Central and South American Menispermaceae for identification. Among these, specimens of Sparattanthelium (Gyrocarpaceae), also less frequently sterile collections of Dioscorea (from Brazil only - not Central American), and of Cucurbitaceae are often sent as unknown Menispermaceae.

I. Chondrodendron Ruiz & Pavón, Syst. Veg.  
261. 1798.

2. Chondrodendron platiphyllum (A. de St. Hilaire) Miers, Ann. Mag. Nat. Hist. III. 19: 122. 1867.

Brazil: T. Plowman 7327 (ECON). Guanabara: D. Sucre 2074 (HB). São Paulo: Alb. Löfgren 3112.

II. Curarea Barneby & Krukoff, Mem. N. Y. Bot. Gard. 22(2): 7. 1971.

1. Curarea toxicofera (Weddell) Barneby & Krukoff, Mem. N. Y. Bot. Gard. 22(2): 9. 1971.

Colombia: Chocó: Rio Pichimá, +100 m, Luis E. Forero 666.  
Peru: Loreto: Maynas, Rio Itaya, Juan Revilla, 1501.

This is the first record from Chocó; the species has been already collected in Panama.

3. Curarea tecunarum Barneby & Krukoff, Mem. N. Y. Bot. Gard. 22(2): 12. 1971.

Ecuador: Tzapino, alt. +420 m, Oldeman & Avedo 42.

The collectors state on the label: "La corteza esta rasgada en pedazitos muy chicos, y usada para preparar Curary (no hay otras plantas mezcladas). Nombre Auca - "Hunta". "

CIONOMENE (1) Krukoff, gen. nov. Menispermaceum tribu Triclisieis referendum sepalis floris ♂<sup>3</sup> intimis in columellam elongatam solidam androecium longe supra sepala externa calyculiformia elevantem concretis -- Generitypus: Cionomene javariensis Krukoff.

Bush rope, young branchlets stout, striate, not lenticillate, minutely puberulent, hollow inside as in some spp. of Caryomene; petioles (2.5)-7-9 cm long, stout, striate, incrassate at both ends, minutely puberulent; leaf-blades coriaceous, suborbicular or broadly ovate, obtuse or submarginate at apex, subcordate at base, (7)-13-19 cm long, (7)-11-14 cm broad, glabrous and lustrous above, densely and softly velvety-tomentulose below even at maturity; costa and secondaries depressed-canaliculate above, very prominent beneath; secondaries (8)-10-12 per side, tertiaries above slightly evident, prominent below; inflorescences ♂ narrowly cymose-paniculate serially supra-axillary, solitary or two together from young leafy branchlets, 11-23 cm long, many-flowered; - pedicels 2-5 mm; flower ♂: sepals 6--8, like the whole inflorescence densely velvety-puberulent externally, 1--2 exterior minute, 3 median at base of flower subequal ovate-deltate 1.5--1.8 x 1.5--2 mm, fleshy-thickened, dorsally convex, 3 interior linear-oblongate  $\pm$ 5 mm, united through  $\pm$ 3.5 mm into a solid column, the free lobes ovate  $\pm$ 1.5 mm, valvate in bud  $\pm$  erect at anthesis; petals 6, flabellate-truncate  $\pm$ 0.6 mm, the 3 outer embracing the opposed filament; androecium 6-merous, the filaments free from base, claviform slightly inclined,  $\pm$ 0.6--0.8 mm, the latero-terminal prominent anthers dehiscent by vertical slits.

Brazil: Amazonas: basin of Rio Javari, Rio Curaçá, 8 miles above mouth, forest on terra firme, G. T. Prance, R. J. Hill, T. D. Pennington and J. M. Ramos 24137 (INPA-holotype, NY) (Oct. 25, 1976).

Collectors describe the plant as liana, corolla brownish-cream, tubular, flowers sweet sickly scented.

The plant cannot belong to the genera Chondrodendron, Curarea, Sciadotenia, Ungulipetalum, Telitocicum, Abuta, Anomospermum, Orthomene or Caryomene of which staminate flowers are known. This leaves out only Elephantomene, of which staminate flowers are not yet known.

The plant has the matted indumentum on the underside of leaves, an indumentum of extremely fine and short hairs clothing the back of the leaf-blades with a felt so close that individual trichomes often cannot be distinguished except under magnification of at least 20 diameters. Only two genera in American

(1) Means "column" + mene.

Menispermaceae, Chondrodendron and Curarea, have the same kind of indumentum, but the one known species of Elephantomene does not. Furthermore, leaves of our plant are unique in the American Triclisieae and Anomospermeae in outline; they are suborbicular or broadly ovate (13-19 cm long and 11-14 cm broad) and subcordate at base.

The full concept of this genus will not be understood until fruits and pistillate flowers are collected. This is the usual case with genera of newly described American Triclisieae and Anomospermeae because of extreme difficulties connected with their collection. It is to be recalled that fruits of Ungulipetalum, ♂ flowers of Telitoxicum and Caryomene, and ♂ and ♀ flowers of Elephantomene are not yet known. I place this genus in Triclisieae next to Curarea. I am backed on this by L. L. Forman, the specialist on Asiatic Menispermaceae, who stated in his letter to me: "It must be a new genus and I agree with your opinion that it could belong in Triclisieae, perhaps allied to Albertisia (syn. Epinetrum), where the inner 3 sepals are valvate but largely joined (laterally only) into an elongate tube; but here many anthers are present on a fused synandrium with the petals at its base, i.e., inside the base of the calyx tube."

For the latin diagnosis and the description of ♂ flowers I am obligated to Barneby who questioned however whether this genus should be described in absence of its fruits or the staminate flowers of Elephantomene. Inasmuch as the type is from the poorly accessible Rio Javari (border of Brazil and Peru) and inasmuch as inspite of our efforts during the last three years, we failed to obtain staminate flowers of Elephantomene, I do not want to wait for the new collection of these two entities.

III. Sciadotenia Miers, Ann. Nat.  
Hist. II. 7: 43. 1851.

7. Sciadotenia sprucei Diels, Pflanzenreich 4(94): 84. 1910.

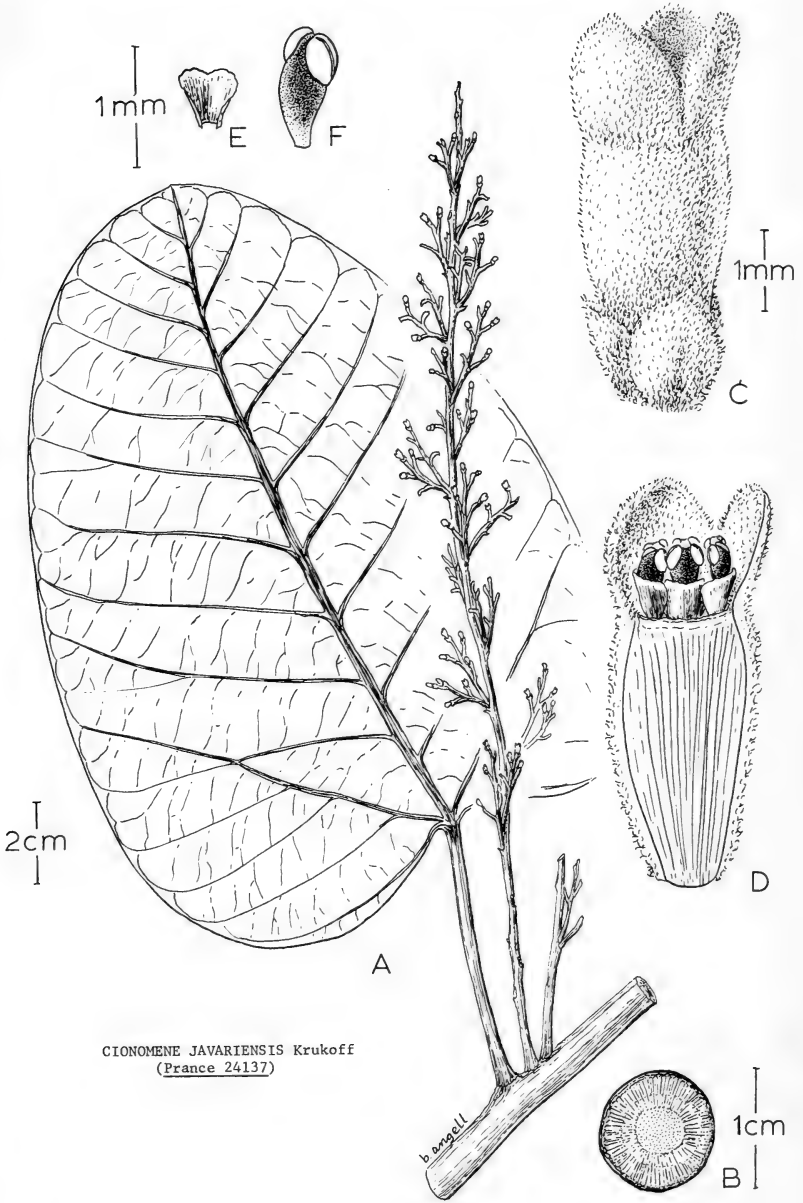
Brazil: Pará: Serra do Cachimbo, BR 163, Cuiabá - Santarem Highway, km 1135, vicin. of Igarape Natal, terra firme, G. T. Prance 25506.

9. Sciadotenia brachypoda Diels in Engler, Pflanzenreich 4(94): 84. 1910.

Brazil: Acre: Cruzeiro do Sul, próximo do aeroporto novo, O. P. Monteiro & C. D. Mota 114.

This is the first record of this species from the State of Acre.





*CIONOMENE JAVARIENSIS* Krukoff  
(Prance 24137)

16. Sciadotenia pubistaminea (K. Schumann) Diels in Engler, Pflanzenreich 4(94): 85. 1910.

Brazil: Bahia: E. Pereira 9469.

This is the fourth collection of this species. It is known from the States of Bahia and Minas Gerais; its fruits are not yet known.

- V. Telitoxicum Moldenke in Krukoff & Moldenke, Brittonia 3: 42. 1938.

7. Telitoxicum negroense (Krukoff & Moldenke) Krukoff, comb. nov.

Telitoxicum negroense (Krukoff & Moldenke) Krukoff, Phytologia 25(1): 37. 1972.

Not validly published because the place and date of publication of this basionym were not cited.

Abuta negroensis Krukoff & Moldenke, Bull. Torrey Club 70: 403. 1943.

The reasons for making a new combination are amply covered in Supplement IX (Phytologia 1972). This species still known only from the type collection (Froes 12423) collected near Santa Ana, on Rio Içana, basin of the upper Rio Negro, State of Amazonas, Brazil.

- VI. Abuta Barrère ex Aublet, Pl. Guian. 1: 618. Pl. 250. 1775.

1. Abuta rufescens Aublet, Hist. Pl. Guian. 1: 618. Pl. 250. 1775.

French Guiana: Cayenne, Saül, circuit Belvédère, 300 m avant d'arrivée au sommet, M. Fournet 20 (30/6-1978). Brazil: Pará: Itaituba, Altamira, N. A. Rosa & M. Silva 2233. Peru: Huanuco: Leon Prado, Rupa Rupa, al este de Tingo Maria, cerca al cerro Quemado, Schunke 10202.

The specimens from Brazil and Peru are vouchers for samples of stemwood for chemical studies in connection with cancer research by Dr. M. Cava.

4. Abuta grisebachii Triana & Planchon, Ann. Sci. Nat. IV, 17: 47. 1862.

Colombia: Vaupés: R. Romero Castañeda 3837 (F). Brazil:

Amazonas: near Manaus, O. C. Nascimento et al. 272 (INPA);  
Mato Grosso: basin of Rio Aripuaná, above Andurina, Prance et al. 18681.

This is the first record of this species from Mato Grosso.

5. Abuta candollei Triana & Planchon, Ann. Sci. Nat. IV.  
17: 47. 1862.

Brazil: Amazonas: D. Coelho 737 (INPA) (near Manaus, Reserva Forestal Ducke), Froes 22859 (basin of Rio Negro).

6. Abuta aristeguietae Krukoff & Barneby, Mem. N. Y. Bot. Gard.  
20(2): 21. 1970.

Ecuador: Azuay: highway Cuenca - Cola de San Pablo, road-side 1650 m, Jef. D. Boeke et al. 1002 (2/15-1977 -frts.).

This is the first collection of this species from Ecuador. It has been known previously from 11 collections, five (including type) from Venezuela, two from Peru and four from Costa Rica. The staminate flowers of this species are still not known.

There is no longer any doubt that A. aristeguietae is specifically distinct from the related A. steyermarkii already collected in Mexico (Chiapas), Belize and Guatemala. Unlike in A. steyermarkii, the dry epicarp of this species turns dark purplish-brown and becomes dotted with distinct pale fawn-colored scabrous dots, as in the case with A. dwyerana. The endocarp in A. steyermarkii is also much thinner.

7. Abuta steyermarkii (Standley) Standley, Field Mus. Publ. Bot. 23: 156. 1944.

Mexico: Chiapas: near Guadalupe, selva Lacandona, Ocosingo, alt. 470 m, Juan I. Calzada et al. 2844 (Jan. 24, 1976 - frts.) (F).

This is the first record of this species from Mexico. It has been known previously from seven collections, four (including type) from Guatemala and three from Belize. This collection is the first collection in fruit, which is different from that of A. aristeguietae (see under A. aristeguietae). The staminate flowers are still not known.

Drupe is oblong-ellipsoid, rounded on both ends scarcely incurved, a little laterally compressed  $\pm 2.25 \times 1.2$  cm, strigulose with appressed hairs, not dotted with distinct pale fawn-colored scabrous dots.

9. Abuta pahni (Martius) Krukoff & Barneby, Mem. N. Y. Bot. Gard. 22(2): 43. 1971.  
Peru: Loreto: Maynas, T. Plowman et al. 6759.
11. Abuta barbata Miers, Contr. Bot. 3: 83. 1871.  
French Guiana: Cayenne: Salil, M. Fournet 19.
14. Abuta selloana Eichler, Flora 47: 389. 1864.  
Brazil: Guanabara: Herb. Jard. Bot. Rio 148538 (US).
24. Abuta racemosa (Thunberg) Triana & Planchon, Ann. Sci. Nat. IV. 17: 48. 1862  
Panama: Canal Zone: Barro Colorado Island, Robin Foster 2318 (F).
25. Abuta panamensis (Standley) Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(2): 22. 1970.  
Mexico: Veracruz: J. I. Calzada 678 (F) (Los Tuxtlas), 1077 (F) (Catemaco). Honduras: Copan, Antonio Molina 30600 (MO). Costa Rica: Heredia: Gary S. Hartshorn 1116.  
This is the first record of this species from Heredia.
26. Abuta chiapasensis Krukoff & Barneby, Mem. N. Y. Bot. Gard. 20(2): 23. 1970.  
Mexico: Chiapas: munic. Ocozocoautla de Espinosa, 3 km N. of Ocozocoautla, D. E. Breedlove 23348.  
Fruits of this species are described for the first time.  
Drupe obovoid 20-24 x 13-15 mm, densely minutely appressed-velutinous and inconspicuously lenticellate, the mealy exocarp  $\pm 05$  mm, the crustaceous endocarp  $\pm 02$  mm thick.
27. Abuta grandifolia (Martius) Sandwith, Kew Bull. 1937: 397. 1937.  
Venezuela: Alto Orinoco, Leon Croizat 399A (F). Brazil: Marlene da Silva & L. D. Coelho s.n. (18/8-1971) (MO); Mato Grosso: A. S. Lima s.n. (11/17-1944). Peru: Loreto: Maynas, T. Plowman et al. 6611. Ecuador: Cononaco, alt. 300 m, Oldeman & R. A. A. Arevalo 115.

VII. Caryomene Barneby & Krukoff, Mem. N. Y. Bot. Gard. 22(2): 52. 1971.

5. Caryomene grandifolia Barneby & Krukoff sp. nov. a caeteris generis speciebus foliis maximis, lamina saepissime 15--35 cm longis absimilis.

Bush-ropes wholly glabrous, but the leaf-blades very densely minutely pallid-papillose beneath, the young stems pale green to blackish, striate, without lenticels. Petiole slender, 4-16 cm long, between the thickened extremities 1-2.2 mm diam. Leaf-blades chartaceous, olive-green, lustrous above, dull beneath, conspicuously pallid-nerved, broadly to narrowly ovate-acuminate, rounded to sinuately subtruncate (rarely very broadly cuneate) at base, long acuminate and mucronate at apex, (0.9-)1.5-3.5 cm long, (4.5-)6-18 cm diam. Primary venation of 5 nerves from the base, the outer pair weak, submarginal, less than 1/4 length of blade, the inner pair divergently incurved-ascending from shortly above insertion of petiole to or beyond middle of blade, the costa giving rise on each side to  $\pm 3-4$  incurved-ascending and several weaker, interposed, divaricate secondaries, these all elevated both sides but more strongly so beneath, the tertiary venation and reticulation faint, the ultimate defined areoles beneath much  $< 1$  mm diam. Flowers  $\sigma^7$  = sepals 6, the 3 outer small  $\pm 1.5 \times 0.8-1$  mm, the three inner much larger  $3-4 \times 2-2.5$  mm, imbricate in vernation; petals 6, fleshy, glabrous embracing filaments; stamens 6 cobriform, all equal, 1.3 mm.

Brazil: Amazonas: Maués, grounds of Guarana factory, disturbed forest on terra firme, D. G. Campbell, O. P. Monteiro, B. W. Nelson, J. O. Ongley (G. T. Prance number 22127 (Apr. 25, 1974 - flrs.) (Holotype - NY); basin of Rio Negro, Macubeta on Rio Marie, Fróes 12477/221. Peru: Loreto: vicinity of Aguaytía, Mathias & Taylor 5127, 5130, T. J. Zavortink 2294, J. Schunke 1970/21, 1970/26.

The earliest collection, which is sterile, was collected in 1942 while Fróes, in the employ of Chicle Development Co., was collecting gum samples and vouchers on the tributaries of the upper Rio Negro. Fróes' field number of this collection is 221 while 12477 stands for Krukoff Herbarium. This collection puzzled us for a long time. We referred (Mem. N. Y. Bot. Gard. 20(2): 11. 1970) to it and to three others from Peru as representing an undescribed Abuta perhaps related to A. imene. However, once the generic concept of Caryomene emerged, the relationship of this undescribed entity was revealed, the dense but minute papillosity of the leaf's lower surface and the general facies and venation of the foliage being characteristic of the genus. It differs from the four described species of Caryomene

in the large size of the leaves. Prance et al. 22127 is the first collection of this species, in fact, the first of the genus in staminate flowers. The above description of vegetative parts and its history of collections are taken from Suppl. VIII (Mem. N. Y. Bot. Gard. 22(2): 60. 1971).

It is interesting to note that two sterile collections of Schunke match the fertile collection of Prance et al. in every detail. The Schunke collection, Zavortink 2294, and Mathias 5127, 5130 were collected from the same property ("chacra de don Diogenes del Aguila"). The undersurface of the leaves in some of these are strikingly olive-green when dry, resembling in this character Caryomene olivascens.

The costa of leaf-blades in C. grandifolia, as in the case with C. foveolata and C. prumnoides is elevated above and tertiary venation of upper leaf-surface slender but evident and prominulous. In C. glaucescens and C. olivascens costa is depressed-caniculate above and tertiary venation of upper surface is immersed and invisible. It is distinguished from C. prumnoides and C. foveolata, in fact, from all other known species of Caryomene, in its large leaves 15-35 cm (in average), almost twice as large as of other known species, long acuminate and mucronate at apex.

VIII. Anomospermum Miers, Ann. Nat.  
Hist. III, 14: 101. 1864.

1. Anomospermum grandifolium Eichler, Flora 47: 388. 1864.

Colombia: Chocó: along Rio Pavarandó, near border with Antioquia, W of Mutata, forest remnants along stream and on steep slopes, +150 m, Al. Gentry & Henry León 20243 (Oct. 8, 1977 (MO, NY-frts. only).

This is the first record of this species from Colombia. This collection in mature fruit.

- 4a. Anomospermum chloranthum Diels spp. chloranthum, Mem. N. Y. Bot. Garden 22(2): 68. 1971.

Brazil: Amazonas: estrada Manaus - Porte Velho, O. P. Monteiro & J. Ramos 789 (INPA).

This is the first record of this species from Amazonas.

- 5a. Anomospermum reticulatum (Martius) Eichler ssp. reticulatum, Mem. N. Y. Bot. Gard. 22(2): 73. 1971.

Brazil: Acre: Serra do Divisor, J. Ramos & G. Mota 336 (INPA).

- 5d. Anomospermum reticulatum (Martius) Eichler ssp. idroboi  
Krukoff & Barneby, Mem. N. Y. Bot. Gard. 22(2): 75. 1971.

This subspecies was described from rather complete material, two collections with staminate flowers and one with mature fruits, all from a single locality, Cordillera La Macarena, Meta, Colombia at 1300-1900 m.

Plants of Menispermaceae are among the most unsatisfactory creations of nature from the taxonomist's point of view. Flowers are extremely small and dioecious, and some genera can be told apart only on fruit and seed characters. Under the circumstances, we usually have in a Herbarium half a dozen or so collections which probably represent new species but cannot be described until flowers of one or other sex or mature fruit are procured. In 1970 three collections of Anomospermum were received from H. Barquero M., one with immature fruit and two others with pistillate flowers. They were mentioned in Supplement X (Lloydia 37: 26. 1974.). Many letters were written to Sr. Barquero urging him to collect staminate flowers and mature fruits. In 1971 he sent a second pistillate collection in flower, and in 1977, still three other collections were received, one with female flowers, one with male flowers (unfortunately infected by mycelium), and a third with almost mature fruit. In the meantime a sterile collection (Croat 22158 (MO) was received from Panama which was cited in Supplement XI (Phytologia 33: 335. 1976.). Finally in June 1978, on a visit to MO, two excellent collections from Panama were found, both with mature fruit, one from Coclé and another from Colón. With these collections we finally have complete material of this subspecies, male and female flowers and mature fruits. The form and sculpture of the endocarp placed these collections in subspecies idroboi. Excellent, abundant leaf material of these two collections connect them with those from Colombia and Costa Rica.

The discontinuous distribution, which would be rather unusual in another group of plants, should not distress those who work on Menispermaceae, a family from which many similar examples could be cited. In 1938, when I was working on the first Monograph of Menispermaceae (Brittonia 3: 1-74. 1938.), Chondrodendrum tomentosum Ruiz & Pavon which, by the way, is the principal ingredient of Curare of many Indian tribes on the Amazon, especially in Peru, had been collected on several occasions in the Panama Canal Zone. Because this seemed to be a very disjointed range of distribution, I studied Ch. hypoleucum especially carefully before reducing it to Ch. tomentosum. During the last 40

years, of course, it has been collected outside of the Amazonian basin in Colombia (Caqueta) and also in the provinces of Panamá and Darién (Panama).

Orthomene verruculosa (Krukoff & Barneby) Barneby and Krukoff was originally collected in Vaupés, Colombia and then it was a great surprise to receive three specimens of it from French Guiana and one from adjoining Amapá, Brazil. These are cited in Supplement IX (Phytologia 25: 45-48. 1972.).

Still another example is Curarea toxicofera (Weddell) Barneby & Krukoff, originally thought to be confined to the Amazonian basin, but eventually found in Colombia (Caqueta) outside of the Amazonian basin and in Panama (provinces of Panamá, Colón, Darién and Canal Zone).

Costa Rica: Alajuela: Zapote de Alfaro Ruiz, Finca Los Ensayos, elev. 1100 m, Humbero Barquero M. 1970/202 (frts.), 1970/s.n., 1970/s.n., 1971/s.n. (o), 9/20-1977/s.n. (o<sup>2</sup> infected with mycelium), 9/20-1977/s.n. (o), 10/26-1977/s.n.  
Panama: Chiriqui: Burica Peninsula, near Costa Rican border, Croat 22158 (MO); Cocle: 7 km N of El Copé, +900 m, Jim Folsom 1313 (1/14-1977 - frts.) (MO), Colón: Rio Lavanita, W. C. D'Arcy 11246 (4/7-1977 - frts.) (MO).

According to Barquero, flowers in Costa Rica usually occur in September.

8. Anomospermum andersonii Krukoff sp. nov. Species foliorum laminiis elongatis pinnatinerviis, drupis gracilibus 2-1/2plo longioribus quam latioribus a congeneribus differt.

For the description of sterile material of this species I refer to Supplement VIII (Mem. N. Y. Bot. Gard. 22(2): 78. 1971). At that time five collections were available to Barneby and me, three from the basin of the upper Rio Solimões, Amazonas, Brazil and two from vicinity of Aguaytia, San Martín, Peru. Recently I received an excellent collection in mature fruits and now this species can be formally described as new.

Drupe obliquely oblong-ellipsoid  $\pm 4 \times 2$  cm; endocarp  $\pm 1.5$  mm thick, carinate around the long diameter and shallowly pitted in lines along either side of the keel, otherwise almost smooth externally except for fine incised venulation, the wall of the cavity undulately wrinkled but otherwise smooth, the external pits not produced internally as prongs.

Brazil: Pará: basin of the upper Rio Tapajós, Rio Cururú, 1-10 km upriver from Pratatí 200-300 m; ca 8°8, 57°5' W; dense



inundated vegetation of trees and vines along edge of river at flood level, William R. Anderson 10861 (Feb. 12, 1974) (Holotype - NY); Amazonas: basin of Rio Solimões, Krukoff 7565, 7567 (São Paulo de Olivença), Fróes 12151 (Igarapé Belém). Peru: San Martín - Loreto, vicin. of Aguaytia, Mathias & Taylor 3526 (NY, UCLA), 5090 (NY, UCLA).

Few, if any, species of Menispermaceae had such a difficult time being "born". It was first collected by me in January 1936, then by Fróes in 1939, then by Mathias in 1957 and 1960 and finally for the first time in fruit by Anderson in 1974. Dr. Anderson asked me to have the holotype deposited at INPA, the only other Herbarium besides NY which is supposed to have this collection. I have written them and the specimen could not be located. Under the circumstances, I have no choice but to describe the species on the basis of the specimen deposited in NY. It differs immediately from Anomospermum matogrossense, fruits of which are not known, in differently shaped leaves which are 3 to 5 times as long and they are wide whereas in A. matogrossense they are not more than 2-1/2 times as long as they are wide. Leaves of Anomospermum andersonii superficially resemble leaves of Telitoxicum rodriguesii from which they are also immediately distinguished by distinct reticulation on both surfaces of the leaves tertiary as seen under a magnifying glass.

For the latin diagnosis I am obligated to Barneby. He questions however that the five sterile specimens cited above are conspecific with the type.

IX. Orthomene Barneby & Krukoff, Mem.  
N. Y. Bot. Gard. 22(2): 79. 1971.

1. Orthomene schomburgkii (Miers) Barneby & Krukoff, Mem. N.Y. Bot. Gard. 22(2): 80. 1971.

Colombia: Antioquia: Munic. Anori, D. D. Soejarto et al. 3943 (MO). Peru: Loreto: J. Schunke V. 6607 (San Martín), Al. Gentry et al. 19070 (MO) (Loreto).

This is the first record from Antioquia.

X. Elephantomene Barneby & Krukoff  
Lloydia 37: 27. 1974.

1. Elephantomene eburnea Barneby & Krukoff, Lloydia 37: 28. 1974.

French Guiana: Saül: S. Mori & J. J. de Granville 8780 (plateau la Dourne), M. Fournet s.n. (frts. collected on the

ground).

Mori and de Granville 8780 probably from the same plant as de Granville 2704. Seeds of this collection germinated many months after they were sown at N. Y. Botanical Garden. The drupe was not known to us and is described below.

Drupe (Fournet s.n.) obliquely pyriform 7 x 5 cm, not or scarcely compressed, the leathery exocarp 4--5 mm thick, the succulent mesocarp traversed by fibers adherent to the endocarp. Endocarp as described in the protologue of the species.

Species not described because of absence of sufficient material

Eight species and 1 subspecies are left undescribed because of lack of fertile or sufficient material. In order to facilitate their collection, the known localities are listed here. For descriptions of their vegetative parts the reader is referred to the papers where they were mentioned.

18. Sciadotenia sp.

Peru: Loreto: down river from Yurimaguas.

Mathias & Taylor 3933 (♂ with inflorescence - axes, carpophores but no drupes) (See Mem. N. Y. Bot. Gard. 22: 25. 1971).

19. Sciadotenia sp.

Brazil: Pará: Serra do Cachimbo, Cuiabá - Santarem highway, km 1300, terra firme, Prance 25705 (sterile) (See Phytologia 39: 285. 1978).

31. Abuta sp.

Brazil: basin of Rio Negro, Maturaca on Rio Cauaburi, R. E. Schultes 24577 (INPA) (sterile) (See Mem. N. Y. Bot. Gard. 22: 52. 1971).

32. Abuta sp.

Colombia: Chocó: Gentry & Forero 7203 (MO, NY) - hills behind Bahia Solano (Puerto Mutis) alt. 0-250 m, tropical wet forest (See Phytologia 33: 333. 1976); Gentry & Fallen 17731 - Rio San Juan, just below Tadó, +100 m (See Phytologia 39: 289. 1978). Both collections are sterile.

33. Abuta sp.

Colombia: Chocó: vicin. of Unguia, +50 m, Gentry 16723

(NY) (sterile) (See Phytologia 39: 289. 1978).

5h. Anomospermum reticulatum ssp. (?)

Peru: Huánuco: southwestern slope of the Río Llulla Pichis watershed, on the ascent of Cerros del Sira (in rain forest, +1290 m), Frank Wolfe 12339 (F), 12340 (F). Both collections are sterile (See Phytologia 25: 44. 1972).

10. Anomospermum sp.

Colombia: Valle: costa del Pacífico, Río Cajambre, silva, alt. 5-80 m, Cuatrecasas 17528 (F) (sterile) (See Phytologia: 33: 335. 1976).

6. Caryomene sp.

Surinam: Brokopongo Dct.: 8 km of village Brownsveg, Van Donselaar 2211 (U, NY-fragment) (sterile) (See Mem. N. Y. Bot. Gard. 22: 61. 1971).

7. Caryomene sp.

French Guiana: Saül, M. Fournet 25 (frts. collected on the ground).

Fournet states on the label: "a vine 40-50 cm in diam." This is the first record of this genus in French Guiana.

### Bibliography

(In order to conserve space, I am citing only the papers which are not cited in Supplements VII-XII).

1. Cava, Michael P., et al. Splendidine. A new Oxoaporphine alkaloid from Abuta rufescens Aublet. Submitted to Can. Jour. Chemistry.
2. Krukoff, B. A. and R. C. Barneby. Supplementary notes on American Menispermaceae XIII. Neotropical Triclisieae and Anomospermeae. Phytologia 39: 283-293. 1978.

List of Exsiccatae

The first list of Exsiccatae covering our papers on Menispermaceae including Supplement VIII was published in Mem. N. Y. Bot. Gard. 22: 1-89. 1971, the second list covering Supplements IX, X and XI in Phytologia 33: 337-340. 1976, and the third covering Supplements XII and XIII in Phytologia 39: 292-293. 1978. The present list covers Supplement XIV. The number in parenthesis corresponds with the species - number of this and other papers (Supplements VIII to XIII). Only numbered collections and those of which the dates of collection are recorded have been listed. If a collector gathered his collection together with others, only his name is cited in this list. Collections with Dr. Prance's numbers are cited under Prance.

Anderson, W. R., 10861 (AN8)

Barquero M., H., 202/1970 (frts.) (AN5d), s.n. 1970 (o) (AN5d), s.n./1970 (o) (AN5d), s.n./1971 (o) (AD5d), s.n./Sept. 20, 1977 (o) (AN5d), s.n./Sept. 20, 1977 (o) (AN5d), s.n./Oct. 26, 1977 (AN5d), s.n./Nov. 1977) (seedling raised at NYBG) (AN5d).

Boeke, Jef.D., 1002 (A6).

Breedlove, D. E., 23348 (A26).

Calzada, Juan I., 678 (A25), 1077 (A25), 2844 (A7).

Castaneda, Romero R., 2837 (A4).

Coelho, D., 737 (A5).

Croizat, Leon, 399A (A27).

D'Arcy, W. G., 11246 (AN-5d).

Folsom, Jim, 1313 (AN5d).

Forero, Luis, E., 666 (CU1).

Foster, Robin, 2318 (A24).

Fournet, M., 19 (A11), 20 (A1), s.n. (Oct. 1978) (E1).

Fróes, R., 12151 (AN8), 12477/221 (C5), 22859 (A5).

Gentry, Al., 19070 (O1), 20243 (AN1).

Hartshorn, Gary S., 1116 (A25).

Herb. Jard. Bot. Rio, 148538 (A14).

Krukoff, B. A., 7565 (AN8), 7567 (AN8).

Lima, A. S., s.n. (11/17-1944) (A27).

Lofgren, Alb., 3112 (CH2).

Mathias, M., 3526 (AN8), 5090 (AN8), 5127 (C5), 5130 (C5).

Molina, Antonio, 30600 (A25).

Monteiro, O.P., 114 (S9), 789 (AN4a).

Nascimento, O. C., 272 (A4).

Oldeman, R. A. A., 42 (CU3), 115 (A27).

Pereira, E., 9469 (S16).

Plowman, T., 6611 (A27), 6759 (A9), 7327 (CH2).

Prance, G. T., 18681 (A4), 22127 (C5), 24137 (C1), 25506 (S7).

Ramos, J., 336 (AN5a).

Revilla, J., 1501 (CU1)

Rosa, N. A., 2233 (A1).

Schunke, V., José, 6607 (O1), 10202 (A1), 1970/21 (C5), 1970/  
26 (C5).

Silva, Marlene, da, s.n. (Aug. 18, 1971) (A27)

Soejarto, D. D., 3943 (O1)

Sucre, D., 2074 (CH2).

Zavortink, T. J., 2294 (C5).

NOTES ON THE SPECIES OF ERYTHRINA. XIII

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Erythrina Symposium II was published in LLOYDIA in Sept./ Oct. 1977. Eight additional papers are planned for publication early in 1979 as Erythrina Symposium III. I plan to submit a brief paper for this Symposium, reserving the present one for information which is best published separately.

169 new collections were examined in connection with the preparation of this paper. No novelties are described as these, as well as the extensions of range of various species, are reserved for Supplement XII which will be published as a part of Erythrina Symposium III.

The important part of this paper is List of Exsiccatae covering specimens cited in papers of this series including the first monograph published in BRITTONIA in October 1939.

1. Erythrina fusca Loureiro, Fl. Cochinch. 427. 1790 based on Gelala aquatica Rumphius, Herb. Amb. 2:235. t.78. 1750.

Belize: Jansen & Ives 1188 (MO) (Belize District, coastal shoreline), John D. Dwyer 10741 (US). Costa Rica: Guanacaste: +10 m, G. Davidse 1452 (F). Colombia: Cauca: H. Garcia-Barriga 18834 (F). Ecuador: Guayas: Guayaquil, Alicia A. de Delgado 79 (MO); Brazil: Amazonas: Humayta, A. P. Duarte 7210 (F). Ceylon: R. H. Maxwell 831 (US), A. H. M. Jayasuriya 1411 (US), 1614 (US). Indonesia: West Irian: Kostermans 838 (A). Samoa: Upolu, Art Whistler 618 (US). Caroline Islands: S. F. Glassman 2904 (US). New Guinea: Sepik Dct., A. N. Millar NGF35133 (A); Morobe Dct., NGF 12370 (A), NGF24979 (A).

2. Erythrina crista-galli L. Mant. 99. 1767.

Panama: Panamá: (cult.), Edwin L. Tyson 6261 (MO). Brazil: Sello s.n. (Mel. 77260) (MEL); Bahia: Ilheus, (cult.), T. S. Santos 27599; Minas Geraes: Mel. 77238 (MEL); São Paulo: Anibal Gimenes 2628. Argentina: D. Seigler s.n. (Oct. 1976). Hong-Kong: (cult.), Kit Yock Chan 164 (US). Hawaii: (cult.), K. Nagata 811 (HLA). Australia: (cult.), Mel. 77239 (MEL).

3. Erythrina falcata Bentham in Mart. Fl. Bras. 15(1):172. 1859.

Brazil: São Paulo: Campinas: C. Pacheco s.n. (29/7-1951); Santa Catarina: J. Mattos 12147, L. B. Smith 12558 (F),

12729 (F), 12800 (US), 12945 (US). Bolivia: Cochabamba: Christopher Davidson 5109.

5. Erythrina ulei Harms, Verh. Bot. Ver. Brand. 48:172. 1907.

Peru: Cuzco: Prov. Paucartambo, Robin B. Foster 3040 (6/7-1974 - flrs. only; leafless) (F).

7. Erythrina poeppigiana (Walpers) O. F. Cook in Bull. U. S. Dept. Agr. Bot. 25:57. 1901.

Cuba: (cult.), A. Gonzales 600 (BM). Jamaica: (cult.), T. G. Yuncker 17899 (BM). Dominican Republic: (cult.), Alain H. Liogier 21313 (F). Guatemala: (cult.), Oswaldo Téllez 541. Costa Rica: Cartago: Turrialba, (cult.), William T. Gillis 10188 (F). Peru: San Martín: Lamas, 1000-1050 m, Jose Schunke V. 9752. Ceylon: (cult.), T. B. Warthington 2724 (BM), 1790 (BM) (progeny of "2724").

8. Erythrina suberosa Roxburgh, Hort. Beng. 53, nomen. 1814; Fl. Ind. 3:253. 1832.

India: Dehra Dun, Kirat Rum s.n. (2/4-1922) (BM), s.n. (25/4-1922) (BM); Nepal: J. F. Dobremez 1805 (BM).

10. Erythrina stricta Roxburgh, Hort. Beng. 53, nomen. 1814; Fl. Ind. 3:251. 1832.

India: Nepal: alt. +100 m, J. Makin 113 (BM) (March-flrs.; leafless). North Burma: F. Kingdon Ward 20724 (BM) (Apr. 26, 1953 - flrs.; leafless).

13. Erythrina subumbrans (Hasskár) Merrill in Philipp. Jour. Sci. Bot. 5:113. 1910:

Burma: Herb. Melbourne 77291. India: F. M. Jarrett HFP 874 (US) (Mysore), C. Thanikaimoni 1313 (near Yercand), Herb. Melbourne 77263, 77290. Ceylon: R. H. Maxwell 901 (US), 976 (US). Sumatra: O. Beccari 888. Philippines: Luming 1161. Samoa: Sawaii, Art Whistler 571 (US).

14. Erythrina breviflora Alph. DeCandolle, Prodr. 2:413. 1825.

Mexico: México: Olivia Converse 133 (MEXU) (Valle de Bravo, +1970 m); Morelos: Wolfgang Boege 1984 (10/12-1971 - flrs.) (MEXU); Michoacán, Br. Arsene 2868 (9/8-1909 - flrs.) (+2100 m), Mario Sousa 7998 (8/20-1977 - flrs.) (2050 m); Oaxaca: +1600 m, Mario Sousa 5811 (8/19-1976 - flrs.) (MEXU).

15. Erythrina edulis Triana; M. Micheli, Jour. de Bot. 6:145. 1892.  
Colombia: Caldas: T. Plowman 3753 (A). Peru: Ayacucho: prov. La Mar, M. T. Madison 10262-70 (F). Ecuador: Napo: near Cosanga, E. W. Davis 347 (S).
16. Erythrina speciosa Andrews, Bot. Repos. 7:pl. 443. 1806.  
Brazil: São Paulo: M. de Goes 19.
20. Erythrina leptorhiza Alph. DeCandolle, Prodr. 2:413. 1825.  
Mexico: Jalisco: El Mirador, +1800 m (abundant), A. Delgado 259 (16/3-1970 - flrs.) (MEXU); Hidalgo: Santa Gertrudis, +2500 m, L. S. Rodriguez J. 1162 (23/3-1975 - flrs.) (MEXU); Mexico: Olivia Converse 135 (MEXU) (+2558 m), Mario Sousa 4584 (MEXU) (+2400 m); Morelos: I. K. Langman 3518 (5/5-1941 - flrs.) (MEXU).
- 22a. Erythrina herbacea L. subsp. herbacea. Erythrina herbacea L. Sp. Pl. 706. 1753 sens. str.  
U.S.A.: Florida: Col. W. L. Stern 3337 (US) (Keys), Rugel 135 (BM), W. J. Dress 949 (BM), 950 (BM); Texas: D. S. Correll 31007.
- 22b. Erythrina herbacea L. subsp. nigrorosea Krukoff & Barneby in Phytologia 25(1):6. 1972.  
Mexico: Veracruz: Bruce Hansen 1788 (US), J. Dorantes 1117 (6/27-1972 - frts.) (MEXU) (falda de Cerro Azul); Oaxaca: Boone Halberg 1202 (MEXU), 7541 (distr. Tlacolula), 7452 (6/19-1977 - frts.) (distr. Tehuantepec, +10 m), 7493 (6/20-1977 - frts.) (distr. Yautepec, +700 m), 7586 (distr. Pochutla, +50 m), 7642 (6/26-1977 - frts.) (distr. Juquilla, +650 m).
23. Erythrina standleyana Krukoff in Brittonia 3:301. 1939.  
Mexico: Quintana Roo: Isla Cozumel, L. A. Pérez 1651 (5/25-1977 - flrs. & frts.) (MEXU).
24. Erythrina flabelliformis Kearney in Trans. N Y. Acad. 14:32. 1894.  
Mexico: Sonora: R. Hernández M. 2382 (6/10-1976 - flrs. & imm. frts.) (MEXU) (on borderline of Sonora and Chihuahua, +1400 m), Al. Gentry 22932 (US); Chihuahua: +6000 ft, Robert A. Bye Jr. 4070 (MEXU).



25. Erythrina coralloides Alph. DeCandolle, Prodr. 2:413. 1825.

Mexico: Miguel Ulloa Sosa s.n. (3/12-1965 - flrs.) (MEXU); Nuevo Leon: E. Matuda 38616 (3/17-1974 - flrs.) (MEXU); Hidalgo: A. Delgado S. s.n. (6/3-1976 - frts. & flrs.) (MEXU) (+1800 m); Mexico: Mario Sousa 4046 (MEXU); Veracruz: Papantla, +298 m, Rafael Hernandez M. 534 (3/11-1969 - flrs.) (MEXU).

- 28a. Erythrina lanata Rose subsp. lanata. Erythrina lanata Rose, U. S. Dept. Agr. N. Am. Fauna 14:81. 1899.

Mexico: Guerrero: M. T. Germán 378 (5/21-1977 - flrs. & frts.) (MEXU) (Playa Azul - Morelia), 383 (MEXU) (Playa Azul - Arteaga), 543 (7/20-1977 - frts.) (MEXU) (Chilpancingo - Acapulco), A. Delgado 199 (5/30-1976 - frts.) (MEXU) (camino a las Grutas de Justlahuaca, +1200 m).

- 28b. Erythrina lanata Rose subsp. occidentalis (Standley) Krukoff & Barneby in Phytologia 27:117. 1973.

Mexico: Sinaloa: +500 ft, G. Breckon 546 (MEXU).

29. Erythrina goldmanii Standley in Contr. U. S. Nat. Herb. 20:181. 1919.

Mexico: Oaxaca: Mario Sousa 5521 (4/18-1976 - flrs.) (MEXU) (Pinotepa Nacional, +110 m); 5206 (MEXU) (+190 m).

30. Erythrina caribaea Krukoff & Barneby in Phytologia 25:9. 1972.

Mexico: Veracruz: Brigada Vazquez 365 (4/4-1974 - frts.) (MEXU) (+150 m); Mario Sousa 4287 (11/11-1973 - frts.) (MEXU) (los Tuxtelas); Oaxaca: Thomas MacDougall s.n. (12/31-1953 - flrs.) (MEXU) (Pluma Hidalgo, +100 m); Mario Sousa 8891 (11/23-1977 - flrs.) (distr. Totitlan, +1100 m).

31. Erythrina folkersii Krukoff & Moldenke in Phytologia 1:286. 1938.

Belize: El Cayo: Mario Sousa 4191; Toledo: John D. Dwyer 12943 (US).

33. Erythrina smithiana Krukoff in Brittonia 3:323. 1939.

Ecuador: Los Rios: L. Holm-Nielsen 2694 (S) (100-200 m), C. H. Dodson 5921 (MO) (Rio Palenque).

36. Erythrina chiapasana Krukoff in Brittonia 3:304. 1939.  
Mexico: Oaxaca: distr. Teposcolula, Tutla +2000 m, Mario Sousa 7226 (4/13-1977 - flrs.) (MEXU). Guatemala: Huehuetenango: 5 kms SE of Huehuetenango, +1800 m, Oswaldo Téllez 624.
42. Erythrina macrophylla Alph. DeCandolle, Prodr. 2:411. 1825.  
Guatemala: Chimaltenango: Tecpan, +2000 m, Oswaldo Téllez 557 (4/4-1978 - young frts.).
46. Erythrina florenciae Krukoff & Barneby in Mem. N. Y. Bot. Gard. 20(2):171. 1970.  
Mexico: Oaxaca: E. Matuda 38601 (12/15-1973 - flrs.) (MEXU) (Huautla de Jimenez, +2000 m).
49. Erythrina lanceolata Standley in Contr. U. S. Nat. Herb. 17:432. 1914.  
Costa Rica: Cordillera de Tilaran, V. J. Dryer s.n. (11/16-1976) (F), Cartago, Roy W. Lent 3921 (F).
50. Erythrina costaricensis M. Micheli, Bull. Herb. Boiss. 2:445. 1894.  
Costa Rica: Puntarenas: Corcovado National Park, Ronald Liesner 3161 (MO). Panama: Cocle: cloud forest, J. P. Folsom 1207 (MO). Colombia: Chocó: Rio Tolo, E. Forero 973 (MO). Antioquia: Munic. Anorí, 400-900 m, D. D. Soejarto 3577 (MO).
52. Erythrina americana Miller, Gard. Dict. ed. 8, No. 5. 1768.  
Veracruz: Mario Sousa 4838 (9/20-1975 - frts. (MEXU) (mun. Zapata, +900 m); Morelos: Barbara Torres 349 (3/13-1976 - flrs.) (MEXU) (Coatlan del Rio), Mario Sousa 4053 (6/3-1973) (MEXU) (Cuernavaca, +1800 m), G. Harking s.n. (MEXU); Oaxaca: distr. Huajuapapan de Leon, +1665 m, Mario Sousa 5136 (2/6-1976 - flrs. & frts.) (MEXU).
53. Erythrina berteroa Urban, Symb. Ant. 5:370. 1908.  
Mexico: Chiapas: Gary Shapiro 483 (5/30-1976 - frts.) (MEXU) (mun. Tapachula), Oswaldo Téllez 537 (4/2-1978 - flrs.). El Salvador: Ahuachapán: +700 m, T. Croat 42168 (MO); Sonsonate: +850, T. Croat 42242 (MO). Guatemala: Retalhuleu: San Sebastian, 333-500 m, Sheila Cosminsky 117 (F); Escuintla; El Rodeo - Osuna, +650 m, Oswaldo Téllez 585 (4/7-1978 - frts.). Honduras: Copan: Antonio Molina R. 30630 (MO), 30613 (MO), (Sta Rita - Sta Isabel, +600 m). Costa Rica: San José: John Taylor 17311 (US). Colombia:

- Chocó: mun. Riosucio, H. Leon 578 (MO); Magdalena: foothills of Sierra Santa Marta, William Anderson 428.
54. Erythrina rubrinervia H. B. K. Nov. Gen. & Sp. 6:434. 1824.  
Colombia: Cundinamarca: +2050 m, A. C. Barclay 3763 (US).
55. Erythrina mexicana Krukoff in Brittonia 3:309. 1939.  
Oaxaca: N of Pochutla, Cerro Espino, alt. 1040-1100 m, Mario Sousa 5585, 7136, 7138; Chiapas: Gary Shapiro 459 (5/4-1976 - frts. & flrs.) (MEXU), T. Croat 40162 (MO), Palenque - Bonampak, +40 m).
58. Erythrina gibbosa Cufodontis in Arch. Bot. Sist. Fitog. & Genet. 10:34. 1934.  
Costa Rica: Alajuela: T. Croat 43544 (MO) (finca Los Ensayos, Boa Vista); Cartago: D. B. Lellinger 1514; Limon: G. B. Rossbach 3844 (A).
70. Erythrina oliviae Krukoff in Phytologia 19(3):128. 1969.  
Mexico: Puebla: El Papayo, Mario Sousa et al 7197 (BM) (flrs. - Apr. 12, 1977; leafless).
71. Erythrina caffra Thunberg, Prodr. Pl. Cap. 121. 1800.  
Hong-Kong: (cult.), Kit Yock Chan 139 (US).  
A colored illustration of this species by E. Hennesy appeared in Killick, Fl. Pl. Afr. 43:pl. 1709. 1976.
72. Erythrina lysistemon Hutchinson in Kew Bull. 1933:422. 1933.  
For illustration of this species see P. van Wyk, Trees of the Kruger Nat. Park 1:225-227. 1972.
73. Erythrina humeana Sprengel, Syst. 3:243. 1826.  
Mozambique: G. Barbosa 182. South Africa: Natal: J. Stephen 703 (MO).
77. Erythrina brucei Schweinfurth, Verhand. Zoo.-Bot. Gesell. Wien 18:653. 1868. et auct. plur., pro majore parte, leguminibus seminibusque exceptis; emend. Gillett in Kew Bull. 15:428. 1962.  
Ethiopia: A. Donaldson Smith s.n. (12/11-94).

86. Erythrina livingstoniana Baker in Oliver, Fl. Trop. Africa 2:182. 1871

A colored illustration of this species by E. Hennessy appeared in Killick, Fl. Pl. Afr. 44:pl. 1737. 1977.

93. Erythrina sigmoidea Hua in Bull. Mus. Hist. Nat. Par. 3:327. 1897.

Guiné: coll. undesign. 2693 (MO) (Bafatá), 3031 (MO) (Gabu, Piradu).

94. Erythrina latissima E. Meyer, Comm. Pl. Afr. Austr. 1:151. 1836.

A colored illustration of this species by E. Hennessy appeared in Killick, Fl. Pl. Afr. 43: pl. 1710. 1976, also in P. van Wyk, Trees of the Kruger Nat. Park. 1:223-224. 1972.

95. Erythrina abyssinica Lamarck, Encycl. Bot. 2:392. 1788; ex. Alph. DeCandolle, Prodr. 2:413. 1825; Gillet in Kew Bull. 15:426. 1962.

Oubangui-Chari, Herb. G. Le Testu 3713 (BM). Ruanda: Bugesera, (savana), G. Troupin 8426 (MO). Burandi: M. Reekmans 1976 (MO) (Bujumbura), 2599 (MO) (Muramwya, +2200 m), 2618 (MO) (Bujumbura, +1400 m), 6581 (MO) (Buruai, +1900 m). Kenya: Nairobi District: R. B. Faden 74/1287 (MO). Tanzania: C. F. M. Swynnerton 3 (BM), 43 (BM), 93 (BM), 94 (BM).

A colored illustration of this species appeared in Killick, Fl. Pl. Afr. 44:pl. 1738. 1977.

96. Erythrina variegata L. Herb. Amboin. 10. 1754; Amoen. Acad. 4:122. 1759, based on Gelala alba Rumphius, Herb. Amboin, 2:234, t.77. 1750.

West Indies: Antigua: Harold E. Box 1397 (BM) (cult.). Philippine Islands: Luzon: A. D. E. Elmer 15656 (BM). Java: H. Zollinger 1440 (Second Expedition to Java) (BM). Thailand: Bangkok, A. Marcan 1150 (BM). India: Bihar: H. Kanai s.n. (Apr. 16, 1960) (BM).

99. Erythrina vespertilio Bentham in Mitch. Jour. Trop. Austr. 218. 1848.

Australia: Queensland: Robert Brown s.n. (Aug.-Dec. 1802) (BM) ("biloba" form grading into typical form).

102. Erythrina velutina Willdenow, Ges. Nat. Freunde Berlin  
Neue Schr. 3:426. 1801.

Grenada: R. A. Howard 10940 (BM). Brazil: Bahia: R. S. Pinheiro 1995 (7/10-1972) (caatinga), 1916 (mun. Ibicui);  
Brasília: E. P. Heringer 14750 (US) (cult., native of caatinga  
of Pernambuco). Ecuador: Buayas: Alicia A. de Delgado 91 (MO).

#### Literature cited

(In order to conserve space, we are citing here only the papers which are not cited in Supplements III-X).

1. Krukoff, B. A. Notes on the species of Erythrina. X.  
Lloydia 40:407-412. 1977. (part of Erythrina Symposium II).
2. " " Notes on the species of Erythrina. XI.  
Phytologia 39:294-306. 1978.
3. " " Notes on the species of Erythrina. XII.  
(to be published as a part of Erythrina Symposium III).

#### List of Exsiccatae

The first figure in Exsiccatae after the collector's name is the collector's number of the specimen, and the figure in parenthesis is the number of species as they are arranged in Conspectus of the species of the genus Erythrina (LLOYDIA 37(3), September 1974) and in Supplements VII-XIII (inclusive).

1) American Species

The list of Exsiccatae for American species is fairly complete since practically all collections seen by me in various Herbaria are cited, with the exception of the following common species: E. fusca, E. crista-galli, E. falcata, E. poeppigiana, and E. herbacea L. ssp. herbacea. These are commonly collected and easily identified. I have seen many other collections of these common species but have not prepared cards for them and have not cited them in any of my papers.

2) Asiatic, Polynesian and Australian Species

These species were not covered in my original Monograph published in Brittonia in 1939 which treated only American species. I have, however, examined and annotated many specimens of these species without preparing cards and without citing them in any of my papers. These include E. suberosa, E. microcarpa, E. stricta, E. resupinata, E. arborescens, E. subumbrans, E. variegata, E. tahitensis, and E. euodiphylla. Cards for E. vesper-tilio, however, were prepared in connection with Erythrina Symposium II and they are cited in Supplement X.

3) African Species

These species also were not covered in the original Monograph of the American species, and the first paper to include African species was published in Erythrina Symposium I in LLOYDIA in September, 1974. Cards for many collections of African species are in the card index. However, they are not cited in my papers, this especially as African species are usually well named.

Only numbered collections and those of which the dates of collection are recorded have been listed. If a collector gathered his collection together with others, only his name is cited in this list. Collections with Dr. Prance's numbers are cited under Prance.

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- Eggers, H. F. A., von, 386b (64c), 1345 (64c), 5543 (63), 6997 (64b), 14432 (18), s.n. (5/21-1876) (65), s.n. (1/7-1877) (65).
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- Ekman, H., 519 (53), 1232 (66), 1364 (67-type), 3208 (66), 3225 (67), 3248 (7), 4866 (103), 5704 (67), 5779 (69), 6124 (67), 6172 (69), 6762 (69), 7416 (53), 7533 (103), 8018 (67), 8024 (66), 8071 (67), 8221 (102), 8244 (67), 8821 (102), 10156 (53), 10173 (67), 10197 (53), 10520 (69), 11347 (53), 11828 (69), 12950 (69), 13083 (103), 14136 (69), 16338 (102), 17436 (69), 17712 (103-type), 17752 (103), 18609 (103), 18641 (53), 18657 (69), 18679 (103), 18720 (69), 18749 (23), 18797 (69), 18991 (22a).
- Elias, 506 (53), 644 (53).
- Ellenberg, H., 879 (3), 1403 (102).
- Elliott, G. F., Scott, 77 (95), 1376 (91), 4516 (79), 4922 (79), 6914 (95), 7236 (95).
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- Evans, I. B. Pole, 603 (95), 1439 (95), 1784 (95), 2976 (95).
- Evans, Morgan, s.n. (Nov./1960) (54).
- Everist, S. L., 9696 (96).
- Eyerdam, 229 (102).
- Eyles, 381 (95), 753 (72), 4352 (94).
- Faden, R. B., 74/286 (108a), 74/294 (91), 74/1287 (95).
- Fagerlind, 243 (33), 657 (15), 2641 (18), s.n. (23/9-1952) (33).
- Fanshawe, D. B., F220 (95), F344 (95), F760 (95), F1332 (95), 1350 (80), 8964 (84).
- Farmer, 184 (79).
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- Faulkner, R. G., 346 (95), 2246 (91).
- Fauaset, Capt. B. T. Godfrey, 35 (108b).
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- Feinsinger, Peter, s.n. (2/78) (63).
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- Gerrard, W. T., 134 (74), 1708 (74).  
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- Greenway, P. J., 1925 (95), 1974 (108a), FH2323 (95), 2543 (95), 2843 (95), 3283 (95), 3392 (95), 4237 (91), 4328 (104), 4819 (95), 4849 (91), 5732 (95), 7554 (91), 8436 (95), 8465 (104), 9181 (104), 9579 (104), 9593 (95), 9646 (91), 10418 (104), 10944 (108a), 11968 (95), 12421 (95), 14577 (76-type).
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- Grenfell, s.n. (3/30-1906) (108a).
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- Guillen, Elias P., 1970-1 (36), 1970-2 (36).
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- Hamilton, M.C.A., s.n. (9/17-1971) (Hybrid #7).
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- Hanekom, W. J., 2321 (72), 2454 (74).
- Hansen, Bruce, 1788 (22b).
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- Harwood, A., 70 (95).
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- Haught, Oscar, 4160 (53), 3505 (102), 5449 (50).
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- Heatwois, H., 875 (99).  
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- Pittier, H. F., 1248 (15), 1248a (15), 1930 (53), 2287 (50), 2541 (53), 2571 (53), 2656 (50), 3693 (49-type), 4731 (53), 5849 (102), 6893 (49), 6939 (53), 7634 (62), 8295 (50), 8770 (62), 10229 (102), 11001 (53), 11500 (102), 12603 (62), 13674 (102).
- Plowes, D. C., 1461 (72), 2338 (94), 33758 (94), 34783 (94), 35825 (94), 39330 (72).
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- Purpus, C. A., 60 (24), 373 (28b), 2680 (14a-type), 3899 (14a), 4385 (14a), 5554 (14a), 5830 (20), 6078 (22b), 9062 (29).
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- Smith, C. E., Jr., 3916 (20), 4091 (25).
- Smith, C. Earle, 4432 (46), 4963 (15).
- Smith, Charles L., 1834 (47), 1420 (25).
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- Smith, J. D., 6480 (58), 6481 (53), 6482 (53).
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- Smith, L., 446 (52).
- Smith, L. B., 12558 (3), 12729 (3), 12800 (3), 12945 (3), 14001 (2).
- Smith, L. C., 22 (21), 109 (14b-type).
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## BOOK REVIEWS

Alma L. Moldenke

**"GENERA OF THE EASTERN PLANTS"** Third Edition by Wade T. Bateson, 203 pp. & hundreds of b/w line drawings. John Wiley & Sons, Inc., New York, N. Y. 10016. \$5.50 paperbound.

The earlier editions of this work were entitled "A Guide to the Genera of Native and Commonly Introduced Ferns and Seed Plants of Eastern North America from the Atlantic to the Great Plains, from Key West - Southern Texas into the Arctic". This book is compactly printed, pocket-sized and copiously illustrated with small sketches illustrating critical characters indicated in efficiently operating keys to the "1591 genera that make up the outdoor flora of this geographic region". The author has long championed this approach in teaching field botany courses with reference to subgeneric taxa "later at home or in the library or laboratory or by reference to some large volume one may be able to identify the particular species". About half of the genera in any region tend to be monospecific, anyhow.

The generic name Clerodendrum is misspelled differently on p. 145 and p. 146.

**"MODES OF ACTION OF HERBICIDES"** by Floyd M. Ashton & Alden S. Crafts, vi & 504 pp., 81 b/w fig. & 62 tab. Wiley - Interscience Publication of John Wiley & Sons, London, Sydney, Toronto & New York, N. Y. 10016. 1973. \$34.00.

Since the annual losses and costs of control for U. S. agricultural weeds exceeds that of either insect pests or diseases, and since 120 million dollars were spent in 1965 on herbicides and more in subsequent years, these labor-saving chemicals are of great importance. They are mostly organic compounds (ca. 150) in foliar or soil sprays that usually break down into innocuous chemicals. "Those that present a hazard to human health or to the safety of the environment must be recognized and handled in such a way as to render them harmless".

For aliphatics, benzoics, carbamates, nitrites, phenols, triazines and several other types the following information is given in each of the 22 chapters of the book: growth and plant structure, common and chemical names and structure, absorption and translocation, molecular fate, biochemical responses and mode of action. This book therefore becomes a practical handbook and reference source for weed science specialists and an excellent text for advanced courses in agriculture, agronomy and weed science.

"THE HAWAII GARDEN TROPICAL SHRUBS", text by Horace F. Clay & James C. Hubbard, photographs by Rick Golt, xv & 295 pp., 103 full color plates. University Press of Hawaii, Honolulu, Hawaii 96825. 1977. \$35.00.

The preface presents this most attractive book as a harbinger "of a planned sixteen-volume series intended to serve as a guide for all Hawaii's gardeners to the cultivation and enjoyment of the Islands' ornamental plants". There are 103 plates, not in the "whole plant style but in an interpretive, symbolic, artistic manner.....but true to the nature of the plant". I can almost feel the texture by looking at them! They are truly beautiful.

The plants are grouped by families about which general horticultural statements are made. For the plants illustrated there are given the scientific and common names and their derivations, descriptions, habit of growth, growing conditions, uses, propagation methods, diseases and pests, pruning, fertilizing and any disadvantages. In the Verbenaceae the following corrections should be noted: the correct name now used for Clerodendrum buchanani var. fallax is C. speciosissimum, for C. nutans (of gardens) is C. wallichii, and for Vitex ovata is V. trifolia var. simplicifolia. In the horticultural trade the plants may still be found under either name. The text describes correctly the "violet" fruit of Callicarpa americana (they are drupes, not "berries") but the matching plate erroneously depicts them as rose-red.

"THE HAWAII GARDEN TROPICAL EXOTICS", text by Horace F. Clay & James C. Hubbard, photographs by Rick Golt, xv & 267 pp., 109 full color plates. University Press of Hawaii, Honolulu, Hawaii 96825. 1977. \$35.00.

"TROPICAL EXOTICS" was published simultaneously with "TROPICAL SHRUBS" in this 16-volume series planned "to help the plant lover and amateur gardener to know, use, and care for the beautiful, unusual, or merely interesting plants that are at his disposal in modern Hawaii", including native ones, introductions from so many places, locally derived new varieties, hybrids, etc. Excellent sources were consulted. Tribute is paid to the work of "Hawaii's renowned botanists — men like Joseph F. Rock, Harold St. John, and Otto Degener". As in the other volume, the explained caution appears: "Do not eat or taste any part of any unfamiliar plants".

The plants illustrated so effectively in large color plates are monocots. The text for each covers carefully the same topics as in the preceding volume. There is added an appendix on insect pests and plant diseases and another on plant propagation. This is also a beautiful publication.

"MATHEMATICAL ECOLOGY" 2nd Edition by E. C. Pielou, x & 385 pp., 53 b/w fig. & 9 tab. Wiley-Interscience Publication, John Wiley & Sons, London, Sydney, Toronto, & New York, N. Y. 10016. 1977. \$20.75.

If you are familiar with the careful way in which the first edition of this work — entitled "An Introduction to Mathematical Ecology" — was presented you will expect much of this second edition and will not be disappointed. "The topics are compartmentalized into the same chapters....[and] it describes new work that I believe exemplifies the approach to ecological problems most likely to yield satisfying results: that of perceiving the many clues to ecological processes that straightforward observation of real ecosystems affords, and interpreting these clues". The usefulness of models in theoretical ecology "consists in not answering questions but in raising them. Models can be used to inspire field investigations and these are the only source of new knowledge as opposed to new speculation."

The text is planned for a graduate course, possibly the best in its field.

"THESAURUS OF ENTOMOLOGY" by Richard H. Foote, xxxi & 188 pp. Entomological Society of America, College Park, Maryland 20740. 1977. Paperbound.

This production is a sensible adventurer into the field of organizing, indexing and information-retrieval for the individual entomologist or worker in related fields as well as for the computer planned for large scale use in a department of agriculture or an abstracting service. The two main sections are (1) hierarchical with 14 major subject matter parts for about 9,000 terms followed by formalized cross-references and "Latin names of all insect and mite families likely to be used for indexing purposes" and (2) alphabetical with all broader and narrower terms with use cross-references. There are 3-column entries, neat, well arranged but with such small print, almost like that on labels pinned with insect specimens.

Other biological sciences could build upon this start to help standardize the meanings of common terms for computerization.

"WATER — The Web of Life" by Cynthia A. Hunt & Robert M. Garrels, 208 pp., 6 b/w fig. W. W. Norton & Co., Inc., New York, N. Y. 10036. 1972. \$2.25 paperbound.

Presented for the "general reader" so that emphasis can be on world-wide water supplies and problems rather than on the localized items featured disproportionately by the news media. "The book develops the basic physical principles governing the behavior of water with a minimum of technical material....and [shows]

how political, technical and economic factors will be critical in the water supply situation of tomorrow...which will require the complete management of water." Local public and school libraries could use this book to advantage.

**"BIOLOGY OF BRACKISH WATER"** 2nd Revised Edition by Adolf Remane & Carl Schlieper, x & 372 pp., 165 b/w fig., 50 tab. & 4 fold-in charts. E. Schweizerbar'sche Verlagsbuchhandlung (Nägele u. Obermiller, Stuttgart) & Wiley-Interscience Division of John Wiley & Sons, Inc., London, Toronto, Sydney & New York, N. Y. 10016. 1971 [1972]. \$21.75.

This is a completely revised, modernized and enlarged English translation of "Biologie des Brackwassers" in Die Binnengewässer, volume 22 (1958) and appears as volume 25 of this series. The authors have spent their professional lifetimes in laboratories in Kiel on the Baltic shores. Part I, by the first author, deals with the ecology of brackish water, its special features, as an area of colonization of fresh-water and marine organisms, biotopes and types of brackish water. Part II, by the second author, deals with physiology and therefor salinity, osmotic and ionic responses, food, oxygen and temperature requirements. Each paper carries very full bibliographies.

A few ordinary words in the text are misspelled by some typesetter and/or were overlooked by some proofreader for whom English is not the first language.

**"MCGRAW-HILL ENCYCLOPEDIA OF THE GEOLOGICAL SCIENCES"** edited by Daniel N. Lapedes et al., iv & 915 pp., 890 b/w illus. McGraw-Hill Book Company, New York, N. Y. 10020. 1978. \$29.50.

The concise, clearly written, well illustrated and mostly signed articles in "this encyclopedia provide a comprehensive treatment of the geological sciences, including geology, geochemistry, geophysics, and those aspects of oceanography and meteorology which are essential to understanding the materials, processes, composition, and physical characteristics of the solid part of the Earth". There are 560 articles and 5,500 entries cross-referenced through an analytical index. There is also a long table listing the properties of 1,500 minerals from anthoinite to zunyite with chemical formulas, crystallography classification, hardness rating on the Moh scale and specific gravity. Virtually needless to record is the obvious fact that this book will prove of valuable use to teachers, students and workers in the above-mentioned fields, but it can be even more useful to folks in related fields with their related questions.

# PHYTOLOGIA

*Designed to expedite botanical publication*

Vol. 41

February 1979

No. 5

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Published by Harold N. Moldenke and Alma L. Moldenke

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

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A NEW STENOGYNE (LABIATAE)  
HAWAIIAN PLANT STUDIES 84

Harold St. John  
Bishop Museum, Box 6037, Honolulu, Hawaii, 96818, USA

There are two large genera of Labiatae native to the Hawaiian Islands, Phyllostegia, and Stenogyne. In the latter a new species has now been discovered at Pohakuloa on the island of Hawaii. This area lies in the saddle between the two high volcanoes, Mauna Kea and Mauna Loa. It is an area of low rainfall on rough, ancient lava flows. The plant cover is mostly low scrub or forest, the latter mostly in "kipukas," or islands of older lands surrounded by the newer lava flows. It is evident that the vegetation here has never been lush, and it has suffered from the grazing of feral goats and from military manouvers and canon fire, for it is now a military training area. The new Stenogyne was found in a single fissure in the lava in a forested "kipuka," and there it is partially protected from the destructive agents that are decimating the flora of the area.

Stenogyne pohakuloaensis sp. nov. (sect. Microphyllae)

Fig. 1.

Diagnosis Holotypi: Liana suffrutescens diffuse ramosa est, ramulis lateralibus brevibus foliosis et floriferis 0.3-1 mm diametro quadratis cum 4 angulis rotundatis valleculis interpositis anguste U-formatis sparse albo-pilosulis tarde subglabratibus, internodiis 7-75 mm longis, nodis paullo incrassatis et pilosulo-cinctis, cicatricibus foliorum 0.8-1 mm latis lunatis elevatis badiis, petiolis 3-7 mm longis in 2 marginibus superis pilosulo-ciliatis, laminis ramae principali 25-27 mm longis 6-8 mm latis anguste lanceolatis crenatis, laminis ramularum lateralium 8-22 mm longis 5-11 mm latis subcoriaceis glabris ellipticis apice obtuso basi breve cuneata marginibus crenatis supra viridibus et nervis impressis infra viridibus et nervis elevatis nervis secundariis 3 in dimidio quoque curvatis ascendentibus, floribus 2 in 2-3 nodis superis foliosis ramularum lateralium, bracteis 1.5 mm longis linearibus sparse pilosulis, pedicellis 2-2.5 mm longis pilosulis, calycibus in flore 5.5-7 mm longis viridibus campanulatis in 10 nervis hirsutulis tubo 3 mm longo labia supera 3.5-4 mm longa cum 3 lobis 1.5 mm longis ovatis, labia infera 1.5-1.8 mm longa cum 2 lobis ovatis acutis, corollis 13-14 mm longis in basi 0.8 mm diametro

sursum majoribus et in fauce 3 mm diametro extra minute puberulis licet spuma lacto-coloratis, labia supera 5 mm longa elliptica, labia infera 2.5 mm longa 3-lobata, lobis lateralibus 2.8 mm longis latisque oblique ovatis acutis, loba infera 2.8 mm longa 2.5 mm lata ovata, filamentis ad labiam superam aequantibus et per 10 mm cum tubo corollae adnatis apicibus liberis 3.3 mm longis glabris, antheris 1.2 mm longis ellipsoideis dimidiatis, ovario 0.8 mm longo glabro, stylo 6 mm longo glabro, 2 stigmatibus 0.3 mm longis subulatis divergentibus, (fructibus incognitis).

Diagnosis of Holotype: Suffrutescent vine, diffusely branched, and leafy and floriferous on short lateral branchlets; leafy branchlets 0.3-1 mm in diameter, square, with 4 rounded angles and narrow U-shaped intervening valleys, sparsely white pilosulous, later subglabrate; internodes 7-75 mm long; nodes slightly enlarged, and with a pilosulous ring; leaf scars 0.8-1 mm wide, lunate, elevated, brown; petioles 3-7 mm long, pilosulous ciliate on the 2 upper rims; blades of main branch 25-27 mm long, 6-8 mm wide, narrowly lanceolate, crenate; blades of lateral branchlets 8-22 mm long, 5-11 mm wide; subcoriaceous, glabrous, elliptic, the apex obtuse, the base shortly cuneate, the margins crenate, above green, and with impressed veins, below green and with elevated veins, secondary veins 3 in each half, curved ascending; flowers at the 2-3 upper leafy nodes of lateral branchlets, 2 at a node; bracts 1.5 mm long, linear, sparsely pilosulous; pedicels 2-2.5 mm long, pilosulous; calyx in flower 5.5-7 mm long, green, campanulate, hirsutulous on the 10 nerves, the tube 3 mm long, the upper lip 3.5-4 mm long, with 3 lobes 1.5 mm long, ovate, the lower lip 1.5-1.8 mm long, the 2 lobes ovate, acute; corolla 13-14 mm long, 0.8 mm in diameter at base, enlarging gradually and 3 mm in diameter at the throat, minutely puberulous without, apparently cream-colored, the upper lip 5 mm long, elliptic, the lower lip 2.5 mm long, 3-lobed; lateral lobes 2.8 mm long and wide, obliquely ovate, acute; filaments about equaling the upper lip, adnate to the corolla tube for 10 mm, the free tips 3.3 mm long, glabrous; anthers 1.2 mm long, the cells ellipsoid, dimidiate; ovary 0.8 mm long, glabrous; style 6 mm long, glabrous; 2 stigmas 0.3 mm long, subulate, diverging; (fruit unknown).

Holotypus: Hawaiian Islands, Hawaii Island, Pohakuloa Training Area, New Bobcat Trail, 5,200 feet elev., Pahoehe Kipuka, with open scrub Metrosideros and Santalum forest, near Wikstroemia and Myrsine lanaiensis, in dense shade in deep lava crack, 8 Jan. 1977, C. H. Lamoureux 4,966 (BISH).

Specimens Examined: Hawaiian Islands, Hawaii Island, same locality and data, F. R. Warshauer 794 (BISH).

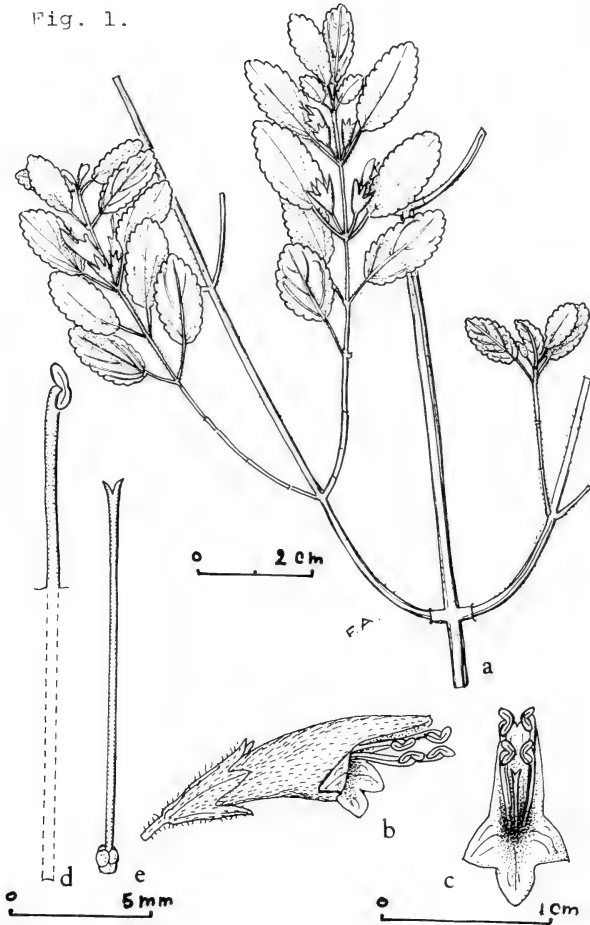
Discussion: S. pohakuloaensis is evidently most closely related to S. scandens Sherff, of the island of Hawaii, a species with the flowers 6 at a node; calyx 6-8 mm long in flower, puberulent above, scarcely so at base, the tube 4-5 mm long, the lobes lanceolate; corolla 18 mm long, ascending pilosulous without, the lower lip 5 mm long; style 24 mm long; and the blades 22-36 mm long, 11-20 mm wide, pilosulous below. S. pohakuloaensis has the flowers 2 at a node; calyx 5.5-7 mm long in flower, hirsutulous on the 10 nerves, the tube 3 mm long, the lobes ovate; corolla 13-14 mm long, minutely puberulous without, lower lip 2.5 mm long; style 6 mm long; and the blades of the lateral branches 8-22 mm long, 5-11 mm wide, glabrous.

The new epithet is formed from the name of the type locality, Pohakuloa, and -ensis, the Latin adjectival place suffix.

#### Legend

Fig. 1. Stenogyne pohakuloaensis St. John, from holotype. a, habit, X 1; b, c, flower, X 3; d, stamen, X 5; e, pistil, X 5.

Fig. 1.



AUSTRAL HEPATICAE XI.

LOPHOCOLEACEAE: NEW TAXA, NEW COMBINATIONS AND REALIGNMENTS\*

John J. Engel

Donald Richards Associate Curator of Bryology, Department of Botany, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605.

NEW TAXA AND NEW COMBINATIONS IN CLASMATOCOLEA

The following new taxa and new combinations were part of a monographic study of Clasmatocolea; the names are published separately to make them immediately available for use.

1. Clasmatocolea humilis var. polymorpha Engel, var. nov.

Amphigastria caulina polymorpha, apices saepe late rotundati ad truncatos ad retusos, tantum disperse breves atque bifidi; amphigastria caulina uniformiter parva magnitudine plantae, illa in distale parte axis (0.8-)1-1.3X caulis latitudine.

Holotype: Tristan da Cunha, above settlement, 620 m., 21 December 1938 Christophersen & Mejland 52 (0!, isotype - S!).

Underleaves polymorphic in shape, the apices often broadly rounded to truncate to retuse, only sporadically short bifid; underleaves uniformly small for plant size, those in distal portion of axis (0.8-)1-1.3X stem width.

2. Clasmatocolea humilis var. suspecta (Mass.) Engel, comb. nov.

Basionym: Lophocolea puccioana var.  $\beta$  suspecta Mass. Nuovo Giorn. Bot. Ital. I. 17: 228. 1885.

3. Clasmatocolea minutiretis Engel & Grolle, sp. nov.

Clasmatocoleae humili (Hook. f. & Tayl.) Grolle similis, sed differt 1) amphigastriis deminutis, inconspicuis, 0.35-0.6X caulis latitudine, bifidis ad 0.55-0.7; 2) ramis terminalibus absentibus; 3) oppositis masculis

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\* I would like to thank Dr. William Beatty for assistance with the Latin diagnoses, and Ann Hollmann for typing the manuscript.

bracteis coalescentibus versus basem; 4) seta 7-8 cellularum diametro, 19-20 epidermalium serierum; 5) strato parietis externae capsulae cum semianularibus incrassatis vittis.

Holotype: Chile, Prov. Magallanes, E. shore of Isla Pilot, Engel 4785 (MSC!).

Plants brown to pale reddish-brown, the stems a rich red-brown. Branches abundant, the ventral-intercalary type very common, lateral-intercalary occasional, terminal branches absent. Leaves strongly erect, deeply conchiform concave, the ventral-basal portion appearing billowed out and extending ventrally well beyond stem surface; leaves undivided, the apex and ventral margin with several irregularly sized and spaced, often incurved teeth, the dorsal margin entire. Leaf cells somewhat thick-walled, trigones large to knot-like; cuticle smooth. Underleaves reduced, 0.35-0.6X stem width, narrowly lanceolate to narrowly long triangular, bifid to 0.55-0.7, the segments cilia-like.

Plants dioecious; bracts obliterating or nearly so the view of dorsal stem surface, the bracts with saccate portion fused toward base with opposite bract. Perianth strongly trigonous, the lobes coarsely armed with sharp or rounded teeth. Seta 7-8 cells in diameter, with 19-20 rows of outer cells. Capsule wall 3-5 layers thick, the outer layer with red-brown, nodule-like or weakly spine-like thickenings and a few semiannular bands; inner layer with semiannular bands common.

#### 4. *Clasmatocolea moniliformis* Engel, sp. nov.

Plantae rigidae, aureo-brunneae, moniliformes; axes 315-420  $\mu$  latitudine. Folia ventralibus cum extremitatibus inserta in caule base amphigastrii vel basalibus cellulis amphigastrii laminae. Folia erecta, subsquarrosa, apice indivisa, oblique truncata, lateribus + parallelis; marginibus et apice integris, margine ventrale subauriculato base. Cellulae foliorum parietibus crassis, trigonis magnis, saepe protuberantibus, cuticula leve. Amphigastria 4.6-6.7X caulis latitudine, cum parte apicale appressa ad caulem, cucullata, inflata, caulem amplectente; apicalibus indivisis, late rotundatis vel truncatis, integris; laminarum marginibus integris.

Holotype: Chile, Prov. Magallanes, E. side of Bahía Borja, Engel 6159 (MSC!).

Plants rigid, golden brown, moniliform; axes 315-420  $\mu$  wide. Leaves with ventral end inserted on stem at immediate base of underleaf or on basal few cells of underleaf lamina. Leaves erect, subsquarrose, the apex undivided, obliquely truncate, the sides + parallel; margins and apex entire, the ventral margin subauriculate at base. Leaf cells thick-walled, trigones large, often bulging; cuticle smooth. Underleaves 4.6-6.7X stem width, with apical portion appressed to stem, cucullate, inflated, clasping the stem; apices undivided, broadly rounded or truncate, entire; leaf margins entire.

5. Clasmatocolea navistipula var. parceramosa Engel, var. nov.

Ramificatio parce adest, rami terminalibus lateralibus interdum; amphigastria caulina ad 1.7X caulis latitudine.

Holotype: Chile, Prov. Magallanes, Brunswick Peninsula, ridge between Bahía Bougainville and Bahía San Nicolas, 9 October 1969, Engel 6425 (MSC!).

Branching sparingly developed, terminal lateral branches occasional; underleaves to 1.7X stem width.

6. Clasmatocolea obvoluta var. cookiana (Mass.) Engel, comb. nov.

Basionym: Lophocolea cookiana Mass. Nuovo Giorn. Bot. Ital. I. 17: 224. pl. 16, f. 11. 1885.

MISCELLANEOUS INFORMATION ON THE GENUS LOPHOCOLEA1. The names Lophocolea austrigena and L. cavispina.

Fulford (1976) treated Lophocolea austrigena (Hook. f. & Tayl.) G. L. & N. as a synonym of Lophocolea cavispina, a species which she transferred from Jungermannia. Both these taxa were described as new in Hooker and Taylor (1844), the former from Isla Hermite (Chile, Prov. Magallanes), and the latter from the Falkland Islands. According to Article 57 (International Code of Botanical Nomenclature, 1972), "The author who first unites taxa bearing names or epithets of the same date has the right to choose one of them, and his choice must be followed." Stephani (1906, p. 56), in his Species Hepaticarum, was the first to unite these species; he used the name Lophocolea austrigena for the combined taxon. Lophocolea austrigena is therefore the correct name.

2. Lophocolea textiloidea Engel, nom. nov.

Chiloscyphus lucidus Mitt. J. Linn. Soc., Bot. 15: 64. 1877 non C. lucidus (Lehm. & Lindenb.) Nees in G. L. & N., Syn. Hep. 182. 1845. Chiloscyphus granditextus Steph. Bull. Herb. Boissier 8: 49. 1907 (= Spec. Hep. 3: 225). [Non Lophocolea granditexta Steph. Bull. Herb. Boissier 6: 881. 1906 (= Spec. Hep. 3: 106)]. Type: Tristan da Cunha, Moseley (NY!).

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NOTES ON *SPERMACOCE* AND *MITRACARPUS* (RUBIACEAE) IN SOUTHEASTERN UNITED STATES

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While preparing the Rubiaceae for my forthcoming Flora of Subtropical Florida (a 30 county area extending from Levy, Marion, and Volusia County south to Lee, Hendry, and Broward County), the genus *Spermacoce* was investigated in detail, both within and to the south of the manual range. This has resulted in the employment of several names not found in recent manuals. In addition, a species new to the flora of Louisiana was discovered.

*Spermacoce* is traditionally distinguished from *Borreria* on the basis of mericarp dehiscence. *Borreria* mericarps separate into two one-seeded halves with each half open on the inner surface while those of *Spermacoce* separate with the central axis remaining attached to one-half and remaining closed and the second half open on the inner surface. This difference does not appear to be significant enough to warrant generic segregation of *Borreria* from *Spermacoce*. Thus, with *Borreria* congeneric with *Spermacoce*, the genus consists of five species in peninsular Florida (Levy, Marion, and Volusia County southward).

Key to Species

1. Calyx with 4 subequal teeth; inflorescence in terminal and axillary glomerules well down on the stem.
  2. Leaves and stems glabrous or scabrous.
    3. Plants annual; fruits 1-2 mm long.
      4. Calyx-teeth solid dark-green..... 3. *S. tenuior*
      4. Calyx-teeth bright-green with conspicuous white margins..... 2. *S. prostrata*
    3. Plants perennial; fruits 2.5-3.0 mm long..... 1. *S. assurgens*
  2. Leaves and stems conspicuously hirsute..... 4. *S. tetraquetra*
1. Calyx with 2 long and 2 short teeth; inflorescence in a single dense terminal glomerule or only at upper 1-2 nodes..... 5. *S. verticillata*

1. *Spermacoce assurgens* Ruiz & Pavon This species occurs in moist areas in pine flatwoods, along the edge of mesic hardwood hammocks, and waste ground in Florida. It is of frequent occurrence nearly throughout the peninsula as well as throughout subtropical and tropical America.

This plant has been going under the name of *Borreria laevis* (Lam.) Griseb. in manuals pertaining to Florida plants (Small, 1933; Long & Lakela, 1976). However, this is a totally different species.

2. *Spermacoce prostrata* Aubl. This species occurs along pond margins, moist areas in pine flatwoods, waste ground, and moist depressions of coastal dunes and sand flats in Florida. It is occasionally encountered in scattered localities nearly throughout the peninsula and is a widely distributed weedy species in the American tropics. This plant is usually incorrectly called *Borreria ocimoides* (Burm. f.) DC. in most floras pertaining to Florida (Small, 1933; Long & Lakela, 1976). *Borreria ocimoides*, however, is a totally different species confined to the Paleotropics.

3. *Spermacoce tenuior* L. This species occurs in wet areas in pine flatwoods, along margins of ponds, limestone pockets, and waste ground in Florida. Specimens have been seen only from Dade and Monroe Counties in southern Florida. However, it is of frequent occurrence elsewhere in tropical America. *Spermacoce keyensis* Small (Small, 1933), belongs here. *Spermacoce portoricensis* Balb., reprinted by Small (1903) and later suppressed by him under *S. keyensis*, is actually *Hemidiodia ocimifolia* (Willd.) K. Schum., a species not known to occur in Florida. Long (1970) regarded the south Florida material as distinct and proposed the name *S. tenuior* var. *floridana* (Urban) Long. From the material I have examined, it does not appear to be separable from other *S. tenuior* from the Caribbean.

4. *Spermacoce tetraquetra* A. Rich. This species occurs in moist pine flatwoods, along the edge of hammocks, limestone pockets, and waste ground in Florida. Specimens have been seen only from Dade, Monroe, and Collier County. Outside of south Florida, specimens have been seen from Cuba and the Bahamas. Alain (1963) reports it from Bermuda, Jamaica, and Honduras, but no specimens have been seen to confirm this.

5. *Spermacoce verticillata* L. This species occurs in pine flatwoods, limestone pockets, and waste ground in Florida. Specimens have been seen from Dade, Collier, Monroe, Palm Beach, and Martin County. It is frequently encountered throughout much of tropical America and also is found in tropical Africa. This species is often placed in *Borreria* [= *Borreria verticillata* (L.) Meyer]. *Borreria terminalis* Small (Small, 1933; Long & Lakela, 1976) belongs here.

*Spermacoce confusa* Rendle Although no specimens of this species have been seen from Florida, it is to be expected since it is a weedy species common in the Neotropics and Paleotropics.

Several specimens from south Florida identified by other workers as this species have been examined and discovered to be mis-identifications of *S. tetraquetra*.

*Mitracarpus hirtus* (L.) DC. A weed of waste places in tropical America, this species has previously been reported (as *Mitracarpus villosus* (Sw.) DC.) as occurring in continental United States (Correll & Johnston, 1970) and central Florida (Ward, 1976). In the course of examining materials of *Spermacoce*, a previously undetected specimen of *M. hirtus* from Louisiana was encountered. This apparently represents the first record of it from that state. I choose to follow Nicolson (1977) in using the name *Mitracarpus hirtus* (L.) DC. rather than *Mitracarpus villosus* (Sw.) DC. for this taxon.

Louisiana: St. Tammany Parish: Waste place along RR, Abita Springs, 3 October 1970. John W. Thieret 32568 (FSU).

I wish to acknowledge Drs. Raymond Fosberg and Dan H. Nicolson of the Smithsonian Institution for their assistance. Dr. Fosberg very kindly provided the names of *S. assurgens* and *S. prostrata* which are applied to our materials. A detailed study of *Spermacoce* by Dr. Fosberg will soon be forthcoming and will explain the intricacies of the nomenclature of these species. Dr. Nicolson kindly read the manuscript in its preliminary form and made helpful comments. This research is supported in part by the George R. Cooley Research Fund.

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CONTRIBUTION TO THE LICHEN FLORA OF URUGUAY.  
X. TAXONOMICAL NOTES.

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In the present paper we continue with the revision of species reported for Uruguay. We also mention works published subsequently to the issue of our preliminary Catalogue (Osorio 1972) in which some collections from Uruguay are identified again. However in such publications previous names given to these species when originally published have been omitted. Additional collections studies for comparative purposes are included too.

Besides the materials collected by the author and preserves in his private herbarium, specimens belonging to the following herbaria have been included: Botanical Museum, University of Helsinki, Finland (H), Departamento de Botánica, Museo Nacional de Historia Natural, Montevideo, Uruguay (MVM).

Collema leucophthalmum Nyl.

TREINTA Y TRES: Vergara, Herter 88809 (H!) (Räsänen 1942:14). Redetermined as Collema glaucophthalmum Nyl. var. glaucophthalmum (Degelius 1974:169).

Additional specimens of C. glaucophthalmum var. glaucophthalmum examined:

DURAZNO: Arroyo El Cordobés, Paso de la Cruz, on Salix, Osorio 2748.

LAVALLEJA: Highway 8 and Arroyo La Calera, on Salix, Osorio 3619.

ROCHÁ: Castillos, Cerro de los Rocha, on Salix, Osorio 5647.

TACUAREMBO: Valle Edén, on trees, Osorio 1138.

Leptogium menziesii (Smrft.) Mont.

LAVALLEJA: Penitente, Herter 87864 (H!) (Räsänen 1938:69). This collection was redetermined as Leptogium acutisporum P. M. Jørg. (P. M. Jørgensen 1975:439). Additional specimens of L. acutisporum examined:

LAVALLEJA: Abra de Cotto, on bark, Osorio 6474, on Myrtaceae, Osorio 6504.

MALDONADO: Pan de Azucar, Parque Municipal, on Erythrina crista-galli, Osorio 5054, on Populus nigra, Osorio 5072.

Lobaria crenulata (Hook.) Vain.

ROCHA: Arroyo del Alferez, Paso de los Talas, Hosseus 1935 (H!) (Räsänen 1939:126).

TERINTA Y TRES: Vergara, Herter 90813 (H!) (Räsänen 1942:14).

Both collections belong to Lobaria erosa (Eschw.) Trev.

Parmelia cristifera Tayl.

MALDONADO: Piriapolis, Hosseus 1935 (Räsänen 1939:126).

Duplicatas of this collection were distributed as Lichenotheca parva, ed. Sect. Bot. Mus. Hist. Nat. Hung. no. 71 (Herb. Osorio). It corresponds to Parmotrema cetratum (Ach.) Hale.

Parmelia revoluta Floerk.

ROCHA: Santa Teresa, Hosseus 48 (Räsänen 1939:127).

Redetermined as Hypotrachyna osorioi (Hale) Hale by Hale (Hale 1975:51.).

Additional specimens of H. osorioi examined:

LAVALLEJA: Cerro Arequita, on stones, Osorio 3937;

Villa Serrana, on stones, Osorio 3835.

MALDONADO: Cerro del Toro, on stones, Osorio 4593;

Cerro Pan de Azucar, on Dodonea viscoa, Osorio 5035, on stones, Osorio 5037.

Parmelia trichotera Hue var. claudelii (Harm.) DR.

TACUAREMBO: Valle Edén, Osorio 1174 (Magnusson 1950:

235). Identified by Hale as Parmotrema reticulatum (Tayl.) Choisy.

Additional specimens of P. reticulatum examined:

CANELONES: La Paz, on stones, Marchesi s.n. (MVM 17681)

COLONIA: Rio Rosario and Rio de la Plata, on bark, Gortari s.n. (MVM 17418); Punta Gorda, on bark, Mones s.n. (MVM17617).

FLORIDA: Est. 25 de Agosto, on wooden fence post, Osorio 1753, on Melia azedarach, Osorio 4381.

MALDONADO: Cerro Pan de Azucar, on stones, Osorio 5023 det. M. Hale.

Parmelia velloziae Vain.

MALDONADO: Piriapolis, Cerro del Toro, Osorio 4599 (Osorio 1971:375). Redetermined by Hale as Xantho-

parmelia mougeotii (Schaer.) Hale.

Parmelia zahlbruckneri Lynge.

LAVALLEJA: Abra de Cotto, Osorio 6480 (Osorio 1971: 375). Determined by Hale as Hypotrachyna livida (Tayl.) Hale (Hale 1975:47).

Additional specimens of H. livida examined:

CERRO LARGO: Arroyo de la Mina, Paso Duraznero, on bark, Ximenez s.n. (MVM 17235), det. Hale.

MALDONADO: Piriapolis, Cerro del Toro, on stones, Osorio 4590, det. Hale.

Phaeographina epruinosa Redgr.

MONTEVIDEO: Colón, Herter 1932 (H!); Miguelete, Herter 88833 (H!), (Räsänen 1942:13).

Both collections belong to Phaeographina arechavaletae Müll. Arg.

Additional specimens of Ph. arechavaletae examined: ARTIGAS: Arroceras Conti, on Peltophorum dubium, Osorio 7426.

MONTEVIDEO: Parque Rodo, on Enterolobium contortisiliquum, Osorio 4877, Parque Tomkinson, on Melia azedarach, Osorio 7347.

SALTO: Salto Chico, on Melia azedarach, Osorio 6661.

TACUAREMBO: Valle Edén, on Melia azedarach, Osorio 1133.

Physcia aegialita (Ach.) Nyl.

ARTIGAS: Arroceras Conti, Lage de Ximenez s.n. (MVM 17137 & 17139) (Osorio 1970:343). Redetermined as Dirinaria confluens (Fr.) Awasthi.

Additional specimens of D. confluens examined:

COLONIA: Nueva Palmira, Arroyo Sauce, on Rapanea laetevirens, Osorio 4837.

Physcia picta (Sw.) Nyl.

SALTO: Paso Yacaré, Osorio 5791, 5799 (Osorio 1970a:2)

SAN JOSE: B. Pascual, Herter 87422 (Osorio 1967:6).

All collections were redetermined as Dirinaria applanata (Fée) Awasthi.

Additional specimens of D. applanata examined:

ARTIGAS: Estancia El Tigre, on Myrtaceae, Osorio 7237.

LAVALLEJA: Minas, Parque Salus, on Eucalyptus, Osorio 4951.

SALTO: Pirotto, on bark, Osorio 6741.

Acknowledgments: to Dr. M. E. Hale, Jr. for help in many ways.

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## DIATOMS AS WATER QUALITY INDICATORS: Part II

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Abstract: Part I of this study was conducted during the 1967-74 period and was reported in *PHYTOLOGICA*, Vol 30, #5, 1975. At that time a comparison was made between the diatom flora of three clean feeder streams and the highly polluted Nashua River. Five diatom species collected in the highly polluted river were considered potentially useful as water quality indicators. The present study was conducted during the 1975-78 time period, this follows the construction of two multimillion dollar waste water treatment plants designed to "clean-up" the Nashua River at Fitchburg, Massachusetts. The treatment plants are now in operation and although not operating at 100% efficiency at this time, a noticeable improvement in the appearance of the Nashua River has taken place. The purpose of this study is to report changes in the diatom flora since the original study and continue the evaluation of diatoms as water quality indicators.

The Study Area: The Nashua River is a tributary of the Merrimack River located in central New England. The Nashua drains an area of 1170 km<sup>2</sup> in the North Worcester County area of central Massachusetts and 228 km<sup>2</sup> in the south central area of New Hampshire. The overall gradient of the river is shallow, dropping 158m over its 8km length. The bedrock of the study area is composed of granite (and related igneous rocks) and metamorphic rocks such as schist and gneiss. The surface geology is a complex of weathered bedrock and glacial deposits including sand and gravel deposits in the form of outwash, eskers and drumlins. More than 75% of the basin is covered with second-growth mixed coniferous-hardwood forest. The above factors contribute to an overall acidic nature of the water in this region. The specific study area is the north branch of the Nashua River which has five small feeder streams that arise in the foothills of the 600km Wachusett Range. These streams are rather clean and are not considered polluted and provide good trout fishing waters. As the feeder streams combine to form the Nashua River at Fitchburg, Massachusetts the water is utilized by a large number and wide variety of industries including paper mills, plastic and metal finishing factories. In 1976, two multimillion dollar waste water treatment plants were completed and put into operation, thus the domestic and industrial waste of the city of Fitchburg (pop. 40,000) is removed from the river. The study design allows for the comparison of diatoms collected from 3 clean feeder streams named Phillips Brook, Whittman River, and Old Mill Brook; with the diatoms collected from the Nashua

River at a site located south of the city of Fitchburg where Massachusetts Highway Route #2 crosses the river.

Methods: Routine chemical and physical examination of the water has been made over the four year period from 1975-78. A Hach Engineers Portable Water Testing Laboratory (Model Dr-E1) was used. The Millipore filter coliform technique was used for bacteria study. The five day, 20C B.O.D. technique was used for Biological Oxygen Demand data. The chemical and physical data vary with season, time of day and water levels. Due to some technical problems with the operation of the waste water treatment plants, the chemical load of the Nashua River is not constant and at time some domestic and industrial pollutants are introduced into the river for short periods of time.

Diatom collections were made at the three feeder stream sites and at the Nashua River site. Rock and plant scrapings were made along with diatometer samples. Diatometer slides were collected after being suspended in the water for a period of 7 days. Diatoms were "cleaned" by using the hydrogen-peroxide/potassium-dichromate method. The cleaned material was placed on #1 cover slips and mounted in Hyrax on microscope slides for study under oil immersion. The following species list is based upon 500-800 diatom counts per slide and are expected to represent at least 80% of the taxa present.

Table 1. Diatom Species Collected (1975-78) Numbers indicate % of total population. + indicates that the species was present but not counted in detail. - indicates not present in this study. \* indicates organic pollution indicator taxa from other studies.

#1=Nashua River 1975-78 study	#2=Old Mill	#3=Whittman R.	#4=Phillips Brk.	sites reported in 1967-74 study	
<i>Acanthos affinis-affinis</i>	1.0	1.7	0.9	+	1,2,3,4
<i>A. clevei-cleveii</i> *	-	0.3	0.4	+	not reported
<i>A. clevei-rostrata</i>	-	0.6	-	-	not reported
<i>A. exigua-contucta</i>	+	-	-	-	not reported
<i>A. exigua-heterovalvata</i>	+	0.4	+	+	not reported
<i>A. hungarica-hungarica</i>	-	0.5	0.5	0.8	1
<i>A. lanceolata-lanceolata</i>	-	0.7	+	3.9	2
<i>A. lanceolata-dubia</i>	-	0.5	0.3	-	not reported
<i>A. lanceolata-lanceolatoides</i>	+	0.6	+	0.4	3,4
<i>A. linearis-pusilla</i>	-	-	-	0.3	4
<i>A. minutissima-minutissima</i>	+	0.3	+	1.3	not reported
<i>Amphipleura pellucida-pellucida</i> *	-	+	0.3	-	not reported
<i>Amphora ovalis-affinis</i>	-	0.2	-	-	2
<i>Asterionella formosa-formosa</i>	-	-	0.4	-	1,2,3,4
<i>Caloneis amphisbaema-amphisbaema</i>	-	+	+	-	not reported

	#1=Nashua River #2=Old Mill #3=Whittman R. #4=Phillips Brook				sites reported in 1967-74 study
	1	2	3	4	
<i>Caloneis bacillum bacillum</i>	0.6	2.8	1.9	0.6	not reported
<i>Cocconeis placentula placentula</i> +	0.9	-	0.6	-	2
<i>C. placentula euglypta</i>	2.0	4.3	6.8	9.1	2,3,4
<i>C. placentula lineata</i>	16.8	7.5	4.2	30.7	4
<i>C. pediculus pediculus</i>	-	0.6	-	-	not reported
<i>Cyclotella glomerata glomerata</i>	-	0.4	0.4	-	2
<i>C. meneghiniana meneghiniana</i>	0.5	5.1	1.3	1.0	1,2,4
<i>C. stelligara stelligara*</i>	0.8	6.3	0.8	1.8	2,3,4
<i>Cymbella aspera aspera</i>	-	+	1.3	+	2,3,4
<i>C. cuspidata cuspidata</i>	-	-	-	+	not reported
<i>C. minuta minuta*</i>	-	0.9	0.8	0.5	not reported
<i>C. microcephala microcephala</i>	-	0.6	-	-	not reported
<i>C. naviculiformis naviculiformis</i>	-	-	0.4	-	not reported
<i>C. triangulum triangulum</i>	-	-	-	0.4	not reported
<i>C. tumida tumida</i>	-	-	+	+	not reported
<i>C. turgida turgida</i>	+	0.8	0.4	1.0	not reported
<i>Diatoma anceps anceps</i>	+	-	1.0	-	4
<i>D. vulgare vulgare*</i>	-	-	1.0	-	not reported
<i>Eunotia arcus arcus</i>	-	+	1.3	-	1,2
<i>E. curvata curvata*</i>	-	0.7	2.6	+	1,2,3,4
<i>E. diodon diodon</i>	-	0.5	+	-	4
<i>E. fallax fallax</i>	-	-	+	-	3,4
<i>E. monodon monodon</i>	-	1.4	2.8	0.8	2,3,4
<i>E. pectinalis pectinalis*</i>	+	0.7	1.2	-	2
<i>E. pectinalis minor</i>	+	0.4	0.6	+	1,2,3,4
<i>E. serra serra</i>	-	-	+	-	not reported
<i>E. tridentula perminuta</i>	-	-	-	+	2
<i>Fragilaria brevistriata *</i>	-	4.2	-	-	not reported
<i>F. construens construens*</i>	+	-	2.4	+	2,4
<i>F. crotonensis crotonensis*</i>	+	0.7	3.0	-	1,3,4
<i>F. pinnata pinnata*</i>	-	1.1	-	+	3,4
<i>F. vaucheriae vaucheriae*</i>	-	9.6	0.6	-	1,2,4
<i>F. virescens virescens</i>	+	-	0.4	-	2,3,4
<i>F. virescens capitata</i>	-	0.9	0.4	-	not reported
<i>Frustulia rhomboides</i>	-	-	0.8	-	4
<i>F. rhomboides saxonica</i>	-	0.4	+	-	2,3,4
<i>F. rhomboides viridula</i>	-	0.6	+	0.5	1,2
<i>F. vulgaris capitata</i>	-	3.1	-	-	not reported
<i>Gomphonema angustatum major</i>	-	3.1	-	-	2,3
<i>G. angustatum sarcophagus</i>	-	1.5	0.4	-	2
<i>G. constrictum capetata *</i>	-	0.4	-	+	4
<i>G. cumrhis cumrhis</i>	-	0.4	-	-	not reported
<i>G. parvulum parvulum</i>	1.5	6.3	2.4	2.4	1,2,3,4
<i>G. parvulum micropus</i>	-	0.9	-	-	not reported
<i>G. tenellum tenellum</i>	-	0.4	-	-	not reported
<i>G. sphaerophorum sphaerophorum</i>	-	0.4	-	-	not reported
<i>G. truncatum turgiatum</i>	-	-	0.4	-	not reported
<i>Melosira granulata granulata</i>	-	2.6	1.6	2.8	1,2,3,4

	#1=Nashua River	#2=Old Mill	#3=Whittman R.	#4=Phillips Brook	sites reported in 1967-74 study
	1	2	3	4	
Melosira distans alpigena	-	-	1.0	2.4	
M. distans distans	0.4	2.6	6.2	3.8	not reported
M. granulata angustissima	-	-	1.4	2.1	1,2,3,4
M. varians varians	-	1.8	0.6	8.8	4
Meridion circulare circulare	+	+	1.9	0.4	1,2,3,4
Navicula amphibola amphibola	+	-	-	-	not reported
N. anglica anglica	-	+	-	-	not reported
N. cuspidata cuspidata *	0.6	4.7	2.1	0.6	1,2
N. dicephala rostrata	-	+	-	-	not reported
N. lanceolata lanceolata*	1.0	1.0	1.4	+	1,2,3,4
N. minima minima*	-	-	0.4	-	1,2,3,4
N. mutica mutica	-	-	+	-	not reported
N. placenta placenta	-	-	-	+	2
N. pupula pupula *	-	0.6	+	-	1,2,4
N. pupula elliptica	-	-	0.4	-	not reported
N. pupula rectangularis	+	-	+	-	1,2,4
N. rhynchocephala *	0.4	2.4	5.9	1.6	1,2,3,4
N. viridula angunesis	+	-	-	-	not reported
N. viridula linearis	-	0.4	+	-	not reported
Neidium affine affine	-	0.4	+	-	4
N. temperie temperie	-	+	-	-	not reported
Nitzschia amphibia amphibia*	45.0	-	-	-	1
N. capitellata capitellata	-	-	1.3	+	not reported
N. commutata commutata	1.6	-	-	-	not reported
N. communis communis*	-	-	+	+	not reported
N. dissipata dissipata*	0.8	-	0.4	0.6	1,2,4
N. filiformis filiformis	+	-	1.2	-	1,2,3,4
N. linearis linearis *	0.4	-	-	-	not reported
N. palea palea*	1.6	-	2.6	0.5	1,2,3,4
N. sigma sigma	0.6	+	+	+	not reported
N. thermalis minor	25.6	-	-	-	2
N. thermalis thermalis	-	-	0.4	-	not reported
Opehora martyi martyi*	-	0.5	-	-	not reported
Pinularia acrosphaeria	-	-	+	+	not reported
P. brebissoni brebissoni	0.9	+	0.4	-	3,4
P. viridis viridis	-	0.6	+	-	2,3
Stauroneis anceps linearis	-	-	+	-	not reported
S. phoenicentron phoenicentron	-	+	+	-	1,3,4
S. phoenicentron gracilis	-	-	+	-	not reported
Surirella angustata angustata	-	0.4	0.4	1.2	1,2
S. linearis constricta	-	-	0.8	-	4
S. ovata ovata	+	1.4	1.2	-	1
S. turgida turgida	-	-	+	+	not reported
Synedra rumpens rumpens*	-	0.6	6.7	6.8	1,2,3
S. rumpens fragilarioides	-	-	1.0	+	not reported
S. ulna ulna	1.0	1.3	3.2	1.4	2,4
Tabellaria fenestrata fenestrata-	-	1.2	2.0	1.6	3,4
T. flocculosa flocculosa	-	1.5	4.4	1.0	1,2,4

Results: 111 diatom species were identified from the four collecting sites and are listed in table 1. 46 species identified were new to the 1975-78 study. As expected, some species (31) were collected in both the feeder streams and the Nashua River. 72 species were identified from the three feeder streams and were not present in the Nashua River. Only 7 diatom species were identified only from the Nashua River, they are:

Acanthes exigua-contucta, Navicula amphibola-amphibola, Navicula viridula-anguensis, Nitzschia commutata-commutata, Nitzschia linearis-linearis, Nitzschia amphibia-amphibia, and Nitzschia thermalis-minor.

The five diatom species identified from the highly polluted Nashua River in the 1967-74 study were: Acanthes hungarica, Nitzschia amphibia, Surirella ovalis, Surirella ovata pinnata, and Synedra rumpens.

When an evaluation of these species as water quality indicators is done in light of the 1975-78 study, Acanthes hungarica and Synedra rumpens are considered not useful as pollution indicators because they are found in all three clean feeder streams in the 1975-78 study. Since Surirella ovalis and Surirella ovata pinata were not found in the 1975-78 study, they are of possible interest as they were tolerant of the serious pollution conditions during the 1967-74 study but now are not present under improved conditons. Nitzschia amphibia present in the Nashua in both the 1967-74 and 1975-78 collections and not reported from feeder streams is true to form and is of interest as a pollution indicator. 15 species are common to all three feeder streams and are of possible interest as clean water indicators.

Diatoms known to be organic pollution indicators have been reported by Lowe (1974). Of the species listed by Lowe, 30 are included in this study and are marked with an asterisk in table 1. Diversity, as shown in table 2, has increased for three of the four streams studied. The percent of the population made up of pollution indicator taxa has in every instance gone down. During the 1967-74 study, more than 50% of the observed diatoms in the Nashua River were represented by two diatom taxa. In the second study, 1975-78, three taxa make up 50% of the diatom population in the Nashua River.

Table 2: Diatom Population Diversity and Structure

	Nashua	Old Mill	Whittman	Phillips
<u>1967-74 study</u>				
Total taxa present (diversity)	31	56	45	61
% pop. as indicator species	61%	44%	33%	22%
<u>1975-78 study</u>				
Total taxa present (diversity)	38	71	82	56
% pop. as indicator species	49%	39%	32%	21%

Conclusions: The shift in diatom species found in the Nashua River supports the idea that diatoms are sensitive to water quality, however, a wide range of physical and chemical parameters are involved and their interaction makes a clear focus on quality indicator species difficult. Certainly one must be cautious of universal "master lists" of pollution indicators such as the one given by Palmer (1969). Specific indicator lists should be developed for individual aquatic systems.

Single species of diatoms by themselves do not seem to be useful as quality indicators, however when included in groups or "assemblages" and considered in relation to the total make-up of the diatom flora, diatoms become useful as water quality indicators. The more diverse the diatom population the more stable and natural the stream may be. If two or three species of diatoms make up more than 10% of the total diatom population, there are indications that the waterway is under stress, at least part of the time.

The chemical/physical data of this report (table 3) when compared to the 1967-74 study shows considerable improvement in the nitrate-phosphate complex and a lowered coliform count. Other factors are stable, thus it can be interpreted to mean that the river quality is improving without undo stress being placed on the system during the change.

Table 3: Physical and Chemical Data (1975-78)

	Nashua R.	Old Mill	Whittman	Phillips
Dissolved Oxygen	4-12 ppm	7-13 ppm	6-13 ppm	7-14 ppm
Water Temperature	2-25C	0-20C	0-20C	0-21C
pH	6.5	6.5	6.5	6.5
Total Hardness	45 ppm	50 ppm	45 ppm	50 ppm
Turbidity (JTU)	5-110	0	10	0
Phosphate	1.4 ppm	trace	trace	trace
Nitrate	4 ppm	trace	trace	trace
Ammonia	1.5 ppm	0	0	0
B.O.D.	3-9 ppm	2 ppm	3 ppm	2 ppm
Coliform/50ml	35-310	20	18	28

The diatom data of this study reveals some interesting long term results. The increase in total diatom diversity from 99 to 111 should be considered a positive sign. The Nashua River shows improvement with diversity up from 31 to 38 taxa. At the same time the per cent of the population made up of organic pollution taxa has dropped from 61% to 49%. This must be acknowledged as a significant shift of water quality in the right direction. The trend of greater diversity and lower per cent of pollution indicator taxa holds true for the Old Mill Stream and the Whittman River. It is interesting to note that the apparently clean trout stream, Phillips Brook, has a diversity drop and thus this

body of water warrants careful monitoring at this time. Diatoms are useful not only for indication of present conditions but can indicate long term trends of improvement or degradation as it develops. This study points up the much improved but as yet incomplete clean-up of the Nashua River in this study area.

#### References:

- Palmer, C.M. A Composite Rating of Algae Tolerating Organic Pollution Journal of Phycology #5 1969
- Lowe, Rex L. Environmental Requirements and Pollution Tolerance of Freshwater Diatoms U.S. Govt. Printing Office, Washington, D.C. 1974 334 p.
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#### A. I. GALUSHKO, "FLORA OF THE NORTHERN CAUCASUS", A REVIEW

Otto & Isa Degener

After attending the meetings of the XII International Botanical Congress in Leningrad in 1975 as mentioned \*before, we joined the Caucasus Tour conducted by Prof. Galushko. We were amazed at Dr. Galushko's intimate knowledge of the ferns, "fern alles," gymnosperms and phanerogams about him, and a bit saddened that this wealth of personal knowledge was not generally available. We are now delighted to report that we just received a copy of the 318-page "Flora of the Northern Caucasus" from our friend.

Though the volume, in boards, is published in Russian in the Cyrillic alphabet, names of Families and lower categories appear in the Roman. Thus we "outsiders" can gain an intriguing bird's eye views of what genera, so many common to temperate North America, exist there. The almost 3,900 species, according to our perusal of the index, are scattered among about 360 genera in 54 families.

Actually a field guide with emphasis on geographic distribution, this vade mecum is enhanced with 76 plates and figures. A few trivial misspellings occur, one being that of "Pulsatilla" under one of the cuts.

Unable to translate into English the information given where copies can be purchased, we suggest writing for them to the author at his home: Fevral'skaya Street 273, T. Pyatigorsk, 357528, U.S. Russia.

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\*Phytologia 17(4):409-411. 1977.

NEW COMBINATIONS IN GENUS CHIONANTHUS L. (OLEACEAE) FROM  
THE ISLAND OF SANTO DOMINGO (HISPANIOLA)

José de Js. Jiménez A.

The prominent English botanist, Dr. William T. Stearn, in revising the genus Linociera Sw. for the sixth volume of the FLORA OF JAMAICA, in a very interesting article entitled "Union of Chionanthus and Linociera (Oleaceae)" published in the ANNALS OF THE MISSOURI BOTANICAL GARDEN 63: 355—357 (1976) has contributed convincing evidence that these two genera are actually congeneric.

In this article he has proposed some appropriate new combinations for taxa found on the islands of Jamaica, Cuba, Santo Domingo (Hispaniola) and Puerto Rico. However, he has left without new nomenclatural combinations two Hispaniolan species, and for this reason, and in full agreement with his point of view and with his kind compliance, I propose them here, viz.:

CHIONANTHUS LANCEOLATUS (Knobl.) Jiménez, comb. nov.

Linociera lanceolata Knobl. in Fedde, Repert. 33: 177. 1933.

CHIONANTHUS MIRAGOANE (Urb.) Jiménez, comb. nov.

Linociera miragoane Urb. in Ark. für Botanik Bd. 22A, 8: 86. 1928.

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## NOTES ON BROMELIACEAE, XI

Lyman B. Smith and Robert W. Read

Since the third part of *Flora Neotropica*, No. 14, Bromelioideae has gone to press, we are now using its enumeration for all three subfamilies.

### 1. PITCAIRNIOIDEAE

#### 1. PUYA

10a. *P. MIMA* L. B. Smith & R. W. Read, sp. nov. In clavi *Florae Neotropicae* cum *P. coerulea* Lindl. posita sed pedicelis longis floribus mutantibus differt; *P. ferruginea* (R. & P.) L. B. Smith habitum simulans sed inflorescentia glabra differt.

PLANT flowering to 2 m high. LEAVES uniform, ca. 5 dm long; sheaths small, suborbicular; blades very narrowly triangular, 3 cm wide, rigid, white-lepidote on both sides, laxly serrate with slender red brown antrorsely curved 7 mm long spines. SCAPE erect, slender, glabrous; upper scape-bracts barely imbricate, ovate, acute, entire, glabrous. INFLORESCENCE laxly racemose, over 4 dm long, glabrous. FLORAL BRACTS like the upper scape-bracts, about equaling the lower pedicels; pedicels ascending, slender, 5 cm long; flowers nutant, making a strong angle with the pedicel. SEPALIS lanceolate, subacute, 45 mm long; petals over 10 cm long, naked, light greenish yellow, spirally contorted after anthesis; ovary almost woolly superior; ovules alate. Pl. 1.

PERU: CAJAMARCA: Jaen: San Felipe, several km above and north-east of village, 1920-1950 m, 10 February 1964, from cultivation in Huntington Botanical Gardens, July 1977, Hutchison 18109 (holotype, US; isotype, UC).

### 8. PITCAIRNIA

20a? *P. ATTENUATA* L. B. Smith & R. W. Read, sp. nov. Ob flores putridos affinitate haud cognita sed ab omnibus speciebus adhuc cognitissimis integrisque, scapo brevi curvato, inflorescentia simplici densa, bracteis florigeris brevibus, floribus subsessilibus, sepalis lateralibus parvis argute carinatis differt.

PLANT somewhat caulescent; stem prostrate, ca. 1 cm in diameter. LEAVES all alike, mostly fasciculate at the apex of the stem, 1-1.5 m long, entire; sheaths very broadly ovate, 15 mm long; blades linear, filiform-attenuate, narrowed toward base but scarcely petiolate, glabrous above with conspicuous pale midrib, densely pale-lepidote beneath. SCAPE curved, 8 cm long, its apex barely protruding from the leaf-fascicle; scape-bracts erect, subfoliaceous, densely imbricate. INFLORESCENCE simple, densely subcylindric, 6 cm long, 25 mm wide. FLORAL BRACTS broadly ovate, attenuate or apiculate, short and covering little of the

sepals, pale-lepidote; flowers subsessile. **SEPAIS** lance-oblong, broadly subacute, 18 mm long, glabrous, sulcate when dry, the posterior ones complanate, strongly carinate; petals 35 mm long, strong yellowish pink (J. Schunke V.); ovary apparently more than 1/2 superior; ovules not known. Pl. 2.

PERU: SAN MARTIN: Mariscal Caceres: Uchiza: Cerro de Santa Cruz east of El Puente (Carretera Marginal), high forest, on moist rocks in deep shade, 700-800 m, 6 August 1974, J. Schunke V. 8078 (holotype, US; isotype, MO).

152. *P. MULTIFLORA* L. B. Smith, Contr. U. S. Nat. Herb. 29: 312, fig. 32. 1949; Smith & Downs, Fl. Neotrop. No. 14: 364, fig. 123 N-O. 1974.

PANAMA: COCLE: Near saw-mill, 8 km north of El Cope (28 km northwest of Penonome), very wet cloud forest, 600-750 m, 1 September 1977, Maas 2780 (U, US). New to Panama.

153a. *P. ANCUASHII* L. B. Smith & R. W. Read, sp. nov. A *P. kalbreyeri* Baker, cui verisimiliter affinis, foliorum laminis serrulatis, inflorescentia multiflora subdensa, bracteis florigeris pedicelos multo superantibus differt.

PLANT evidently caulescent, flowering 1.1 m high. LEAVES dimorphic, some with broad blades, others bladeless with petioles modified into stout spines; sheaths uniform, ovate, 12 cm long, entire, drying dark castaneous, coriaceous, covered with appressed brown scales; petiole 1.2 m long, spinose-serrate, castaneous at base; blade linear-lanceolate, biattenuate, nearly 3 m long, 8 cm wide, serrulate, glabrous, bearing a strong median channel. SCAPE erect, stout, finely white-arachnoid; scape-bracts erect, densely imbricate, lanceolate, attenuate, to 20 cm long, entire, the lower coriaceous, castaneous, even, brown-lepidote, the others thin, pale, strongly nerved and sulcate when dry, finely whitish-lepidote. INFLORESCENCE simple, subdense, 55 cm long, laxly and very finely white-lepidote. FLORAL BRACTS very narrowly triangular, to 10 cm long, always much exceeding the slender 3 cm long pedicels; flowers suberect. SEPAIS oblong-lanceolate, acute, 4 cm long, thin, strongly nerved, ecarinate; petals over 6 cm long, yellow (!Ancuash), bearing a large truncate scale at base; ovary 1/2 superior; ovules acute or apiculate, Pl. 3.

PERU: AMAZONAS: Quebrada Sasa, Rio Canepa, monte, 250 m, 30 May 1973, Ernesto Ancuash 519 (holotype, US; isotype, MO).

163a. *P. BICOLOR* L. B. Smith & R. W. Read, sp. nov. A *P. reflexiflora* Andre, cui valde affinis, foliorum laminis multo latioribus, petiolis spinoso-serratis differt.

PLANT caulescent, flowering over 1.3 m high. LEAVES dimorphic, some reduced to thin, red, finely white-lepidote, entire, linear-lanceolate, 17 cm long sheaths, others 1.1 m long, green, glabrous; sheaths 2 cm long, suborbicular, spinose-serrate; petioles elongate, slender, subdensely spinose-serrate; blades linear-lanceolate, biattenuate, entire, 6 cm wide. SCAPE erect, slender; scape-bracts imbricate, linear-lanceolate, subacute and acuminate, entire, finely white-lepidote, soon glabrous. INFLORESCENCE simple, erect, dark red except for the greenish yellow petals; axis slender, sparsely appressed-lepidote. FLORAL BRACTS

lance-ovate, attenuate, membranaceous, to 25 mm long, all exceeding the pedicels; pedicels setiform, 5 mm long; flowers spreading. SEPAIS oblong, rounded, apiculate, 11 mm long, thin; petals lanceolate, acute, 4 cm long; ovary ca. 3/4 superior; ovules caudate. Pl. 4.

COLOMBIA: CHOCÓ: Ansermanuevo to San José de Palmar road near line with Valle, Alto del Galapago, terrestrial, 2000 m, Forero, Gentry, Sugden & Daly 2852 (holotype, MO; photo US).

195a. *P. HITCHCOCKIANA* L. B. Smith emend. L. B. Smith & R. W. Read. A descriptione originali bracteis florigeris per anthesin arcuato-divergentibus, a *P. wendlandii* Baker bracteis florigeris sine lamina, a *P. clavata* L. B. Smith foliorum laminis integerrimis multo angustioribus differt. Pl. 5 (Asplund 20082).

ECUADOR: TUNGURAHUA: Valley of the Pastaza River, between Baños and Cashurco, 8 hours east of Cashurco, on tree, 1300-1800 m, 25 September 1923, Hitchcock 21816 (holotype, NY; isotypes GH, US); valley of Rio Pastaza, between Rio Topo and la Victoria, cliff, 1200 m, 1 December 1939, Asplund 10029 (S, US); Banas, Rio Pastaza, 15 February 1953, Prescott 494 (NY); Machai, cliff, 1500 m, 30 March 1956, Asplund 20037 (S, US). NAPO: Mera, Mangayacu to Puente Quile, 31 March 1956, Asplund 20082 (S, US).

In Flora Neotropica Monograph No. 14 this species was described and keyed as having erect floral bracts although most of the material beyond the type showed them arched-divergent. Consequently it is necessary to change its position to the vicinity of *P. clavata*.

The following specimen can not be separated satisfactorily from *P. hitchcockiana* although it is a rather large disjunct:

BRAZIL: MATO GROSSO: Campo Grande, 1978, A. Seidel 778 (US).

204a. *P. MUCIDA* L. B. Smith & R. W. Read, sp. nov. A *P. scep-trigera* Mez et *P. umbratile* L. B. Smith, quibus affinis, bracteis florigeris membranaceis integerrimis, floribus sessilibus, sepalis anguste triangularibus differt.

PLANT known only from a scape, inflorescence, and 2 detached similar leaves, wholly mucilaginous (!Forero et al.). LEAVES linear-lanceolate, 4 cm wide with pale median channel, attenuate, subpetiolate, to 1 cm wide and sparsely serrulate; sheath unknown. SCAPE straight, stout, scape-bracts very fragile and almost wholly lost but doubtless densely imbricate before anthesis. INFLORESCENCE simple, densely ellipsoid, 14 cm long. FLORAL BRACTS membranaceous and extremely fragile but evidently ample and covering the sepals, entire, rose (!Forero et al.), apparently glabrous; flowers sessile. SEPAIS narrowly triangular, attenuate, 45 mm long, coriaceous, verrucose, white-lepidote, the lateral ones alate-carinate; petals rose (!Forero et al.), appendaged; ovary ca. 4/5 superior; ovules caudate. Pl. 6.

COLOMBIA: CHOCÓ: Nevita: Mereda Llanadas, north slope of Cerro Torra, ridge west of Rio Surama, road to Alto del Oso, epiphytic in forest, 600-900 m, 22 February 1977, Forero, Gentry, Sugden & Daly 3143 (holotype, MO; photo, US).

252a. *P. CURVIDENS* L. B. Smith & R. W. Read, sp. nov. A *P. glaziovii* Baker et *P. scandens* Ule, quibus verisimiliter affinis,

foliis exterioribus integris, scapi bracteis inferioribus foliaceis magnis, inflorescentia multiflora, a P. glaziovii inflorescentia laxa, pedicellis gracillimis, a P. scandens caule brevissimo, bracteis florigeris quam pedicellis vix longioribus differt

PLANT acaulescent with swollen base, flowering to 45 cm high. LEAVES glabrous, dimorphic, the basal ones as shown by a young shoot reduced to small apiculate entire sheaths; the others with deciduous blades known only from the persistent base with subdensely serrate flat, curved or twisted spines. SCAPE erect, slender, white-lepidote soon becoming glabrous; lower scape-bracts foliaceous but with persistent linear, long-attenuate blades to 32 cm long, 7 mm wide, entire, sparsely and fugaciously vestite toward base with coarse, white, spreading scales, upper scape-bracts lance-ovate, attenuate, entire, shorter than the internodes. INFLORESCENCE simple, 14 cm long before complete anthesis, lax, sparsely white-arachnoid, soon glabrous. FLORAL BRACTS lance-ovate, attenuate, about equaling the slender, 10 mm long pedicels; flowers in bud, suberect, scarlet with yellow base (Irwin et al.). SEPALS lance-oblong, 23 mm long, the posterior carinate; petals naked; ovary ca. 2/3 superior; ovules caudate. Fl. 7.

BRAZIL: MINAS GERAIS: Serra do Cipó, km 132 (ca. 153 km north of Belo Horizonte), high campo slopes, outcrops, and creek margin, 1400 m, 17 February 1968, Irwin, Maxwell & Wasshausen 20338 (holotype, UB; photo US).

Probably conspecific but leaves unknown and sepals slightly different shape:

BRAZIL: MINAS GERAIS: Serra do Cipó, km 120 (ca. 145 km north of Belo Horizonte), sand campo with outcrops, 1200 m, 14 February 1968, Irwin, Maxwell & Wasshausen 20081 (UB).

## 2. TILLANDSIOIDEAE

### 14. TILLANDSIA

55. T. TRUNCATA L. B. Smith, Contr. U. S. Nat. Herb. 29: 530, fig. 85. 1954.

PERU: HUANUCO: Huanuco - Tingo Maria road, "ceja de la montaña", km 456, ca. 2400 m, epiphytic, 13 April 1977, Gentry, Reville, Alfaro Castaneda & Daly 19316 (MO). New to Peru.

### 16. GUZMANIA

31a. G. RUGOSA L. B. Smith & R. W. Read, sp. nov. A G. virescente (Hooker) Mez et G. weberbaueri Mez, quibus ob bracteas florigeras rugosas affinis, scapi bracteis foliaceis magnis differt.

PLANT known only from scape and inflorescence but presumably stemless because of its ligulate scape-bracts. LEAVES unknown but presumably large and ligulate judging from the lower scape-bracts. SCAPE straight, stout, sparsely punctulate-lepidote; scape-bracts foliaceous, much exceeding the base of the inflo-

rescence, ligulate, acute, green, concolorous, obscurely punctate-lepidote, the lowest 4 dm long, 45 mm wide. INFLORESCENCE large, covered with mucilage, bipinnate, lax with basal internodes 4 cm long; primary bracts subfoliaceous, red, exceeding the lower spikes; spikes spreading, densely ellipsoid, 6 cm long, the sterile naked stipe 3 cm long. FLORAL BRACTS broadly elliptic, 22 mm long, centrally rugose and verrucose, laxly lepidote; flowers subsessile, suberect. SEPAIS oblong, rounded and slightly cucullate at apex, 25 mm long, 6 mm wide, equally subfree, thin, nerved, sparsely appressed-lepidote, yellow. Pl. 8

COLOMBIA: CHOCO: Road from Ansermanuevo to San Jose del Palmar, by Valle del Cauca boundary, Alto del Galapago, terrestrial in open area, 2000 m, 18 February 1977, Forero, Gentry, Sugden & Daly 2904 (holotype, MO; photo, US).

43a. *G. ATTENUATA* L. B. Smith & R. W. Read, sp. nov. A *G. acorifolia* (Griseb.) Mez, cui affinis, foliorum vaginis pallide viridibus, laminis longe attenuatis, inflorescentia digitata subglobosa, bracteis primariis filiforme attenuatis differt.

PLANT possibly somewhat caulescent but base lacking, flowering ca. 5 dm high. LEAVES to 8 dm long, obscurely punctulate-lepidote; sheaths ovate, 12 cm long, pale green; blades linear, long-attenuate, 12 mm wide. SCAPE straight, very slender; scape-bracts subfoliaceous, densely imbricate and completely covering the scape. INFLORESCENCE densely digitate, subglobose, 3 cm long, green, obscurely punctulate-lepidote; primary bracts with small ovate base and very narrowly triangular filiform-attenuate blade; spikes subsessile, subglobose, densely few-flowered, 15 mm long. FLORAL BRACTS suborbicular, 7 mm long, nerved; flowers subsessile. SEPAIS elliptic, obtuse, 9 mm long, very short-connate, nerved. Pl. 9.

PANAMA: DARIEN: Southern slope of westernmost summit of Cerro Tacarcuna massif between Pucro base camp and Tacarcuna summit camp, epiphytic in lower montane wet forest, 1400-1600 m, 21 July 1976, Gentry, Leon & Forero 16866 (holotype, MO; photo, US).

78. *G. RETUSA* L. B. Smith, *Fieldiana Bot.* 28: 143, fig. 23 a-e. 1951.

PERU: HUANUCO: La Divisora, Tingo Maria - Pucallpa road near Loreto border, alt. 1150-1250 m, epiphyte, 29 March 1977, Gentry, Daly & Salvador Cruz 18829 (MO). New to Peru.

116a. *G. TESTUDINIS* L. B. Smith & R. W. Read, sp. nov. In *Florae Neotropicae* clave ob sepala alte connata, foliorum laminas ligulatas, inflorescentiam compositam laxam et pedicellos breves *G. dudleyi* L. B. Smith et *G. sprucei* (Andre) L. B. Smith interposita.

PLANT known only from fragments but presumably stemless because of its ligulate leaf-blades, flowering ca. 6 dm high. LEAVES to 72 cm long, obscurely appressed-lepidote; sheaths elliptic, ca. 10 cm long, green except for the castaneous base; blades ligulate, broadly subacute and apiculate, 4 cm wide, concolorous. SCAPE erect, slender, glabrous; scape-bracts ovate, attenuate, exceeding the internodes. INFLORESCENCE very laxly bipinnate, 14 cm long, soon glabrous; axes red (!Forero et al.);

primary bracts broadly ovate, attenuate, chartaceous, nerved, about equaling the lowest branch; racemes spreading, to 4 cm long, laxly 2-6-flowered, short-stipitate. FLORAL BRACTS broadly ovate, obtuse, 9 mm long, thin, nerved; pedicels obscure, 3 mm long; flowers divergent. SEALS 16 mm long, yellow (!Forero et al.), highly connate, the free lobes broadly obovate, 5 mm long. Pl. 10.

COLOMBIA: CHOCÓ: Road from Ansermanuevo to San José del Palmar, by Valle del Cauca boundary, Alto del Galapago, terrestrial in cloud forest, 2000 m, 18 February 1977, Forero, Gentry, Sugden & Daly 2905 (holotype, MO; photo, US).

117b. G. KENNEDYAE L. B. Smith & R. W. Read, sp. nov. A. G. sprucei (Andre) L. B. Smith et G. lellingeri L. B. Smith & R. W. Read, cuibus affinis, sepalis per anthesin in bracteis florigeris omnino inclusis differt.

PLANT stemless, flowering 44 cm high. LEAVES 5 dm long, laxly vestite with minute appressed brown scales; sheaths 10 cm long, purple-striped (!Kennedy), dark castaneous at base; blades ligulate, attenuate, 2 cm wide, green, concolorous. SCAPE erect, slender; scape-bracts imbricate and completely covering the scape, subfoliaceous to ovate. INFLORESCENCE simple, sub-lax, 13 cm long. FLORAL BRACTS divergent, ovate, acute, 5 cm long, all exceeding and enfolding the sepals, red, subchartaceous, faintly nerved and lepidote toward apex; pedicels ca. 4 mm long. SEALS 35 mm long, connate into a slender 23 mm long tube, the free lobes elliptic, obtuse; corolla 6 cm long, yellow. Pl. 11.

PANAMA: PANAMA: La Eneida, region of Cerro Jefe, very common, epiphytic in cloud forest, 800 m, 2 September 1974, Helen Kennedy, Maas & Dressler 3372 (holotype, US).

Stouter and with leaf-blades 5 cm wide the following is not taxonomically different:

COLOMBIA: CHOCO: North ridge of Alto del Buey, east-southwest of El Valle, epiphyte in premontane wet forest, 500-1150 m, 8 August 1976, Gentry & Fallen 17359 (MO, US).

#### 18. CATOPSIS

5. C. BERTERONIANA (Schult. f.) Mez, DC. Mon. Phan. 9: 621. 1896.

FRENCH GUIANA: Approuague Stream, Arataye River, Pararé Falls, 6 km from the stream, on a granite "inselberg", epiphytic on shrubs, 400-500 m, 29 August 1977, Sastre 5829 (P, US). New to French Guiana.

Plate 1



*Puya mimia* Smith & Read





Plate 3



*Pitcairnia andashii* Smith & Read



Pitcairnia bicolor Smith & Read.

Plate 5



*Pitcairnia hitchcockiana* L. B. Smith emend. Smith & Read



Pitcairnia mucida Smith & Read

Plate 7



*Pitcairnia curvidens* Smith & Read



*Guzmania rugosa* Smith & Read

Plate 9



*Guzmania attenuata* Smith & Read



MISSOURI  
BOTANICAL GARDEN  
HERBARIUM  
No. 2594387

HERBARIO NACIONAL COLOMBIANO

COLOMBIA, Departamento del Cauca, Provincia de Guapi, Municipio de Guapi, Finca La Estrella, 1000 metros de altitud, 10 de Febrero de 1977.  
No. 1000. E. Forero, A. Góngora, A. Soggeen & O. Delgado.

*Guzmania testudinis* Smith & Read



## Plate 11



Guzmania kennedyae Smith &amp; Read

NOTES ON NEW AND NOTEWORTHY PLANTS. CXX

Harold N. Moldenke

*LIPPIA MARTIANA* f. *CAMPESTRIS* Moldenke, f. nov.

Haec forma a forma typica speciei laminis foliorum inferioribus subtus multo sparsiore pilosis recedit.

This form differs from the typical form of the species in having the lower surface of its inferior leaves much more sparsely pilose.

The type of the form was collected by the Taxonomy Class of the Universidade de Brasilia (no. 518) in cerrado low-tree and scrub savanna (the natural vegetation, with woody layer slightly opened by fires from the original tree and scrub woodland form), burned last dry season, south side of the campus of the Universidade de Brasília, 15°45' S., 47°51' W, Distrito Federal, Brazil, on November 16, 1977, in the wet season, and is deposited in the United States National Herbarium at Washington.

*PREMNA ALSTONI* var. *MOLLIS* Moldenke, var. nov.

Haec varietas a forma typica speciei recedit laminis foliorum subtus plusminusve distincte pubescentibus.

This variety differs from the typical form of the species in having the lower leaf-surfaces more or less distinctly pubescent.

The type of the variety was collected by an unknown collector at Tissamaharama, Hambantota District, Sri Lanka, in December, 1882, and is deposited in the Peradeniya herbarium.

*PREMNA ALSTONI* var. *SUBCRENATA* Moldenke, var. nov.

Haec varietas a forma typica speciei recedit laminis foliorum late ellipticis vel elliptico-ovatis basaliter plusminusve cordatis marginaliter subcrenatis subtus densissime pubescentibus.

This variety differs from the typical form of the species in having its leaf-blades elliptic or elliptic-ovate, basally more or less cordate, marginally subcrenate toward the apex, very densely pubescent beneath.

The type of the variety was collected by Magdon Jayasuriya and S. Balasubramanium (no. 448) among the shrubbery bordering a rock outcrop in semi-sun at Haragama, Kandy District, Sri Lanka, at 500 meters altitude, on December 14, 1971, and is deposited in the Peradeniya herbarium.

*PREMNA LATIFOLIA* var. *MAJOR* Moldenke, var. nov.

Haec varietas a forma typica speciei inflorescentiis multifloris laxe divaricatis usque ad 10 cm. latis recedit.

This variety differs from the typical and other forms of the species in having its inflorescences much larger, many more-flowered, to 10 cm. wide during anthesis, its branches loosely and widely divaricate.

Type: Sohmer 8986, Buthawa Bungalow, Sri Lanka, dep. at Peradeniya.

The woody Rubiaceae of Aldabra Island (Indian Ocean)

F. R. Fosberg

Smithsonian Institution, Washington, D. C. 20560

The Rubiaceae of Aldabra have appeared baffling, even to one who claims some special knowledge of the family. The herbaceous members have been dealt with in another paper (Few Bull. 33: 136-140, 1978). The woody species, of which there are eight, require some more detailed comment than is appropriate in the flora, and one troublesome new species should be described, and placed on record.

With two exceptions these species are principally components of the mixed scrub vegetation type, common on the "platin" and "pavé" limestone surfaces. This is a sclerophyllous scrub and many of its members show a striking similarity in habit, leaf form and texture, presumably related to the severe climate and drainage environment in which they live, perhaps also to the highly calcareous substrate. A related problem is that many of the available specimens were collected when not at their best, as much of the field work has been done in dry seasons, or, as in the 1968 field season, when expected rains failed. Hence the characters useful in taxonomic investigations are not well exhibited.

In addition to these local sources of difficulty, the classification of the Rubiaceae, especially of the Ixoreae and related tribes, has undergone some drastic overhauling by Bremekamp, Verdcourt and recently by Tirvengadam, which is probably not yet finished. The distinctions between the genera Pavetta, Tarenna, Ixora, Myonima and others seem very tenuous, even after the lengthy exposition by Bremekamp in his monograph of the genus Pavetta L. (Fedde, Repert. 37: 1-208, 1934). This is not an appropriate place to go into these problems, but it does seem advisable to describe the Aldabra species in more than ordinary detail and to discuss their peculiarities. This study casts some doubt even on the assignment of the genus Tricalysia A. Rich. to the tribe Ixoreae. The development of the fruiting placenta, with the seeds deeply embedded in it, suggests that it might equally well go into the Gardenieae, though not all characters support this.

To make the account of the nomenclature complete, all the woody species of the Aldabra group are listed and described with their synonymy and notes of interest, even though, as in Guettarda speciosa and Canthium bibracteatum, no particular taxonomic difficulties are evident. Guettarda speciosa proves to be clearly heterostylous.

Canthium Lam., Encycl. Meth. 1: 602, 1785.

Pllectronia sensu DC. et auct., non L., Mant. Pl. 6, 1767.

Shrubs or trees; stipules ovate, cuspidate or acuminate; inflorescences axillary cymes, often much reduced, even to small fascicles; flowers 4-5-merous; corolla with short cylindrical tube, usually pilose within, especially at throat, lobes valvate, spreading; stamens inserted in throat, filaments short; ovary usually 2-loculed, with one pendulous ovule in each locule, style 1, stigma cylindrical, 2-4 lobed, included or exserted; fruit a drupe with one 2-loculed or two 1-loculed stones.

A principally African but also Indo-Pacific genus with one species in Aldabra.

Canthium bibracteatum (Baker) Hiern in Oliver, Fl. Trop. Afr.

3: 145, 1877; Fosberg, Phil. Tr. R. S., B, 260: 218, 1971;

Renvoize, Phil. Tr. R.S., B, 260: 231, 1971.

Pllectronia bibracteatum Baker, Fl. Maur. & Seychelles 146, 1877; Hemsley, Kew Bull. 1919: 123, 1919.

Glabrous shrub 1-2 (rarely 3-4) m tall, much-branched, branchlets gray, internodes often short, rather stiff, nodes prominent; leaves elliptic to oblong, rarely ovate, 4-8(-9) x 1.5-2.5(-4) cm, apex obtuse to blunt-acute or slightly acuminate, base rounded to acute, midrib tending to be dull orange when dry, a narrow pale zone on either side of it frequent, 4-7 veins on a side, obscure above, distinct but not prominent beneath, small sparsely hirsute domatia in their axils beneath, petiole several mm long; stipules firm, ovate-long-acuminate, 3-5 mm long, tardily caducous, a row of oblong erect glands in their axils, these also early caducous; cymes much reduced, pedunculate, umbelloid, 5-20 flowered, congested when many-flowered, 10-15 mm long, peduncle about 1/3 to 1/2 of this, at its summit a pair of large somewhat gibbous stipular bracts subtending the slender pedicels; flowers white, 3-4 mm long; calyx shallow, somewhat 4-dentate; corolla tube cylindrical to slightly dilated, 2.5 mm long, lobes ovate, 1.5 mm, throat choked with wool; anthers broadly ovate, pointed, exserted on short filaments; style shorter than corolla tube but elongating until capitate stigma is exserted just beyond anthers; drupe compressed globose to slightly obcordate, slightly geminate, 3-4 x 4-2 mm, ripening yellow to red and finally black.

Specimens examined:

Aldabra,--s.l., Dupont 204 (K); Fryer 54 (K), 74 (K).

West Is. (Ile Picard): Back of settlement, Fosberg 49509 (US); Renvoize 747 (K, US); Bassin Cabri, Wood 1615 (E, US).

Middle Is.: Gionnet Channel Camp area, Fosberg 49588 (US); east end of Middle Island, Fosberg 49094 (US), 49095 (US).

South Is.: Appr. 3 km NW of Cinq cases Camp, Fosberg, Grubb & Graham 49178 (US); Takamaka Well, Fosberg 49253 (US); Takamaka area, lagoon side, Fosberg 49056 (US), 49055 (US); Takamaka Camp area, Renvoize 874 (US K).

Guettarda L., Sp. Pl. 991-992, 1753; Gen. Pl. ed. 5, 428, 1754. [1753].

Cadamba Sonnerat, Voy. 2: 228, t. 128, 1776.

Trees and shrubs, sometimes spiny (ours not), leaves simple, opposite or rarely ternate; stipules obovate or (elsewhere) ovate or lanceolate, apex (in ours) obtuse, often recurved; cymes axillary, dichotomous or rarely flowers reduced to 2 or 3, or 1, often secund; flowers bisexual, rarely polygamo-dioecious (-4)5-8(-9)-merous; calyx tubular, truncate to dentate; corolla salverform, lobes imbricate or their membranous margins infolded, undulate or crenulate; anthers sessile or subsessile, inserted in corolla throat, included or slightly exerted; ovary 2-9 celled, with 1 pendulous ovule in each cell, style filiform with a cylindro-capitate stigma; fruit a drupe with 2-9 pyrenes united into a woody or bony stone, in ours corky and floating.

Originally described in Genera Plantarum and Species Plantarum as monoecious.

A principally American genus with one widely distributed strand or lowland species, which has been regarded as constituting a separate section, Cadamba (Sonn.) DC. (=sect. Guettarda). This species is found on Aldabra.

Guettarda speciosa L., Sp. Pl. 991, 1753; Schinz, Abh. Senckenb. Nat. Gesellsch. 21: 91, 1879; Voeltzkow, Abh. Senckenb. Nat. Gesellsch. 26: 552, 1902; Hemsley, Kew Bull. 1919: 213, 1919; Vesey-Fitzgerald, Jour. Ecol. 30: 13, 1942; Stoddart & Wright, Atoll Res. Bull. 118: 29, 1967; Stoddart, op.cit. 59, 1967; Renvoize, Phil. Tr. R.S., B, 260: 230, 1971; Fosberg, Phil. Tr. R.S., B, 260: 217-219, 1971.

Large shrub to small or medium-sized tree, very bushy, much branched in habit; twigs about 1 cm thick, subterete, pubescent with short incurved hairs which turn golden on about the second or third internode; leaves broadly oblong to somewhat ovate or obovate, on short thick petioles about 1-2 cm long, 5 mm thick, terete, blades heavy chartaceous, nerves pinnate, 10-11 pairs spreading widely, curving gradually into the margin, connected by irregularly ladder-like cross-nerves, the spaces filled with several orders of close network, main nerves slightly puberulent above, densely short-pilose beneath, smaller nerves less so, apex obtuse with

slight acumen, base cordate; stipules large, strongly acuminate, shortly sheathing, carinate where united at sides, sparsely strigose, caducous from all but first 1-3 nodes, leaving a row of small hairs in axils; leaf scars orbicular slightly flattened distally, with a narrow horseshoe of bundle scars; cymes axillary from second node from apex, prominently pedunculate, peduncles strongly ascending, about 10 cm long, branching crowded, twice dichotomous, a sessile flower in each fork, with an oblong acute bract subtending it externally, each branch with about 5 alternately disposed flowers in 2 rows, each subtended by a lanceolate bract; whole inflorescence appressed puberulent; calyx deeply cup-shaped, longer than wide, margin irregular or very shallowly 3-lobed, with a purplish rudiment very poorly developed in each sinus; corolla salverform, tube much longer than the obovate lobes, very slightly dilated gradually upward, 3-5 cm long, about 1.5 mm diam. below, to 4 mm at top, pilose within, lobes 7-8, even on same plant, lobes and tube puberulent without, lobes papillate within, tube pilose within except basal few mm; anthers same number as corolla lobes, linear, attached several mm below sinuses, dorsally but almost basally; style single, filiform, of 2 lengths, on brevistylous plants about 1/2-2/3 lengths of corolla, on longistylous plants stigma slightly exserted, stigma short cylindrical, truncate on top, exuding a drop of sticky liquid; corolla opening in evening, strongly fragrant, dropping before noon next day, leaving the style which usually falls somewhat later; both longistylous and brevistylous plants fruit abundantly; young fruit globose, mature ones depressed globose, drupaceous, with white flesh containing stiff fibers which persist after flesh rots or is eaten by hermit crabs; stone corky, floating, with 5-6 cells.

Specimens examined:

Aldabra. -- s.l., Dupont 281 (K); Fryer 51 (K).

West Is.: Vesey-Fitzgerald 6034 (K).

South Is.: Anse Cèdres, Stoddart 718 (K, US); Cinq Cases, Fosberg 48971 (US), 48910 (US); Stoddart 1016 (K, US); Renvoize 959 (US, K); Takamaka Camp, Renvoize 1110 (US, K); Trou Nenez, Stoddart 975 (K, US); Rhyne 1035 (US); Anse Mais, Stoddart 953 (US); Wood 1691 (US).

Cosmoledo Atoll. -- Menai Is., south part of Menai Islet, Fosberg 49842 (US); Vesey-Fitzgerald 5987 (K); Renvoize 1250 (US, K).

Astove Island: s.l., Ridgway 85 (US); Gwynne & Wood 1321 (EA) (leaves very tomentose beneath, resembling f. taitensis); west side, Stoddart & Poore 1265 (K); Grand Anse, Fosberg 49685 (US).

Polysphaeria Hook. f. in Benth. & Hook. f., Gen. Pl. 108, 1873.

--Hiern in Oliver, Fl. Trop. Afr. 3: 127, 1877.

Shrubs, stem erect, branching, branches producing terminally dense clusters of slender "supra-axillary" flowering branchlets

bearing flowers in dense small axillary sessile or pedunculate glomerules, flowers with small cup-shaped bracteoles; leaves of flowering branchlets opposite, often differing from those subtending the branchlets; stipules caducous, short and broad; flowers with a turbinate or campanulate hypanthium, its limb truncate or shortly 4-dentate; corolla funnellform, tube short, throat densely bearded, lobes 4, contorted; stamens 4, inserted in mouth of corolla tube, filaments short, anthers linear dorsifixed near base; ovary 2-locular, with one pendant ovule in each cell, style exserted, stigma fusiform; fruit baccate, 1-2-celled, 1-2 seeded; seeds suborbicular, plano-convex, testa striate-sulcate, endosperm ruminant.

A small African genus of 10-12 species, one of them found in the Aldabra Group.

Polysphaeria multiflora Hiern in Oliver, Fl. Trop. Afr. 3: 127-128, 1877.

Glabrous shrubs, rarely small trees, bark shreddy, branchlets sharply different from, and congested toward tips of branches, diverging at a very wide angle from the stem, in axils of leaves, or of much reduced leaves, becoming supra-axillary on slightly older wood, leaves elliptic, lance-elliptic, or oblong-elliptic, acute or acuminate with blunt tip, shortly petiolate, conspicuously downward-pointing, stipules triangular, slightly acuminate, caducous, carinate; flowers in very close sessile cymose axillary glomerules with stipular scales at base, glomerules composed of triads closely packed, of different ages, individual flowers subtended by calyx-like cupules of united bracteoles, appressed pilose within; ovaries very small, calyx a cup slightly lobed or toothed on margin, glabrous; corolla white, 5-6 mm long, salverform to funnellform or campanulate, 4-parted, lobes slightly imbricate, not or slightly contorted in bud, becoming recurved after opening, glabrous without, copiously white bearded in throat, glabrous in tube, anthers lanceolate, sessile in throat, ovary 2-locular, ovules 1 in each locule; style longer than corolla, puberulent except near base, stigma well-exserted, slightly lobed; fruit globose, 6-7 mm diameter, black when ripe (fleshy?), with 2 hemispheric stones each 1-seeded.

Specimens examined:

Aldabra.--

West Is. (Ile Picard): 50 m E of Station, Wood 1660 (US, E); path just north of Settlement, Fosberg 48725 (US), 48751 (US, K); back of settlement, Fosberg 49502 (US); grove behind Settlement, Renvoize 714 (US, K).

South Is.: 2nd pool on route west of Hodoul Point, Renvoize 935 (US, K); coast northwest of Pt. Hodoul, Fosberg 49051 (US); Point Hodoul, Renvoize 903 (US, K); Cinq Cases Camp, Fosberg 48916 (US); Cinq Cases inland, R. Hnatiuk 732055 (US); on plain

near Camp at Cinq Cases, Renvoize 818 (US, K); 2 km NW of Cinq Cases Camp, Fosberg & Grubb 48917 (US); appr. 3 km NW of Cinq Cases Camp, Fosberg, Grubb & Graham 49181 (US); near coast, south of Takamaka, Renvoize 1131 (US, K); Takamaka Grove, Fosberg 49297 (US); Takamaka, Stoddart 1036 (US); Takamaka well, Fosberg 49260, 49350, 49324 (all US); Dune Jean Louis, 300 m north of south coast, near path of lagoon, Frazier 55 (US); 350 m from south coast near trail to lagoon, Frazier 59 (US); Trou Nenez, Stoddart 987 (US); Dune D'Messe, Renvoize 1387 (US, K).

Cosmoledo Atoll. -- Menai Is.: North end, Fosberg & Grubb 49772 (US).

Astove Atoll: s.l. Veevers-Carter 37 (EA); Ridgway 37 (US); Grand Anse, Fosberg 49725 (US); South of Grand Anse, south part of west arm of atoll, Fosberg & McKenzie 49760 (US).

Psychotria L., Syst. Nat., ed. 10, 929, 1759.

Mostly shrubs, rarely trees or vines; leaves often obovate, sometimes with domatia in vein axils, often turning purplish on drying; stipules caducous or persistent, separate or united, often forming a calyptra enclosing the terminal bud, this usually with 2 or 4 appendages or "ears" at the tip, axils of stipules with a row of erect hair-like glands; inflorescences cymose or thyrsoïd, rarely reduced to a fascicle or a single flower, open to capitate, terminal or axillary; flowers bisexual or dioecious, 4-6-merous, usually small, calyx usually short, lobed, toothed or truncate; corolla with cylindric or slightly dilated tube, this from very short to rarely 1-2 cm long, usually with lobes from as long as to much longer than tube, spreading to reflexed; stamens inserted in throat just below sinuses, anthers attached basally or dorsally, style shorter than to exceeding tube, bifid, ovary 2-celled, ovules solitary, erect, basifixed; fruit a drupe with 2 pyrenes, these often dorsally 1-several times carinate, flat on ventral surface, seed filling cavity, endosperm entire, ventrally grooved or ruminant.

A very large tropical genus, sometimes variously subdivided, with species in all except the driest tropical wooded areas, difficult to classify. All Aldabra specimens seen seem to belong to one species.

Psychotria pervillei Baker, Fl. Maur. & Seych. 155, 1877.

--Hemsley, Kew Bull. 1919: 123, 1919.--Fosberg, Phil. Tr.

R.S., B, 260: 220-225, 1971. --Renvoize, Phil. Tr. R.S., B, 260: 231, 1971.

Psychotria spp. Baker, Kew Bull. 1894: 148, 1894.

--Schinz, Abh. Senckenb. Naturf. Gesellsch. 21: 291, 1897. --Voeltzkow, Abh. Senckenb. Naturf. Gesellsch.

26: 552, 1902. --Hemsley, Jour. Bot. 54 (Suppl.): 19, 20, 1916.--Kew Bull. 1919: 123, 1919.



Shrub to 3 m tall, glabrous; leaves dark green, elliptic to obovate, blades to 13 x 4.5 cm, usually much smaller, apex acuminate, base rather cuneately contracted into a petiole about 1, rarely 1.5 cm long, venation not prominent, main veins 9-11 on a side arching to near the margin where they anastomose into an undulate submarginal vein; cymes 1-3 at terminal node, sometimes becoming axillary by development of a bud at same node, pedunculate, slender, 3-5 cm long, a whorl of 3 or usually 4, rarely 5, branches at the first node, each branch up to 3 times dichotomous but with a sessile flower (or fruit) in each fork, branchlets puberulent, bractlets minute, ciliolate, ultimate triads with center flower sessile; calyx lobes 5, low-triangular; corolla tube 3-4 mm long, lobes oblong-ovate, about 1.5-2 mm long, apex slightly hooked, inner surface densely papillate-puberulent; anther tips exerted, style with bifid stigma exerted; fruits globose or depressed globose, slightly compressed, sub-geminate when dry, 3 x 3 mm, pyrenes dorsally ribbed, fleshy, bluish-gray or slightly purplish.

Found also in the Seychelles; very rare in Aldabra, greatly reduced or possibly eliminated in recent years by attacks of a coccid.

Specimens examined:

Aldabra,--s.l., Fryer 56 (K); Dupont 24 (K), 115 (K).

Ile Michel: Dupont 223 (K).

South Is.: 3.5 km W of Point Hodoul, Fosberg 49210 (US, K); 3 km NW of Cinq Cases camp, Fosberg, Grubb & Graham 49180 (US, K); Takamaka Grove, Fosberg 49273 (US, K), 49274 (US, K); Renvoize 1062 (K, US); Merton 7079 (US); Hnatiuk 731317, 731320, 73052, 732056 (all US); near Takamaka Well, Fosberg 49290 (US, K); behind first pool on route from Takamaka camp to coast, Renvoize 1056 (K, US).

Tarenna Gaertn., Fruct. 1: 139, 1788.

Shrubs, rarely trees; leaves simple, opposite, usually petiolate; stipules ovate, caducous; inflorescence terminal or becoming lateral, cymose; flowers usually 5-6-merous, in one small group 4-merous; calyx usually lobed; corolla hypocrateriform to somewhat funnel-form with spreading lobes imbricate in bud; stamens inserted in corolla throat below sinuses, filaments short, anthers linear; style elongating, stigma becoming strongly exerted, clavate to linear, ovary 2-loculed, placentae fleshy, bearing 1-several or more ovules, or these rarely colateral on small placentae; fruit fleshy, with thin or sclerified endocarps, seeds in fruit tending to be subglobose or rarely globose with a cavity on one side, or prismatic without a hilar cavity, or compressed and having a linear excavation on one edge.

A large African-Indo-Pacific genus with 3 very distinct Aldabra species. Earlier Aldabra records of Pavetta species

belong here.

Key to Aldabra species

1. Inflorescence and flowers, except for corolla limb, glabrous
  2. Cymes in pairs, soon becoming axillary--T. supra-axillaris
  2. Cymes 3, terminal-----T. verdcourtiana
1. Inflorescence and flowers notably pubescent, cymes remaining terminal, leaves usually at least slightly hairy beneath-----T. trichantha

Tarenna supra-axillaris (Hemsley) Bremekamp, in Fedde, Repert. Sp. Nov. 37: 206, 1934.

Pavetta supra-axillaris Hemsley, Jour. Bot. 54, suppl. 2: 19, 1916. --Kew Bull. 1919: 123, 1919.

Shrub to 3 m tall, glabrous except in inflorescence, branchlets slender, pale, terete, diverging widely from branches, usually without a shortened first internode; leaves elliptic or lance-elliptic to narrowly ovate or lance-ovate, often somewhat falcate, often somewhat folded, up to 10 x 3 cm but mostly much smaller, apex acute to usually acuminate, point usually blunt, base acute, somewhat attenuate, blade thinly coriaceous, veins 10-11 on a side, usually quite obscure, especially above, petiole slender, 4-8 mm long; stipules ovate, somewhat acuminate, rounded at tip, somewhat sheathing at base but soon separated by growth of lateral branchlets or inflorescences; cymes borne in pairs at terminal nodes, but soon becoming lateral by elongation of stem, 2-3 cm long, or shorter, peduncle slender, arcuate so the cyme is usually pendent, branching rather congested, 2 or 3 times trichotomous, a cupule of 4 more or less united scale-like bractlets subtending each ramification and each flower bud, their margins closely ciliate, distal parts and sometimes entire inflorescence liberally covered by a somewhat granular resinous secretion, possibly from axils of stipular bractlets; flowers pentamerous, calyx lobes sub--orbicular, densely white-ciliate, imbricate at base, puberulent within, in fruit tending to close inward, corolla with tube glabrous, slightly dilated upward, limb clavate in bud, strongly papillate externally, puberulent toward tips, lobes strongly but minutely ciliolate, pilose-bearded at base, narrowly oblong elliptic; anthers exserted, linear, 3.5 mm long; style at maturity long--exserted, stigma narrowly fusiform or paddle-shaped (perhaps by collapse), tardily becoming apically bifid, ovary bilocular, with one ovule in each cell; fruit globose, 2.5-3.0 mm in diameter, crowned with a conical ring of slightly indurate imbricate calyx lobes, fleshy, black, endocarp sclerified, globose, with one cell containing a single globose seed with a chestnut-brown minutely cellular reticulate surface and with a deep somewhat irregular cavity in one side.

## Specimens examined:

Aldabra.--s.l., Hnatiuk 732025 (US).

West Is.: vicinity of settlement, Stoddart 947 (US, K); Hnatiuk 731755 (US); Fosberg 48812 (US, K); Wood 1625 (US); 1/2 mi. [0.8 km] N of West Pt. village, Rhyne 867 (US).

Middle Is. (Malabar Island): Vesey-Fitzgerald 6020 (K); Gionnet Channel camp area, Fosberg 49587 (US, K); Anse Porceau, small cove 0.5 km E of Gionnet Channel, Fosberg 49565 (US, K), 49566 (US).

South Is.: Takamaka Well, Fosberg 49318 (US), 49323 (US, K); Anse Mais, Fosberg 49650 (US).

Ile Esprit: Fryer s.n. (K, holotype).

This species, found in Madagascar and coastal East Africa as well as Aldabra Atoll, is somewhat anomalous in Tarenna, as its cymes are borne 2 at a terminal node and soon become apparently truly axillary. The origin and development of these inflorescences need further investigation on the ground, where living plants can be studied over a period of time.

The species may be, as Hemsley suggested, close to T. nigrescens (Hook. f.) Hiern, but not to the Aldabra species that Hemsley referred to T. nigrescens.

Tarenna trichantha (Baker) Bremekamp, in Fedde, Repert. Sp. Nov. 37: 207, 1934.

Pavetta trichantha, Baker, Kew Bull. 1893: 148, 1893.--Schinz, Abh. Senckenb. Naturf. Gesellsch. 21: 91, 1897.--Voeltzkow, ibid. 26: 552, 1902.--Hemsley, Kew Bull. 1919: 123, 1919.--Fosberg, Phil. Tr. R.S., B, 260: 218, 225, 1971.--Renvoize, ibid., 231, 1971.

Rutidea coriacea sensu Hemsley, Kew Bull. 1919: 124, 1919, non Baker, Fl. Maur. & Seych. 149, 1877.

Shrub or small tree to 4 m tall, with hard wood, young growth usually more or less pubescent, branches pale brownish gray, internodes varied in length; leaves broadly obovate to oval or broadly elliptic, apex rounded or obtuse, base broadly cuneate to rounded, upper surface puberulent or scabrous to glabrous, lower surface shortly pilose to almost glabrous, main veins 5-8 on a side, more prominent beneath, petiole rather slender, mostly 0.5-1 cm long; stipules triangular-ovate, acuminate, carinate, almost glabrous to, more usually, densely strigose; cymes dense, corymbiform, borne singly or in 3's at terminal nodes of branchlets, conspicuously pubescent, sub-thyrsoid, 4-5 times ramified tending to be very rounded on top, or hemispherical, ultimate branching either in irregular triads or subscorpioid cymules, bracteoles at

ramifications strap-shaped with broad base or distally, merely strap-shaped or subulate, pubescence white, appressed; flowers whitish, fragrant, inferior ovary and calyx densely white tomentose, calyx teeth 5, triangular; corolla salverform, tube cylindric, about 5 mm long, appressed puberulent, somewhat dilated at top, limb in bud clavate, rounded at apex, densely appressed puberulent without, glabrous within, lobes 5, broadly oblong, about 1.5 x 1 mm, glabrous within, reflexed, rounded or obtuse at apex, throat not bearded; anthers ovate-oblong, about 2 mm long, erect, apex bluntly mucronulate, base sagittate; style exerted 3-5 mm, included portion thinly puberulent, exerted part glabrous, distal part fluted, somewhat fusiform; fruit globose, 3-5 mm diameter, sparsely appressed puberulent, crowned by minute persistent calyx-lobes surrounding a thickened ring-like disk, endocarp very thin paper-like, brittle, seeds 2, 3 or 4 even on same plant, somewhat compressed-globose, about 2 mm across, dark brown, glossy, minutely rugulose making a hammered appearance under strong magnification, a deep linear scar excavated on one edge.

Specimens examined:

Aldabra. --s.l., Abbott s.n. (K, holotype, US, isotype); Dupont 87 (K); Fryer 86 (K); Hnatiuk 732022 (US), 732026 (US).

West Is.: Vicinity of settlement, Hnatiuk 731508 (US); Renvoize 739 (US, K); N of Settlement, Renvoize 1204 (US, K); path to Bassin Cabri, Hnatiuk 732043 (US), 732063 (US); Bassin Cabri, Wood 1664 (US).

Ile Polymnie: Hnatiuk 731314 (US).

Middle Is. (Ile Malabar): Hnatiuk 732028 (US); 250 m W of Middle Camp, Wood 1636 (US); E end of island, Fosberg 49073 (US).

South Is.: Near coast 1/4 mi. [0.4 km] N of Point Hodoul, Renvoize 1006 (US, K); 3.5 km W of Pt. Hodoul, Fosberg 49209 (US), 49210 (US); Pt. Hodoul, Fosberg 49048 (US); Cinq Cases, Fosberg & Grubb 48885 (US); vicinity of Cinq Cases camp, Fosberg 48911 (US), 48921 (US), 49023 (US), 48924 (US); Cinq Cases dune, Renvoize 914 (US, K), 915 (US, K); SE coast, 0.6 km E of Au Bord de la Mer, Takamaka area, Renvoize 873 (US, K); Fosberg 49249 (US); Takamaka Well, Fosberg 49259 (US), 49346 (US), Takamaka Grove, Hnatiuk 731706 (US); near Takamaka Grove, Hnatiuk 732054 (US); S of Takamaka Grove, Fosberg 49383 (US); near Wilson's Well, Hnatiuk 731899 (US); vicinity of Dune Jean-Louis Renvoize 1308 (US, K); Fosberg 49387 (US), 49388 (US); Hnatiuk 731506 (US); Dune d'Messe, Renvoize 1394 (US, K); Trou Nenez, Stoddart 976 (US); N of Dune Blanc, Hnatiuk 731504 (US).

Ile Esprit (Euphrates I.): Fosberg 488770 (US); Hnatiuk s.n.s.d. (US).

Ile Michel: Fosberg 49352 (US), 49355 (US); Renvoize 1045 (US, K).

Assumption I. -- center of W coast, Frazier 608 (US); center of island, Frazier 747 (US); 200 m inland of South Settlement,

Frazier 716 (US); s.l., Dupont 116 (K).

Cosmoledo Atoll: s.l. Dupont 279 (K).

Astove Island: Ridgway 92 (US); Grand Anse, Fosberg 49720 (US); north of settlement, Renvoize 1204 (US, K).

This species, found in the Aldabra Group, the Comoros, and coastal East Africa, can be recognized by its densely congested whitish or gray pubescent cymes. In vegetative characters, especially leaf shape and hairiness, it is quite variable. A specimen from Assumption, Frazier 608, has the corollas and hypanthia almost glabrous.

Tarenna verdcourtiana Fosberg, n. sp.

Tarenna nigrescens sensu auct. Aldab., non (Hook. f.) Hiern  
in Oliver, Fl. Trop. Afr. 3: 92, 1877.

Frutex vel arbuscula glabra, foliis plerumque ellipticis, stipulis ovato-acuminatis, cymis terni terminalibus subthyrsoideis ramulis dichasioideis, floribus tetrameris, corollae fauce vix barbata, ovario 2-4 locularibus, placenta carnosa uni-ovulata, endocarpo tenuissimo, seminibus 1-4 hilo excavato.

Glabrous shrub to 4 m tall, usually much smaller, branchlets gray, slender, diverging at about 45°-50° from larger branches, branching may be slightly supra-axillary, basal internode may be much reduced, with only a pair of stipules at its summit; leaves elliptic to slightly obovate, to lance-elliptic or rarely very broadly elliptic, mostly 4-7 x 1.5-2.5 cm or smaller, rarely larger, apex acute to somewhat acuminate, base acute to obtuse, blade firm-chartaceous to subcoriaceous, venation pinnate but usually rather obscure, petiole 5-8 mm or shorter; stipules ovate, usually long-acuminate; cymes 3, terminal (or 1, trichotomous with peduncle suppressed), when well developed each branch thyrsoid with 2 internodes and 3 triads of prominently pedicellate flowers, branched portion often much reduced, and triads represented by a single pedicel with two scale-like bracts near base, whole inflorescence at most 2-4 cm long, in many specimens much smaller (possibly due to drought); pedicels sometimes elongate to as much as 1 or even 1.5 cm; calyx campanulate, 1.5 mm long, shallowly 4-lobed, lobes obtuse to rounded tending to be somewhat erose or ciliolate; corolla tube about 4-5 mm long, somewhat dilated upward, glabrous without, throat lightly bearded, limb bluntly fusiform in bud, lobes 4, spreading to somewhat reflexed, oblong, about 7 mm long, margins revolute, apex rounded; anthers broadly linear, about 6 mm long, exerted from sinuses, strongly curved after dehiscence; style somewhat longer than corolla tube after elongation, slightly pubescent, stigma linear, flattened or slightly fusiform, about 7 mm long, somewhat papillose-puberulent; fruit globose, 5-6 mm in diameter; seeds 1-4, arranged radially, with convex surface dull brown, gently rugose, a deep pit on inner

angle.

Specimens examined:

Aldabra.--

West Is.: back path, Renvoize 2736 (US, K); vicinity of settlement, Hnatiuk 731756 (US); Wood 1631 (US, holotype); Renvoize 746 (US, K); path to Bassin Cabri, Hnatiuk 731310 (US), 731496 (US); Anse Var, Hnatiuk 731306 (US).

Polymnie: Hnatiuk 731309 (US).

Middle Is.: Gionnet Channel Camp area, Fosberg 49585 (US, K), 49586 (US, K), 496682 (US); Renvoize 1167 (US, K).

South Is.: Bassin Frigate, in the groves, Merton 7091 (US); Anse Mais, Renvoize 2722 (US).

Assumption.--center of island, 0 m, Frazier 785 (US), 786 (US).

This species has been commonly referred to Tarenna nigrescens (Hook. f.) Hiern (Coptosperma nigrescens Hook. f.) but has tetramerous flowers and differs in various other respects, such as a 2-4 celled ovary. It has, even on the same plant, an inconstant number of ovary-cells and seeds. With some hesitation I place it in Tarenna in spite of its tetramerous flowers, single ovule per cell sunken in a fleshy placenta, and radially arranged seeds. Its very thin, almost unsclerified endocarp, and especially its frequently tri- or even quadriloculate ovaries are certainly out-of-place in Pavetta. I know too little of Myonima, but it seems to have 5 corolla lobes, polygamo-dioecious flowers and bony or cartilaginous pyrenes. This species merits much further study.

It is dedicated to Dr. Bernard Verdcourt, of Kew, able student of African Rubiaceae and other families.

Triainolepis Hook. f. in Benth. & Hook. f., Gen. Pl. 2: 126, 1873.

--Hiern, in Oliver, Fl. Trop. Afr. 3: 219, 1877.--Bremekamp, Proc. K. Nederl. Akad. Wetensch. C, 59: 1-21, 1956.

Shrubs or scrubby trees; leaves opposite, usually conspicuously nerved; stipules usually tricuspidate; cymes terminal, small; calyx campanulate, with 5-7 unequal teeth; corolla tomentose without, tube glabrous within, bearded in throat, lobes 5, spreading, glabrous within, valvate in bud; anthers oblong, dorsifixed on short filaments; ovary (4-) 5-10-loculate, with one or two erect ovules in a cell; fruit globose, fleshy, with 5-7 (-10) bony united pyrenes each with one seed, with fleshy endosperm.

Small principally Madagascar genus with two African species; one species in Aldabra, also in the Comoros and Madagascar.

Triainolepis africana subsp. hildebrandtii (Vatke) Verdc., Kew Bull. 30: 282, 1975.--Fl. E. Trop. Afr., Rub. (pt.1): 150, 1976.

Triainolepis fryeri (Hemsley) Bremekamp, Proc. K. Nederl. Akad. Wetensch. C, 59: 12, 1956.--Fosberg, Phil. Tr. R.S. B, 260: 218, 225, 1971.--Renvoize, *ibid.* p. 231.

Psathura fryeri Hems1., Jour. Bot. 54, suppl. 2: 20, 1916.

Triainolepis hildebrandtii Vatke, Oesterr. Bot. Zeitschr. 25: 230, 1875.--Hemsley, Kew Bull. 1919: 123, 1919.

Shrub 1-4 m tall, twigs glabrous or youngest growth lightly strigulose, light brown to greenish, orange or pinkish, internodes from 3 cm to usually much shorter; leaves lance-elliptic to lanceolate, up to 13 x 4 cm, usually much smaller, notably acuminate, base acute, somewhat decurrent on petiole, nerves distinct, about 10 on a side, small domatia in their axils, nerves pubescent beneath, petiole 5-10 mm long, slender; stipules low, strigulose, somewhat sheathing, each side with a low obtuse lobe with 3-5 linear processes on margin; cymes 3, rarely 1 or 5, at terminal node, sometimes one in each axil at the next node down from terminal one, sparsely to densely puberulent; slender, loosely branched 4-7 times, mostly 2.5-4(-5) cm long, central one tending to be smaller or strongly reduced, branching trichotomous to quite irregular, or becoming somewhat helicoid, central flower or branchlet tending to be reduced or abortive, a very small linear bractlet at each ramification; flowers white, hypanthium hemispheric, longitudinally rugose and granulate-puberulent, calyx broadly cylindrical or somewhat campanulate, rugose without, puberulent, sinuses each with a conspicuous gland and a dense tuft of hair, lobes 5-6, unequal, triangular to almost strap-shaped with broad base, apex blunt, hirsute, especially within and on margins; corolla densely tomentulose-pubescent without, less so on lobes, tube cylindrical, 7-8.5 mm long, upper 1-1.5 mm abruptly strongly dilated, limb truncate in bud, lobes 5, linear-oblong, spreading to recurved, with a strong hook-like appendage subapically within, throat and bases of lobes densely bearded; anthers 5, exserted in short-styled flowers subexserted in long-styled, lanceolate, erect; heterostylous, style glabrous, filiform, 4-5 mm long in short-styled, 10-11 mm in long-styled, 7-10-branched at apex ovary 7-10 celled; fruit a globose or depressed globose, white to pink drupe, sulcate without when dry, endocarps united into a sulcate bony pyrene 6 mm or less in diameter, single seeds developed in some locules, in others abortive.

Specimens examined:

Aldabra.--s.l., Abbott in 1892 (K); Dupont 31, 44, 91 (all K); Fryer 44 (Type K, 2 sheets); Thomasset in 1903 (K), 240 (K);

Hnatiuk 732058 (US).

West Is. (Ile Picard): Fox 284 (K); Settlement, Renvoize 725 (K, US), 743 (K, US) 839 (K, US); Fosberg 48833 (US); back of settlement, Fosberg 48695, 48700, 48808, 48810 (all US); Bassin Cabri, Hnatiuk in 1974 (US).

Middle Is.: Mixed scrub, W of East Channel, Renvoize (Grubb) 1343 (K, US).

South Is.: 3/4 mi. [1.2 km] W of Flamingo Pool, Renvoize 994 (K, US); 1.5 km N of Cinq Cases Camp, Fosberg 48993 (US); Takamaka Camp, Renvoize 872 (K, US); near Takamaka Well, Fosberg 49292 (US). Dune Jean Louis, Fosberg 49399 (US).

Ile Esprit (Euphrates I.): Fosberg 48753 (US), 48754 (US), 48768 (US); Wood 1654 (K, US), 1655 (K, US).

Ile Michel: Hnatiuk 731318 (US); Fosberg 49365 (US); Renvoize 1040 (K, US).

Assumption.--Coeur de Boeuf, Dupont 259 (K); Fryer 761 (US).  
Cosmoledo.--Thomasset 242 (K).

This species in Aldabra is variable, depending on the conditions, such as available moisture and quality of soil. In dry conditions its leaves point strongly downward. It is common in mixed scrub and on platin. It is also found in East Africa, Madagascar and the Comoros. Verdcourt, Fl. Trop. E. Africa, Rubiaceae (Part I) 150, 1976, reduces T. fryeri outright to T. africana ssp. hildebrandtii (Vatke) Verdc., which may be the best final disposition of it and is followed above.

Tricalysia A. Richard ex DC., Prodr. 4: 445, 1830 (Oct.).--A.

Richard, Mém. Fam. Rubiacées...: 224, 1829 [1830, Dec.] .

--Mém. Soc. Hist. Nat. Paris 5: 224, 1834.

Shrubs or small trees; leaves elliptic or lanceolate; stipules subulate; flowers in few-flowered small axillary bracteate cymes; flowers 4-8-merous; calyx toothed or rarely bilabiate; corolla with lobes imbricate or contorted in bud; anthers linear, exserted on short filaments from corolla throat; ovary 2-celled, ovules 2 or more in a cell, collateral or in 2 vertical rows on a fleshy placenta, style exserted, stigma 2-lobed; fruit fleshy, globose; seeds 1-9 (or 12?), more or less rounded or irregularly obtusely angular, deeply sunken in the remains of the fleshy placenta.

A small African-Indo-Pacific genus with one species in Aldabra, which also occurs in Africa.

Tricalysia sonderiana Hiern, in Oliver, Fl. Trop. Afr. 3: 119, 1877.

--Fosberg, Phil. Tr. R.S. B, 260: 218, 225, 1971.--Renvoize, ibid. 231.

Tricalysia cuneifolia Baker, Kew Bull. 1894: 148, 1894.--Schinz, Abh. Senckenb. Naturf. Gesellsch. 21: 91, 1897.--Voeltzkow, ibid, 26: 552, 1902.--Hemsley, Jour. Bot. 54: 18, 1916;



Kew Bull. 1919: 123, 1919.

Shrub or small tree 1-5 m tall, branchlets pale yellowish gray, tending to be elongate, rarely even somewhat scandent, youngest internodes glabrous or slightly puberulent; leaves ovate to elliptic or narrowly so, up to 10 x 4 cm, usually smaller, glabrous, apex acute to slightly acuminate, base acute to somewhat abruptly contracted, veins 6-9 on a side, distinct but not prominent beneath, petiole 1-3 mm; stipules ovate, sheathing, abruptly acuminate, acumen spine-like, tending to diverge somewhat from stem, subsistent; cymes very condensed, once or twice branched, or reduced to single triads, conspicuously scaly-bracteate in ramified part; pedicels varying greatly in length, usually with one to several scattered scale-like bractlets, flowers white, hypanthium glabrous, very slightly contracted at base of calyx, calyx very broadly campanulate to saucer-shaped, 2-2.5 mm wide, shallowly 5-lobed, lobes low-triangular; corolla about 10 mm long just before opening, tube and limb subequal, tube dilated upward, limb in bud conical, basal part of lobes strongly imbricate, upper part somewhat less so, lobes becoming reflexed, broadly oblong, somewhat exceeding tube, glabrous within and without except at base, bases of lobes and throat usually copiously and conspicuously bearded; anthers completely exerted and reflexed, 4 mm long, linear, the cells 3 mm, the apical 1 mm of the connective enlarged into an oblong fleshy appendage; style glabrous, well exerted beyond the beard, divided at apex into two strongly flattened lanceolate somewhat recurved branches, stigmatic and papillate on inner faces; ovary 2-(-3) locular, ovules up to 6 in a cell, borne on fleshy placentae; fruits globose, black, 6-7 mm diameter, endocarp crustaceous, seeds deeply sunken in fleshy placentae, 6-9 (-12?) in a fruit, sub-peltately attached, irregularly compressed subangular, attached on one angle, with an irregular cavity on one side near attachment, separated by the thin remains of the placenta, surface dark chestnut brown, cellular-alveolate.

Specimens examined.

Aldabra.--s.l. Abbott in 1894 (K, type, US, isotype); Dupont 3 (K), 132 (K); Dupont in 1906 (K); Fryer 91 (K); Thomasset in 1903 (K).

West Is.: Settlement, Renvoize 745 (US, K), 749 (US, K), 1177 (US, K); Fosberg 48696 (US); 48698 (US); 400 m SW of Bassin Cabri, Wood 1614 (US, K).

Polymnie: Hnatiuk 731315 (US), 731505 (US).

Middle Is.: Hnatiuk 791305 (US); Gionnet Channel Camp area, Fosberg 49581 (US); 49668 (US); Anse Porceau, 1/4 mi. [0.4 km] E of Passe Gionnet, Renvoize 1169 (US, K); E Ile Malabar, near Middle Camp, Hnatiuk 731900, 731901, 731902, 731903, 731904 (all US); E end of island, Fosberg 49066 (US); W of East Channel, Renvoize 1322 (US, K), 1442 (US, K).

South Is.: 3.5 km W of Pt. Hodoul, Fosberg 49204 (US); 3 km

NW of Cinq Cases Camp, Fosberg, Grubb & Graham 49179 (US); 1.5 km NW of Cinq Cases Camp, Fosberg & Grubb 49007 (US); W of Takamaka Pool, Renvoize 1114 (US, K); Takamaka Grove, Hnatiuk 731503 (US), 731895 (US), 731896 (US), 731897 (US); Takamaka (Wilson's) Well, Fosberg 49378(US); Hnatiuk 731898 (US); vicinity of Takamaka Camp, Renvoize 1022 (US, K), 1074 (US, K); Takamaka Platin, Stoddart 1037 (US, K).

Ile Esprit: Fosberg 48761 (US), 48769 (US), 48776 (US).

Ile Egret: Renvoize 1291 (US, K).

Assumption...Center of island, Frazier 778 (US).

One flowering specimen, Wood 1614, has the bases of the corolla lobes and throat only slightly bearded, but otherwise does not differ significantly.

This species is distributed fairly widely in South and East Africa, as well as on Aldabra and Assumption. It is found in mixed scrub and in small areas or clumps of scrub in platin.

The inclusion of its seeds embedded in the developed fleshy placentae suggests that the genus may belong in the Gardeniae rather than in the Ixoriae, where it seems to be placed in recent classifications of Rubiaceae.

Some doubt has been expressed as to whether T. cuneifolia Baker is properly referred to the mainland African species. The latter is enormously variable over its wide range in Africa. The Aldabra plant, which is much less variable, seems well within the range of variation of T. sonderiana.

CALLICARPA ERIOCLONA SCHAUER (SENSU STRICTO)

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We discuss the taxon Callicarpa erioclona Schauer, describe its remarkable pubescence, and restrict its circumscription to plants having such pubescence, excluding Micronesian plants referred to this species.

Callicarpa erioclona Schauer, in DC Prodr. 11: 643, 1847.

This name has been applied in recent years by some workers to plants from Micronesia and other parts of the western Pacific and Malesia, that have otherwise been called C. cana L. or C. candicans (Burm. f.) Hochr., and even to those called C. paucinervia Merr. However, the remarkable pubescence noted by Schauer (l.c.) as "pube ramulosa rufa lanatis subterque pube farinosa alba tomentosis" and "Tomentum singulare, duplex, superum floccoso lanatum, postea sensim abolescens rufum, subjectum farinaeum densum subpersistens candidum" does not occur on any Micronesian material seen by us, nor on the general run of C. candicans sensu lato throughout its range.

The indument referred to occurs on the young twigs, petioles, peduncles, principal cyme branches, and occasionally is slightly developed on the principal veins on the under-sides of the leaves. It consists of a dense white layer of closely matted stellate hairs, towering above which are tall erect strong hairs which are closely covered by whorls of stiff short secondary hairs. This tall pubescence is of a dull brownish or dirty-reddish color, is rather easily rubbed off, and gives the branchlets a shaggy sordid appearance.

It seems best to restrict the application of the name Callicarpa erioclona to plants with this sort of indument, and to choose as lectotype Cuming 911 of the two collections cited. The Lesson New Guinea collection also cited by Schauer does not seem to be present, at least in the C. erioclona cover, in the Geneva Herbarium. Neither collection is represented in the Prodr. Herbarium, and Schauer only mentions having seen them "in h. reg. berol. Kunth et Lucae." Probably they were destroyed in Berlin in World War II. We here designate as the actual lectotype sheet the Cuming 911 sheet received in Geneva in 1841. The locality given is simply "Philippines."

We have examined an ample series of mostly Philippine specimens similar to this in the US and Geneva herbaria.

The plant is a shrub or small tree, with long internodes and curving sordid-pubescent branchlets; large elliptic strongly acuminate shortly petiolate leaves, white and somewhat brownish re-

ticulate-veined beneath, glabrous or nearly so above, margins subentire in lower part, serrate, to dentate, often very sharply so, distally (completely subentire in Ramos 42770); cymes dense to somewhat open, reniform in outline, intricately branched, sordid-pubescent, flowers pink (Steiner 418) or almost white (Williams 2964); fruits globose, about 2 mm in diameter.

Plants of this type seem to be commonest in the Philippines, but we have seen one sheet from Sabah. There is a somewhat similar plant from Cochinchina (Gaudichaud 126) which has the pubescence sparser and shorter, and which has the secondary hairs on the erect hairs much longer, less numerous, and almost white. This plant also has somewhat more prominent dentation on leaf margins than is usual, and with the other non-Philippine specimens cited below, may ultimately turn out to belong to a different species.

Several varieties and forms have been recognized by Lam (1919) and Bakhuizen (1921) but in the Philippine material studied the variation scarcely seems to warrant segregation (but see remarks below on Javanese, Chinese, and Indochinese specimens).

Specimens examined:

Philippines: s.l. Cuming 911 (G, 3 sheets, lectotype and 2 isolectotypes)

Luzon: Macaharing, (Manila), Loher 4449 (US)

Bataan Prov.: Lamao R., Mt. Mariveles, Borden 1595 (US); Whitford 487 (US); Merrill 2536 (US); Elmer 6647 (G).

Balangar Prov.: s.l. Ramos 1901 (US, G).

Cayagan Prov.: Littoc, vic. Peñablanca, Adduru 150 (US)

Laguna Prov.: s.l. McGregor 22910 (US); San Antonio, Ramos 23798 (US); Los Baños, Mt. Maquiling (Makiling), Elmer 17598 (US, G); Whitford 19757 (US); Foxworthy in 1914 (US); Steiner 418 (US); Galutera 33358 (US).

Nueva Ecija Prov.: Mt. Umingan, Ramos & Edaña 26417 (US).

Nueva Vizcaya Prov.: s.l. Ramos 8176 (US) Bosoboso, Ramos 1039 (US).

Sorsogon Prov.: Irosin, Mt. Bulusan, Elmer 15124 (US), 15082 (US, G).

Bohol: s.l. Ramos 42770 (G, US)

(leaf pubescence thinner, margins subentire in both, cymes larger and looser than usual in Geneva sheet only.)

Leyte: s.l. Wenzel 1479 (G)

(leaves less dentate than usual, pubescence thinner and closer.)

Catanduanes I.: s.l., Ramos & Edaño 75120 (US).

Mindoro I.: vic. San José, Lambert & Brunson 69 (US); Baco, Merrill 1667 (US); Polo, Merrill 2245 (US).

Mindanao: Davao Prov., Mati, Ramos & Edaño 40314 (G); Todaya, Mt. Apo, Elmer 11190 (US,G); Santa Cruz, Williams 2964 (US).

Zamboanga Prov.: Zamboanga, Ahern's collector 540 (US); Tetuan, Quadras 335 (US)

Borneo: Sabah (British North Borneo): Banguey Island, Castro & Melegrito 1714 (G).

Nova Guinea: Lesson (not seen, cited by Schauer).

Cochinchine: Touraine, Gaudichaud 126 (G) (pubescence atypical).

China: Kwangsi Prov., Ta Tseh Tsuen, Yung Hsien, Steward & Cheo 876 (G). (Pas rather similar erect, more barbellate, hairs on stems, but large reticulate serrate leaves, greenish beneath).

Java: s.l. "Herb. Labill" (G); Perrottet in 1820 (G)

These two sheets resemble C. candicans but show on their stems a rather depressed pubescence of short erect hairs similar to those of Gaudichaud 126 (above) but so short as to be almost intermediate with stellate hairs.

We would not include these Java specimens, not Gaudichaud 126 nor Steward and Cheo 876 in C. erioclona but have at present no satisfactory disposition for them.

ADDITIONAL NOTES ON THE GENUS VERBENA. XXIX

Harold N. Moldenke

VERBENA xMOECHINA Moldenke

Mohlenbrock (1975) says that in Illinois this hybrid occurs in "Dry ground, particularly in pastures; Adams, Hardin, Peoria, and Winnebago cos."

VERBENA MONACENSIS Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. [577], 1977; Moldenke, Phytologia 36: 243. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [577], fig. 135 [as V. tenuisecta]. 1977

Pinkus reports of his two collections, cited below, that the plants are usually called V. elegans in the horticultural trade and that they are "practically hardy in Dallas, Texas, area, but in a cold winter young plants will die, old established ones in protected places near a house will overwinter successfully; the plant is good for hanging baskets."

Additional citations: CULTIVATED: Ohio: Pinkus 1 (Z). Tennessee: Pinkus 2 (Z).

VERBENA MONTEVIDENSIS Spreng.

Additional bibliography: Moldenke, Phytologia 36: 236 & 243--244. 1977.

The corollas are said to have been "blue" on Cabrera & al. 27646.

Material of this species has been misidentified and distributed in some herbaria as V. litoralis var. caracasana (H.B.K.) Briq.

Additional citations: ARGENTINA: Entre Ríos: Cabrera, Kiesling, & Tur 27646 (N). Misiones: Krapovickas, Cristóbal, Maruñak, Fire, & Tressens 15302 (Ld). Santa Fé: Alvarez 95a (N).

VERBENA NEOMEXICANA (A. Gray) Small

Additional bibliography: Moldenke, Phytologia 36: 244--245 & 287 (1977) and 41: 171. 1979.

The Powell & Powell 3000, distributed as V. neomexicana, actually is V. bracteata Lag. & Rodr., while York 49002 is V. canescens var. roemeriana (Scheele) Perry. Crockett 248 & 6447 are V. cloverae Moldenke, Burr 454 is V. halei Small, Higgins 10269 & Rowell 11147 are V. perennis Wooton, and Powell 2158 is V. plicata Greene.

VERBENA NEOMEXICANA var. HIRTELLA Perry

Additional bibliography: Moldenke, Phytologia 36: 244--246 & 287 (1977) and 41: 171. 1979.

Recent collectors have encountered this plant "in rocky alluvial

soils with Mimosa shrubs" and "on rocky hillsides with Gutierrezia, Rhus, Atriplex, Opuntia, Yucca, and Juniperus", flowering and fruiting in October. The corollas are said to have been "purple" on Edwards & Repass 4730.

The Gentry & Barclay 18439, distributed as V. neomexicana var. hirtella, actually is V. cloverae Moldenke.

Additional citations: NEW MEXICO: Socorro Co.: Edwards & Repass 4730 (N). MEXICO: Chihuahua: G. N. Jones 23227 (Ld); Wallace, LeDoux, & Dunn 197 (Ld).

#### VERBENA NEOMEXICANA var. XYLOPODA Perry

Additional bibliography: Moldenke, Phytologia 36: 244 & 246. 1977.

Recent collectors have encountered this plant in "Idria-Franseria association with volcanic rock, on sandy wash bottoms, and "infrequent on shrubby hillsides", at 2400--3600 feet altitude, flowering and fruiting in April and May. The corollas are said to have been "light-blue" on Holmgren & Holmgren 6810 and "pinkish-violet" on their no. 7122.

The Gentry & Barclay 18439, distributed in some herbaria as V. neomexicana var. xylopoda, actually is V. cloverae Moldenke.

Additional citations: ARIZONA: Pima Co.: Holmgren & Holmgren 6810 (N). Yavapai Co.: Holmgren & Holmgren 7122 (N). MEXICO: Baja California: Gentry & Cech 8998 (W--2810946).

#### VERBENA NIGRICANS Rojas

Additional bibliography: Moldenke, Phytologia 36: 246. 1977.

Rojas Acosta (1897) says for this taxon only "122 -- Verbena negra, verbena nigricans, (Roj.) Difiere muy poco de la anterior par el color negrazco, pero tiene las mismas aplicaciones i propiadas".

#### VERBENA NIVEA Moldenke

Additional bibliography: Moldenke, Phytologia 36: 246--247. 1977.

Additional citations: ARGENTINA: Jujuy: Fabris & Marchionni 1810 (Mu).

#### VERBENA OCCULTA Moldenke

Additional bibliography: Moldenke, Phytologia 36: 247. 1977.

Recent collectors describe this species as an ascending herb with "purple" corollas, known locally as "verbena", and found it growing at 2900 meters altitude, flowering in June.

Additional citations: PERU: Cajamarca: Sagástegui A., Cabanillas S., & Dios C. 8078 (N).

#### VERBENA OFFICINALIS L.

Additional & emended bibliography: R. Br., Prodr. Fl. Nov. Holl., imp. 1, 512 (1810) and imp. 2, 2, [Isis 1819:] 154. 1819; Haines,

Bot. Bihar & Orissa, ed. 1, 4: 707--708. 1922; Gathorny-Hardy, Wild Fls. Brit. 22. 1938; Perez-Arbelaez, Pl. Util. Colomb., ed. 1, 441 (1947) and ed. 2, 745. 1956; Haines, Bot. Bihar & Orissa, ed. 2, 2: 742. 1961; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 1, 717. 1969; J. R. Forster in Kalm, Travels N. Am., ed. 2, 67. 1972; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 2, 717. 1974; Shosteck, Flow. & Pl. 279. 1974; T. Johnson, Gerard Herbal, ed. 3, 717--719, fig. 1. 1975; Arutyunov, Izv. Akad. Nauk Turkm. SSR. Biol. Biol. Nauk 5: 69. 1976; Cleene & De Ley, Bot. Rev. 42: 452. 1976; Malag. Heras, Act. Phytotax. Barcin. 18: 108. 1976; Tasei, Apidologia 7: [277]--280, 282, 286, 291, 298, & 299, fig. 7e. 1976; Arutyunov, Biol. Abstr. 64: 5194. 1977; Clay & Hubbard, Haw. Gard. Trop. Shrubs 185 & 294. 1977; Hocking, Quart. Journ. Crude Drug Res. 15: [iv]. 1977; S. C. Hood, Quart. Journ. Crude Drug Res. 15: 212. 1977; Kajewska, Act. Biol. Cracow Ser. Bot. 20: 41--50. 1977; Lelong, Sida 7: 140. 1977; Lewis & Elvin-Lewis, Med. Bot. 122, 193, 370, 391, & 514. 1977; López-Palacios, Fl. Venez. Verb. 11, 559, & 654. 1977; Moldenke, Biol. Abstr. 64: 6575. 1977; Moldenke, Phytologia 36: 274--279, 297, & 452. 1977; Speta, Candollea 32: 145 & 155. 1977; Tasei, Biol. Abstr. 64: 6635. 1977; Kajewska, Biol. Abstr. 66: 935. 1978; Moldenke, Phytologia 41: 155 & 181. 1979.

Additional illustrations: T. Johnson, Gerard Herbal, ed. 3, 717, fig. 1. 1975; Tasei, Apidologia 7: 291, fig. 7e. 1976.

Speta (1977) records this species from Brač Island, Jugoslavia, and says that "In den Kernen der Korolle und deren perlschnurartigen Haaren sowie der Blätter konnte ich keine Kristalle finden". Cleene & De Ley (1976) report that it is susceptible to crown-gall, Agrobacterium tumefaciens. Lelong (1977) reports the plant as "Rare on roadsides" in Mobile County, Alabama. Tasei (1976) states that pollen is gathered from its flowers by the solitary bee, Osmia coerulescens.

Kajewska (1977) found that "In V. officinalis the course of meiosis is regular, giving rise to tetrads of macrospores. The embryo sac of the Polygonum type develops from the chalazal macrospore. The endosperm is cellular from the start. After 3 mitotic divisions with cytokinesis 3 tiers of endosperm cells are formed. The middle tier develops into the cellular proper endosperm, whereas the micropylar one transforms itself into a short-lived small few-celled micropylar haustorium. It degenerates still before the division of the zygote. The chalazal cell functions directly as a haustorium after one nuclear division without cytokinesis. Both nuclei increase their degree of ploidy in the way of endomitoses and attain 12n. The proper endosperm as well as the micropylar haustorium remain on the triploid level. The development of the zygote is delayed. It starts its mitotic divisions only in the stage of well developed proper endosperm and the chalazal haustorium. The micropylar haustorium and the viable synergid which becomes binucleate after an additional mitotic division take part in the nutrition of the zygote."



Hood (1977) reminds us that this species has been used widely in folk magic and in the past also as a styptic, vulnerary, and in the treatment of sores and tumors. Lewis & Elvin-Lewis (1977), speaking of the physical basis underlying some native uses of plants in medicine, say "A treatment having even weaker foundations, but important psychological implications, was used in the court of the Roman emperor Theodosius (fourth century AD): vervain (Verbena officinalis) root was cut in half, with one part hung around the patient's neck and the other hung to dry over a smouldering fire. As the vervain dried, the tumor supposedly shriveled. If the patient at any time appeared to be ungrateful for the cure, however, the physician would threaten to throw the root into water, assuring the patient that as the root absorbed moisture, the tumor would return."

It is interesting to note that Gathorny-Hardy (1938) places the genus Verbena in the Labiatae (Lamiaceae).

López-Palacios, in a personal communication to me, says "Aparece citada en el Fifth Summary...: 120 para el Valle del Cauca, pero seguramente debe tratarse de algún ejemplar cultivado".

Walker (1976) cites the following specimens of V. officinalis from the Ryukyu Island Archipelago: Ishigati: Fosberg 37244; Masamune & Mori s.n.; A. Smith 50, 211. Takemoti: Fosberg 37559. Miyako: Fosberg 38169, 38374, 38613. Kurema: Okuhara & Sunagawa 22. Irabu: Okuhara & Sunagawa 81. Okinawa: Field & Lowe 21t, 96e; Moran 5066; Phillips 105; SIRI 5720; E. H. Walker 7557, 8101. Yonaguni: Hatusima 24199. Island undetermined: Wright s.n. He lists the vernacular name, "kuma-tsu-zura" [=very old man, application uncertain].

The Cox, Dunn, & Harmon 391, distributed as V. officinalis, actually is V. abramsii Moldenke, while Bayliss BS.7937 is V. brasiliensis Vell., Cristóbal, Arbo, Maruffak, Maruffak, & Irogoyen 16634 is V. litoralis H.B.K., Contreras 6152 is V. longifolia Mart. & Gal., Contreras 5247 is V. longifolia f. albiflora Moldenke, and Pringle 8534 is V. menthaefolia Benth.

Additional citations: MOROCCO: Lewalle 8334 (Ld). INDOCHINA: Annam: Scholes s.n. [1 July 1943] (W--2630558). MOUNTED CLIPPINGS: E. H. Walker, Fl. Okin. & South. Ryuk. 883--884. 1976 (W).

#### VERBENA ORCUTTIANA Perry

Additional bibliography: Moldenke, Phytologia 36: 279--280. 1977.

Additional citations: MEXICO: Baja California: R. Moran 13604 (Ld).

#### VERBENA OVATA Cham.

Additional bibliography: Moldenke, Phytologia 36: 280. 1977.

Additional citations: ARGENTINA: Corrientes: Krapovickas, Cristóbal, Arbo, Maruffak, Maruffak, & Irogoyen 17069 (Ld).

**VERBENA PARODII** (Covas & Schnack) Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 280. 1977.

Richardson reports seeing this plant "intermittently" in Mendoza, Argentina; the corollas on his no. 2015 are said to have been "white" when fresh.

Additional citations: ARGENTINA: Mendoza: Richardson 2015 (Ld, N).

**VERBENA PARVULA** Hayek

Additional bibliography: López-Palacios, *Fl. Venez. Verb.* 560, 571--573, 653, & 654, fig. 134. 1977; Moldenke, *Biol. Abstr.* 64: 4787. 1977; Moldenke, *Phytologia* 36: 280--281 (1977) and 41: 180. 1979.

Illustrations: López-Palacios, *Fl. Venez. Verb.* [572], fig. 134. 1977.

Taylor encountered this species in low forests and wet upland pastures, at 1600 meters altitude. López-Palacios (1977) cites the following collections from Venezuela: Mérida: López-Palacios 2525; Ruiz-Terán, López-Figueiras, & López-Palacios 8231. Trujillo: Ruiz-Terán & López-Palacios 2327. He records "verbena" as a vernacular name applied to the plant.

Additional citations: COSTA RICA: Heredia: J. Taylor 17625 (Ld, W--2770932).

**VERBENA PARVULA** var. **GIGAS** Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 281. 1977.

The corollas are said to have been "blue" on Sagastegui, Fukushima, & Vásquez 6463 and these collectors found the plant in anthesis in April.

Additional citations: PERU: Cajamarca: Segastegui, Fukushima, & Vásquez 6463 (W--2701938).

**VERBENA PERENNIS** Wooton

Additional bibliography: Moldenke, *Phytologia* 36: 281--282. 1977.

Recent collectors have found this plant growing in gravelly limestone soil in Yucca-Opuntia-Prosopis grassland communities, as well as in limestone canyons and bluffs, flowering and fruiting in May. The corollas are said to have been "purple" on Powell 3287.

Additional citations: TEXAS: Brewster Co.: A. M. Powell 3287 (Au). Culberson Co.: Marcks & Marcks 1310 (Au); Sikes & Smith 513 (Ld). Pecos Co.: R. McVaugh 7935 (Au--122398); Rowell 11147 (Ld). NEW MEXICO: Chaves Co.: Higgins 10269 (N).

**VERBENA xPERRIANA** Moldenke

Additional bibliography: Mohlenbrock, *Guide Vasc. Fl. Ill.* 366. 1975; Moldenke, *Phytologia* 36: 282. 1977; Mohlenbrock & Ladd, *Distrib. Ill. Vasc. Fl.* [247] & 276. 1978.

Mohlenbrock (1975) says that in Illinois this hybrid occurs in "Dry soil" in Adams, Cass, Monroe, Wabash, and Woodford counties.

**VERBENA PERUVIANA** (L.) Britton

Additional synonymy: Verbena chamaedry-fovia Palmer & Fowler, Fieldb. Nat. Hist., ed. 2, 286, sphalm. 1975.

Additional bibliography: Darwin, Journ. Res. Voy. Beagle, ed. 2, 40. 1860; Stafford, Ann. Rep. Smithson. Inst. 1916: 414. 1917; Haines, Bot. Bihar & Orissa, ed. 1, 4: 707 (1922) and ed. 2, 2: 742. 1961; Gillanders, Paterson, & Rotherham, Know Your Rock Gard. Pl. 45, 63, & 101. 1973; Mohlenbrock, Guide Vasc. Fl. Ill. 365 & 366. 1975; Palmer & Fowler, Fieldb. Nat. Hist., ed. 2, 286. 1975; Moldenke, Biol. Abstr. 64: 6575. 1977; Moldenke, Phytologia 36: 283—285 & 299. 1977; Speta, Candollea 32: 146 & 155. 1977; Mohlenbrock & Ladd, Distrib. Ill. Vasc. Pl. [247] & 276. 1978; Moldenke, Phytologia 41: 167. 1979.

Mohlenbrock (1975) says that in Illinois this species is "frequently cultivated but rarely escaped; Kane and Kankakee cos."

Additional vernacular names recorded for this species are "scarlet-flower'd vervain", "verbena de jardin", and "verbena extranjera". Speta reports (1977) that "Die Kerne in Zellen der Korolle (Epidermis und Haare) enthalten Stapelquadratischer Plättchen" as in V. canadensis (L.) Britton.

Darwin (1860) observed fields of this plant at Maldonado on the banks of the Río La Plata in the vicinity of Montevideo, Uruguay (July 26) and enthuses: "What would a florist say to whole tracts so thickly covered by the Verbena melindres, as, even at a distance, to appear of the most gaudy scarlet?" One can well imagine his amazement at such a sight of this truly spectacular plant! Fortunately he was not colorblind to red!

Meyer & Vaca report the species "abundant" in Chaco and found it in anthesis in November, the corolla-color being "red".

Additional citations: ARGENTINA: Catamarca: Dillon & Rodriguez 531 (Ld). Chaco: Meyer & Vaca 23286 (N).

**VERBENA PHLOGIFLORA** Cham.

Additional bibliography: Loud., Hort. Brit., ed. 2, 553. 1832; Moldenke, Biol. Abstr. 64: 6575. 1977; Moldenke, Phytologia 36: 283—285 (1977) and 41: 182. 1979.

Loudon (1832) calls this species "Tweedie's vervain" and asserts that it was introduced into cultivation in England from South America in 1836. The corollas on Gibbs & al. 3416 are said to have been "lilac" when fresh.

Additional citations: BRAZIL: São Paulo: Gibbs, Leitão Filho, Kinoshita, & Andrade 3416 (N, N). PARAGUAY: V. Maruffak 134 (Ld).

**VERBENA PINETORUM** Moldenke

Additional bibliography: Moldenke, Phytologia 36: 265 (1977) and 41: 171. 1979.

Recent collectors have come upon this species in pinyon pine-oak forests, at 7900 feet altitude, flowering in August. It has been misidentified and distributed in some herbaria as V. halei Small.

Additional citations: MEXICO: Chihuahua: Dunn, Torke, Bennett, & Wieder 22610 (Au, N).

#### VERBENA PLATENSIS Spreng.

Additional synonymy: ?Verbena albicans Rojas, Cat. Hist. Nat. Corrient. 76, 173, & 206. 1897. ?Lantana albicans Rojas, Cat. Hist. Nat. Corrient. 205. 1897. ?Verbena albiflora Rojas, Cat. Hist. Nat. Corrient. 206, num. mud. 1897.

Additional bibliography: Rojas Acosta, Cat. Hist. Nat. Corrient. 76--77, 173, 205, & 206. 1897; Krapovickas, Bol. Soc. Argent. Bot. 11: Supl. 261 & 269. 1970; Heslop-Harrison, Ind. Kew. Suppl. 15: 142. 1974; Moldenke, Phytologia 30: 132, 150, & 164--165 (1975), 31: 388, 392, & 412 (1975), 34: 270 (1976), and 36: 123 & 286. 1977; López-Palacios, Fl. Venez. Verb. 560 ' 654. 1977.

Rojas Acosta (1897) says of his V. albicans: "140 -- Verbena blanca, verbena albicans (Roj.) Corrientes i otras provincias. Especie parecida a su congénere la verbena negra; amia, ramosa, ascendente, de unos 30 centímetros. Tallo cuadrangular, nodoso, flores de color albado en espigas cilíndricas i alargadas, frutos una cuatro ...." Unfortunately, my photographic reproduction of the pages involved are very indistinct and in places virtually undecipherable, but there is some additional description on p. 173. It seems most probable that "Lantana albicans" is a transcription error for Verbena albicans, since the vernacular, "Verbena blanca", is given for both. It seems probable also that Verbena albiflora may likewise belong here. Final disposition of these names depends on an examination of the types, if they can ever be located.

#### VERBENA PLICATA Greene

Additional bibliography: McGregor & al., Fl. Great Plains 569. 1977; Moldenke, Phytologia 36: 286--287 (1977) and 41: 163. 1979.

McGregor (1977) records this species from Cimarron, Harmon, and Jackson counties, Oklahoma, as well as from Bailey, Childress, Cottle, Hall, and Motley counties, Texas.

The corollas are said to have been "light-blue" on Hutchins 351 & 361, "purple" on Smith & al. 9, "red-purple" on Holmgren & Holmgren 6933, and "light-purple" on Smith & al. 32. Recent collectors describe this plant as from 1--3 feet tall, perennial, "common" or "locally common to frequent along roadsides" or in pastures, at 3300 feet altitude, sometimes in association with Larrea tridentata and Prosopis glandulosa, flowering and fruiting in April.

The Pichon 177, distributed as V. plicata, actually is V. canescens H.B.K., while Crockett 6466 is V. canescens var. roemeriana (Scheele) Perry.

Additional citations: TEXAS: Garza Co.: Hutchins 351 (Ld), 361

(Ld). Hidalgo Co.: Crockett 296a (Ld); Lundell & Lundell 10038 (Ld), 10069 (Ld); R. Runyon 4875 (Au--266159). Kleberg Co.: R. Runyon 4283 (Au--290498). Midland Co.: Lundell & Lundell 10260 (Ld). Pecos Co.: Lundell & Lundell 10204 (Ld). Presidio Co.: York 48164 (Au--122448). Starr Co.: Lundell & Lundell 9788 (Ld). Taylor Co.: T. A. Williams s.n. [May 15, 1900] (Ld). Upton Co.: Lundell & Lundell 10223 (Ld). Uvalde Co.: Smith, Butterwick, Cuba, Turner, & Turner 9 (Ld). Ward Co.: Lundell & Lundell 11381 (Ld); Powell 2158 (Au--296045). Webb Co.: Smith, Butterwick, Cuba, Turner, & Turner 32 (Ld). Zapata Co.: Lundell & Lundell 10109 (Ld).  
NEW MEXICO: Eddy Co.: Holmgren & Holmgren 6933 (N).

**VERBENA PULCHELLA** var. **CLAVELLATA** (Troncoso) Shimmers

Additional bibliography: Flook, *Sida* 5: 169. 1973; Moldenke, *Phytologia* 24: 49. 1972.

**VERBENA PUMILA** Rydb.

Additional bibliography: McGregor & al., *Fl. Great Plains* 281, map 1123. 1977; Moldenke, *Phytologia* 36: 288 (1977) and 41: 158. 1979.

The Warnock 4600, distributed as V. pumila, actually is V. bracteata Lag. & Rodr.

Additional citations: TEXAS: Bexar Co.: J. Jermy 65 (Ld). Hardeman Co.: Ball 1114 (Ld).

**VERBENA QUADRANGULATA** Heller

Additional bibliography: Moldenke, *Phytologia* 36: 288—289. 1977.

Recent collectors refer to this plant as decumbent and found it in flower and fruit in April. The corollas are said to have been "light-purple" on Smith & al. 29.

Additional citations: TEXAS: Webb Co.: Smith, Butterwick, Cuba, Turner, & Turner 29 (Ld).

**VERBENA RECTA** H.B.K.

Additional bibliography: Moldenke, *Phytologia* 36: 289—290. 1977.

Additional citations: MEXICO: México: J. Rzedowski 18409 (Ld).

**VERBENA RIGIDA** Spreng.

Additional bibliography: J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Perad. Man. Bot. 2:] 142. 1911; Cleene & De Ley, Bot. Rev. 42: 452. 1976; Lelong, Sida 7: 140. 1977; López-Palacios, Fl. Venez. Verb. 560, 573—575, & 654. 1977; Moldenke, Biol. Abstr. 64: 6575. 1977; Moldenke, *Phytologia* 36: 283, 290—294, & 307. 1977; W. J. Park, *Park Seeds Fls. & Veg.* 1978: 90. 1977; K. E.

Rogers, *Sida* 7: 78. 1977; Anon., *Exxon USA* 17 (2): 5. 1978; W. J. Park, *Park Seed Fls. Veg.* 1979: 90. 1978; Moldenke, *Phytologia* 41: 165. 1979.

Additional illustrations: Anon, *Exxon USA* 17 (2): 5 [in color]. 1978.

Loudon (1832) reports that this species was introduced into English gardens from Buenos Aires in 1830. Rogers (1977) reports it "Local in dry open places. Introduced" in Forrest and Perry Counties, Mississippi, and Lelong (1977) reports it "Infrequent on roadsides, waste places" in Mobile County, Alabama. Cleene & De Ley (1976) report that it is susceptible to crown-gall disease caused by *Agrobacterium tumefaciens*. The corollas on Vasconcelos Neto 3241 are said to have been "roxas" when fresh, while on Correll & Correll 38740 and Proctor 23557 they were "bright-purple", on Correll & Correll 38438 "dark bright-purple", and on Hatschbach 40391 "violet".

Walker (1976) records the vernacular name, "bijo-zakura" [meaning a beautiful woman, applied also to the flowering-cherries]. He cites Amano 5828 and SIRI 5976 from Okinawa. López-Palacios (1977) cites only López-Palacios 2891 from Federal District, Venezuela, but comments "Citada como cultivada por Knuth, *Initia Fl. Venez.* 599. 1928, y por Badillo in Pittier et al. *Cat. Fl. Venez.* 2: 331. 1947." He lists "Virginia" as a vernacular name.

Amazingly, material of *V. rigida* has been misidentified and distributed in some herbaria as Glandularia dissecta (Willd.) Schnack & Covas.

Additional citations: SOUTH CAROLINA: Richland Co.: Logue 976 (Ld). LOUISIANA: East Baton Rouge Par.: Blackwood 60 (Ld); Crockett 8661 (Ld). TEXAS: Fayette Co.: Crockett 8633 (Ld). Fort Bend Co.: Correll & Correll 38439 (Au—284197, Ld). Hardin Co.: Crockett 354 (Ld). Harris Co.: Taylor & Taylor 9919 (Ac, Ld). Jefferson Co.: Crockett 6924 (Ld), 8306 (Ld). Shelby Co.: Correll & Correll 38740 (Ld); Lundell & Lundell 10502 (Ld). JAMAICA: Crosby, Hespenheide, & Anderson 427 (Ld); Proctor 23557 (Ld). BRAZIL: Paraná: Hatschbach 40391 (N). São Paulo: Vasconcelos Neto 3241 (N). MOUNTED CLIPPINGS: E. H. Walker, *Fl. Okin. & South. Ryuk.* 884. 1976 (W).

**VERBENA RIGIDA** f. **LILACINA** (Benary & Bodger) Moldenke, *Phytologia* 37: 27. 1977.

Additional bibliography: Moldenke, *Phytologia* 36: 293 (1977) and 37: 275. 1977; W. J. Park, *Park Seeds Fls. & Veg.* 1978: 90. 1977.

Park (1977) offers this color form, described as having "lavender flowers", to the horticultural trade under the name, "hardy *Verbena venosa*".

**VERBENA RUFIFLORA** Rojas

Additional bibliography: Moldenke, *Phytologia* 36: 295. 1977. Rojas Acosta (1897) calls this plant "margarita roja".

[to be continued]

## BOOK REVIEWS

Alma L. Moldenke

"PLANT TISSUE AND CELL CULTURE" edited by H. E. Street, viii & 503 pp., 156 b/w fig. & 15 tab. University of California Press, Berkeley, Los Angeles & New York, N. Y. 10017. 1974. \$32.50.

This is Volume 11 of the Botanical Monographs consisting of 15 carefully presented papers of which 7 are authored or coauthored by the editor, with most coming from authors and laboratories in the United Kingdom. Aware of the rapid developments in the plant tissue and cell culture techniques and their widespread application, these authors describe "clearly current techniques and assess their potential value and current limitations. This should enable research workers to assess how far they could be of value in their own field of study and to make an informed judgement of the technical problems they are likely to encounter in their use". Callus, cell suspension, tumors, pollen and anther cultures, plant parasites in tissue culture, organogenesis and embryogenesis and isolation of protoplasts — are all carefully reported. There are as yet unanswered questions as whether valuable genotypes might be preserved by such techniques with mineral oil covering and/or deep freezing preservation. Also there is the possibility of developing tissue cultures in chemostats for controlled production of alkaloids, steroids, vitamins, antibodies, enzymes, etc. on a commercial scale. "The basic texture of research consists of dreams into which the threads of reasoning, measurement and calculation are woven." This book provides an excellent advanced treatment of the subject.

"MANGROVE VEGETATION" by V. J. Chapman, viii & 447 pp., 298 b/w fig. & 36 full photo plates. J. Cramer, Verlag, D-3301 Lehre, Germany. 1976. DM.120-150.

This is the most comprehensive and outstanding study of mangal vegetation available to date. Its author has studied the Old and New World mangroves for several decades and has contributed considerably to and studied the relevant literature as indicated throughout the text and in the huge bibliography. This volume is the second of three with the first one entitled "Salt Marshes and Salt Deserts of the World".

North, Central and South American, east and west coast African, Indian, Indo-Malesian, Australian and New Zealand, Oceanian and Philippine mangroves are identified and described. Their morphology, embryology, physiology, ecology and economic uses are carefully discussed and experimental work reported and evaluated. The

author still uses the obsolete -on spelling for Clerodendrum. The only criticism is the very small size of some very useful figures, so small that the terms are difficult to read even with a handlens, as in figures 79 and 83.

"McGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS" 2nd Edition, edited by Daniel N. Lapedes et al., xv & 1829 pp., 3,000+ b/w figs. & photos. McGraw-Hill Book Company, New York, N. Y. 10020. 1978. \$39.50.

Just four years ago the first fine edition of this work appeared. It must have sold well and fast. With the rapid advances in all pure and applied science fields, it would be foolish to reprint more copies: therefore this new edition with 8,000 new definitions bringing the total to 108,000 terms defined, described and often illustrated. The Appendix has also been enlarged with an explanatory treatment of the SI or International System of Units and the computations for equivalents. The range covers all the sciences and technologies effectively with clear-cut and succinct language. This dictionary is needed on public and school library shelves, in schools, universities and technical laboratories.

I hope that the next edition will return to the honeybee its other two wings since it is not a dipterous insect!

"EATING WILD PLANTS" by Kim Williams, x & 180 pp. & 117 b/w line drawings. Mountain Press Publishing Co., Missoula, Mont. 39801. 1977. \$5.95 paperbound.

This is an interesting little book to slip into a pocket before going off into the field or the park but only after knowing the ten basic rules for eating wild plants safely. Greens for salads and potherbs, roots for main dishes or beverages, fruits, mushrooms, herb teas, and poisonous plants are described with suggested preparations and folk lore notes. The author's illustrations are usually recognizable -- certainly not those of Daucus carota and Delphinium bicolor -- but are too sketchily executed for the general reader who is not already well acquainted with the plant in question.



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# PHYTOLOGIA

*Designed to expedite botanical publication*

Vol. 41

February 1979

No. 6

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Published by Harold N. Moldenke and Alma L. Moldenke

303 Parkside Road  
Plainfield, New Jersey 07060  
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*Sphagnum subobesum* Warnst. in  
North America

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Department of Biological Sciences  
SUNY at Binghamton  
Binghamton, N.Y.

The presence of *Sphagnum subobesum* Warnst. in British Columbia has been briefly noted previously (Schofield, 1969; Andrus & Vitt, 1977) but the unusualness of the record merits more substantial discussion. Previously the species was known only from Japan (Suzuki, 1958) where it occurs quite widely in northern Honshu and less abundantly on Hokkaido. A strong correlation exists between the British Columbian and Japanese moss floras with approximately half the British Columbia species also occurring in Japan (Schofield, 1965). The communality is much stronger in *Sphagnum* where, out of an estimated 36 British Columbian species and 43 Japanese species, 32 occur in common. The estimates are based on Schofield (1968) and Suzuki (1972), supplemented by personal investigations. *Sphagnum subobesum* is one of numerous bryophytes with a North Pacific distribution (Schofield, 1969). Its center of distribution is clearly in Japan with the North American records probably remnants of formerly more widely dispersed and abundant populations, a pattern shared with several other species, e.g., *Pleuroziopsis ruthenica* and *Hypopterygium fauriei* (Schofield, 1965).

The Queen Charlotte Islands, where the two known *S. subobesum* stations are found, are a logical place for such a relict disjunct to occur. Species with North Pacific distributions have a strong affinity for moist climates and are seldom seen very far inland. In this respect, the Queen Charlotte Islands are ideal, having a climate of exceptional moistness and mildness for their latitude. At Sandspit, for example, a few miles from the Moresby Lake *S. subobesum* site, average monthly means range from 36°F in January to 58°F in August with 20°F the average low for the year and 72°F the average high. Due to the strong orographic effects induced by the extremely mountainous terrain, the precipitation varies dramatically, ranging from 40-50 inches/year for eastern coastal settlements in the rain shadow to 200 or more inches/year on the western slopes. A pronounced summer dry season occurs throughout the islands in July and August. At lower elevations, 90% or more of the yearly total falls as snow while at upper elevations an unknown but high percentage falls as snow as evidenced by permanent ice fields (Calder & Taylor, 1968).

Probably because of the dry season, many of the more unusual species that occur here, especially disjuncts, are found in protected, moist microsites where moisture is abundant year round. Both known *S. subobesum* sites are protected steep rock faces that were wet when collections were made during the dry season. At the Moresby Lake site, *S. subobesum* grew in some abundance with *Sphagnum compactum* DC., *S. tenellum* (Brid.) Brid., *S. subsecundum* Nees., *S. papillosum* Lindb., *Campylopus atrovirens* DeNot., *Hypnum dieckii* Ren. & Card. and a profusion of leafy liverworts of which *Herberta adunca* (Dicks.) Gray, *Pleurozia purpurea* (Lightf.) Lind., *Scapania undulata* (L.) Dumort, *Calypogeia muelleriana* (Schiffn.) K. Müll, *Anthelia julacea* (L.) Dumort, and a *Bazzania* species apparently unreported for North America (N.G. Miller, in lit.) were especially prominent. It seems quite likely that further collecting will discover more *S. subobesum* in similar sheltered microsites within the maritime climatic belt along the British Columbian and Alaskan coasts and perhaps even through the Aleutian Islands. Such a pattern could be expected in view of Schofield's (1969) suggestion that many North Pacific species expanded their ranges not by the Bering land bridge but rather via the Aleutians.

#### DESCRIPTION

*Sphagnum subobesum* Warnst. 1900, Section *Subsecunda*

Plants  $\pm$  moderate-sized, with an aspect intermediate between that of *S. subsecundum* and *S. tenellum*, much like smaller forms of *S. lescurei*. Stem green on new growth to dark brown on old growth; cortex one layer of enlarged thin-walled cells with 1-2 large, round, wall-thinnings per cell. Stem leaves ranging from 0.9 mm long in anisophyllous forms to 1.4 mm long in isophyllous forms, often at right angles to stems, lingulate in anisophyllous forms to ovate in isophyllous forms, concave; apex rounded and erose to weakly toothed; border narrow; hyaline cells undivided, on anisophyllous forms with scattered pores in the cell angles in the apical 1/3 of the leaf on both convex and concave surfaces, on isophyllous forms with pores on the convex surface in continuous rows along the commissures at the apex but toward the base becoming less frequent and restricted to cell apices and angles, efibrillose throughout in anisophyllous forms and fibrillose throughout in isophyllous forms. Branch fascicles with two spreading branches and one hanging branch. Branch leaves from middle of spreading branches quite variable in size (0.9 to 1.7 mm long), short ovate to ovate, straight or very slightly falcate-secund, concave; the convex surface with round to elliptic pores (4-7  $\mu$ ) in  $\pm$  continuous rows along the commissures, these rows becoming progressively less

continuous toward the base until restricted to cell angles and apices; concave surface aporose; chlorophyll cells truncate-elliptic and exposed evenly on both surfaces.

SPECIMEN CITATIONS:

1. Pocket Inlet, SE end, glacially scoured, largely barren slope, W Moresby Island, Queen Charlotte Islands, 52°35'N, 131°50'W. July 12, 1966, Schofield 31491 (DUKE)
2. Moresby Lake, Moresby Island, Queen Charlotte Islands. 52°56'N, 132°06'W. On wet slope; assoc. with *S. compactum*, *S. tenellum* and *S. subsecundum*, 28/VI/1975. Andrus & Vitt 3374 (NY, US, CN, DUKE, FH, MICH)
3. Moresby Lake, Moresby Island, Queen Charlotte Islands, E. Corner of Moresby Lake. 52°56'N, 132°06'W, 450 ft. elev., on steep, wet, NW facing slope, mixed with *Sphagnum compactum* and *Herberta adunca*. 30/VI/1975. Sphagnotheca Boreali-americana No. 82 (distribution as noted in Andrus & Vitt, 1975)

SIMILAR SPECIES

The continuous rows of pores along the branch leaf hyaline cell commissures and the truncate-elliptic chlorophyll cell cross-section easily place *S. subobesum* in the *Subsecunda*. Four other *Subsecunda* occur in western North America. Of these, *S. orientale* L. Sav. and *S. contortum* K.F. Schultz are separated by the very small size of their branch leaf pores, less than 2  $\mu$  in diameter. *Sphagnum platyphyllum* (Braithw.) Warnst. also often has pores this small but some forms do not. Large-pored forms, particularly isophyllous ones, are very similar to *S. subobesum* in many details but will differ clearly in the branch leaf pore pattern. In *S. subobesum*, the pores grade from continuous rows near the leaf apex to scattered occurrences only in the cell apices and corners at the leaf base. *Sphagnum platyphyllum* may not always exhibit continuous rows of pores but, whatever the pore character, it will remain constant from leaf apex to base. The actual taxonomic problems are minimal, however, since *S. platyphyllum* has a continental distribution and *S. subobesum* has an oceanic distribution. Distributional details for *S. platyphyllum* are unclear but it seems possible it does not overlap *S. subobesum* in range.

*Sphagnum subsecundum* Nees. *sensu stricto*, though, has substantial phytogeographic and morphological similarities with *S. subobesum*, especially in Japan (Suzuki, 1972). *Sphagnum subsecundum* occurs widely on the Queen Charlotte

Islands and in one case is quite abundant on the same site as *S. subobesum*. The two species differ in several ways, however, as Table 1 indicates.

*Sphagnum subsecundum*

*Sphagnum subobesum*

Stem leaves < 1.0 mm long usually  $\leq 0.8$ ; usually anisophyllous, sometimes hemiisophyllous; appressed to stem.

Stem leaves  $\geq 1.0$  mm long (rarely 0.9 mm); usually hemiisophyllous to isophyllous; often at right angles to stem.

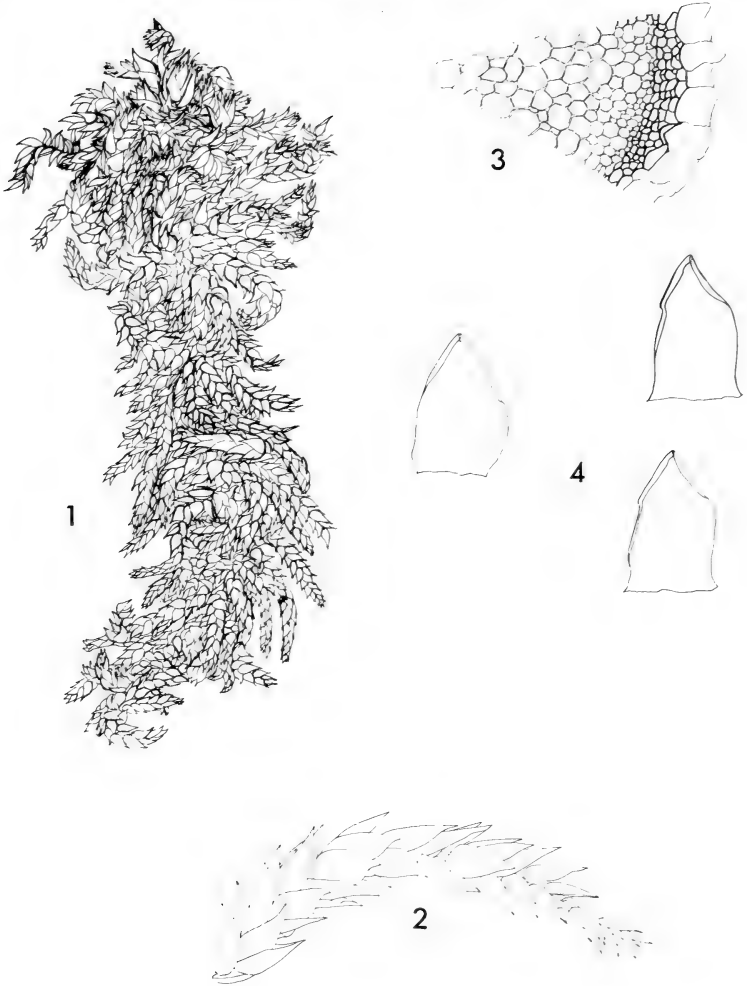
Fascicles of two spreading and two hanging branches.

Fascicles of two spreading and one hanging branch.

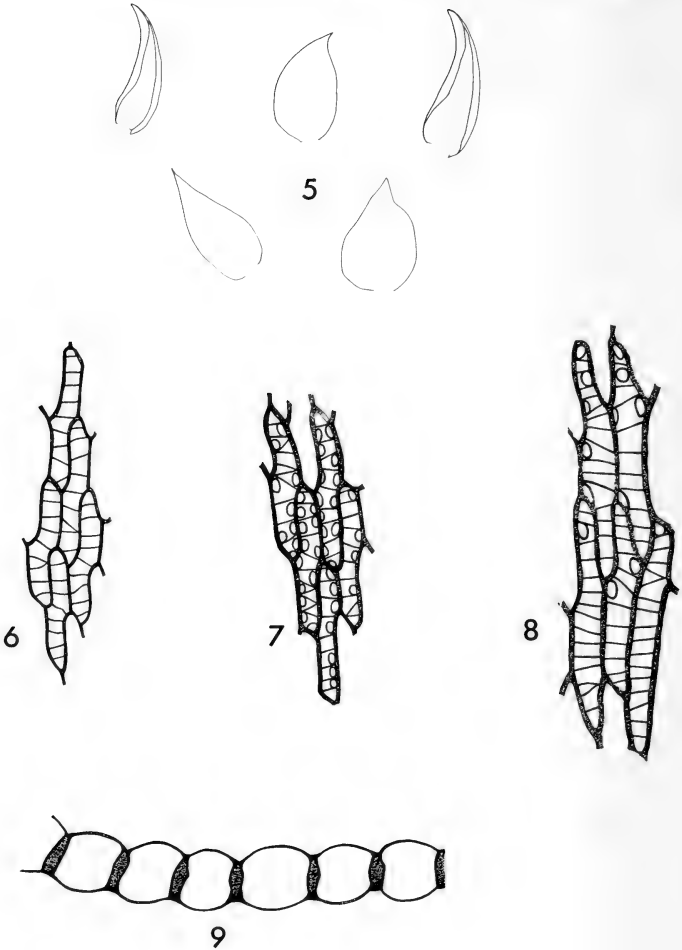
Branch leaves  $\pm 1.2$  mm long (0.8-1.5); hyaline cells throughout the leaf with pores continuous rows along the commissures.

Branch leaves  $\pm 1.5$  mm long (0.9-1.7); hyaline cells with pores in continuous rows along the commissures in cells near the apex, grading to cells at the leaf base with pores only in the cell ends and corners.

Table 1. Comparison of *Sphagnum subsecundum* and *S. subobesum*



*Sphagnum subobesum* Warnst. -1. Habit. x 2.4. -2. Spreading branch. x 8. -3. Stem transverse section. x 215. -4. Stem leaves x 15.



*Sphagnum subobesum* Warnst. -5. Branch leaves. x 15. -6. Branch leaf concave surface. x 180. -7. Branch leaf convex surface, apical region. x 180. -8. Branch leaf convex surface, basal region. x 180. -9. Branch leaf transverse section. x 340. Drawings by Steven Sierigk.



*Sphagnum subobesum*, like *S. platyphyllum* and the amphiatlantic Subsecunda species *S. lescurii* Sull., is hydrolabile (Suzuki, 1958) and apparently well adapted for habitats where hydrologic stress is significant, e.g., sites where plants may go through frequent wet-dry cycles. In the heart of its range in Japan, *S. subobesum* exhibits a great variety of forms with respect to habit, leaf size, and leaf shape. As to habitat, *S. subobesum* may be found both submerged and emergent, with the submerged forms often producing subsimplex modifications. As in *S. lescurii* (Andrus, 1974), modified stem leaves are common. The full range of morphological variability is substantially greater than the description herein would indicate, but that description is based upon North American material growing at the extreme of its range under probably ideal conditions. *Sphagnum subsecundum*, by contrast, is hydrostable and nearly always anisophyllous.

Support for this research was provided by S.U.N.Y. Research Foundation U.A.C. grant #040-7297-B. Special thanks are due to N.G. Miller for identification of hepatics.

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A NEW COMBINATION IN PITHECELLOBIUM

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Texas at Austin

and

Department of Biological Sciences,  
University of California, Santa Barbara

Jean Luis Berlandier published extracts from his journal, making premature mention of several binomials which he referred to as designating plants described in his manuscript (a botanical manuscript that apparently has not been published). Several of these names are nomina nuda, and others were superfluous when printed. However, a few are referred to in terms that clearly permit their identification with well known species whose previously accepted names they antedate. Thus, Juglans microcarpa Berlandier replaced J. rupestris Engelmänn some decades ago.

Another Berlandier plant name that is readily identified through its accompanying discursive description is Mimosa ebano, which has been published three times over Berlandier's name. The precisely identical descriptive discussion of these three publications, translated from the Spanish, is here quoted from Mosaico Mexicano 4: 418, 1840:

"In the vicinity of the port of Matamoros, we have observed scarcely five species of mimosas (mesquites) and only two merit our attention; not so much by the utility that may be obtained of them, as by being very common in all areas. The first is a luxuriant tree, scantily spiny, called ebony, but very different from the true ebony, or Diospyros ebanum, of authors. The plant that concerns us is a pretty species of mimosa which we have described in our manuscripts with the name of mimosa ebano, to record its name, very common in all the country. It is notable for its dark shade, for the properties of its fruits, and for the central part of the wood, which has a black color very distinct from the other and to which it owes its name. Though the wood is durable, its brittleness does not permit it to be considered useful for many purposes. The toasted seeds, ground and taken like coffee, are purgative and not disagreeable; but these same seeds, only toasted and eaten in large quantities, as many herders do, produce in those who are not accustomed to this food a mild discharge of the urethra similar in all respects to a blennorrhoea that does not damage and that has no consequence at all."

This plant is clearly identical with Pithecellobium flexicaule (Benth.) Coult. The habit, degree of spininess, wood color, and vernacular name (in a Mimosoid in Tamaulipas) could be descriptive of no other species. The uses of the seeds described by Berlandier are very similar to those described by Standley for P. flexicaule (Contr. U.S. Nat.

Herb. 23: 394. 1922). but Standley offers no information on their physiological effects. Standley reports "ebano" applied to other genera of Mimosoideae in Sinaloa and Oaxaca, but in Tamaulipas, Nuevo Leon, and Texas the vernacular name belongs strictly to Pithecellobium flexicaule. The nomenclature, therefore, requires the following recombination:

PITHECELLOBIUM EBANO (Berlandier) comb. nov.

Mimosa ebano Berlandier, Mosaico Mexicano 4: 418. 1840;  
in Berlandier and Chovel, Diario Viage Comision de Limites, p. 293. 1850; Bol. Soc. Mex. Geogr. Estad. 5: 126. 1857.

Lectotype: Berlandier 2262, without data,  
C.W. Short Herbarium, ANS (Phila.); duplicate,  
"arb. 20-25 pied. vulgo "Ebano". (El Encinal) de  
S. Fernando à Santander. Berlandier legit 8bre  
1830. Mexique. Berlandier N<sup>o</sup> 2262," F (dupl. ex G)

Acacia flexicaulis Benth., London Journ. Bot. 1: 505.  
1842.

Pithecolobium texense Coult., Contr. U.S. Nat. Herb. 1:  
37. 1890; Bot. Gaz. 15: 270. 1890.

Pithecolobium flexicaule (Benth.) Coult. Contr. U.S.  
Nat. Herb. 2: 101. 1891.

Berlandier discussed the "ebano" in his various journal manuscripts as he encountered the species in Veracruz, Tamaulipas, Nuevo Leon, and Texas, but he made no mention of the plant beyond the range of the species as it is currently understood.

Chemosystematic Notes on the Asteraceae II  
Acyclic Sesquiterpenes

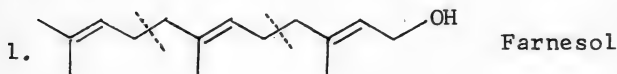
H. Robinson<sup>1</sup>, F. Bohlmann<sup>2</sup> and R. M. King<sup>1</sup>

Abstract

*Elaborated acyclic sesquiterpenes prove taxonomically significant in the Eupatorieae and Anthemideae. Distinctive forms occur in each tribe and a unique type of ester occurs in Brickellia. Presence of Furan sesquiterpenes correlated with lack of polyacetylenes further demonstrates the position of Ursinia in the Anthemideae.*

The acyclic sesquiterpenes in their simpler forms occur widely, Farnesol (1) as an example being found in the essential oils of many plant families. The compounds are widely distributed in members of the Asteraceae usually representing the simple precursor of the numerous sesquiterpene, diterpene and triterpene chemical pathways developed in that family. In the recent Symposium on the Biology and Chemistry of the Compositae only the treatment on the chemistry of the Anthemideae by Greger (1977) gave the chemical group any but casual notice. It seems that a few points should be brought out more clearly and the status of the group in the Asteraceae should be summarized.

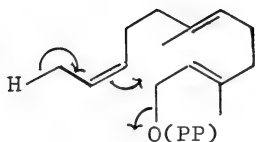
The acyclic sesquiterpenes are potentially the simplest of the sesquiterpene compounds and should exist as intermediates in all sesquiterpene, pathways even though they may not accumulate in detectable amounts. Unelaborated forms such as Farnesol (1) are close in form to the basic theoretical three-isoprene unit of all sesquiterpenes. The general structure of the acyclics can be shown in a variety of ways, many of which suggest the manner in which they can form rings leading to other sesquiterpene types.



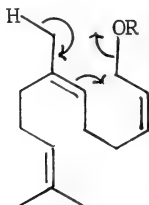
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Washington, D.C. 20560 USA

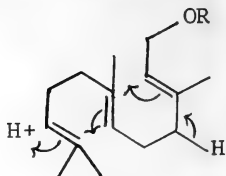
<sup>2</sup>Institute of Organic Chemistry, Technical University  
D-1000 Berlin W. Germany



2. Germacradiene

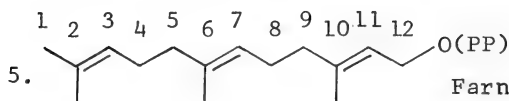


3. Bisabolene

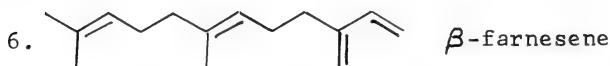
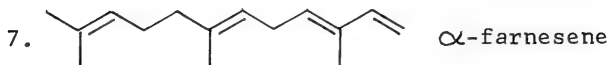


4. Drimenol

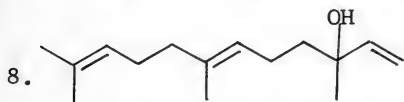
The general representation preferred here is the linear form of the carbon skeleton as represented by farnesol pyrophosphate (5) the general precursor of other forms of acyclic sesquiterpenes in the Asteraceae.

Farnesol pyrophosphate  
(E, E)

This compound is presumed to occur in all tribes of the family in which other sesquiterpenes are found. Simple modifications involving elimination of water (6, 7) are also widely distributed in the family.

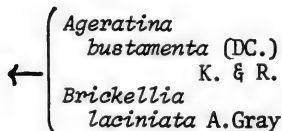
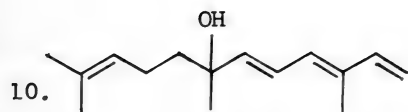
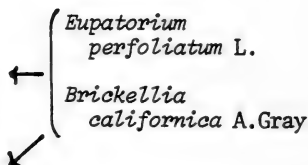
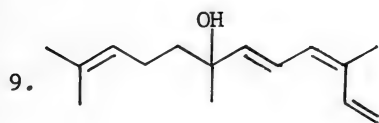
 $\beta$ -farnesene $\alpha$ -farnesene

In the tribes the Eupatorieae and Anthemideae the acyclic sesquiterpenes become elaborated and these elaborations are characteristic of the tribes. In a few cases the elaborations are characteristic of genera or groups of genera. One specialized feature found in both tribes is the use of the precursor (8) nerolidol with a tertiary alcohol group at C-10.



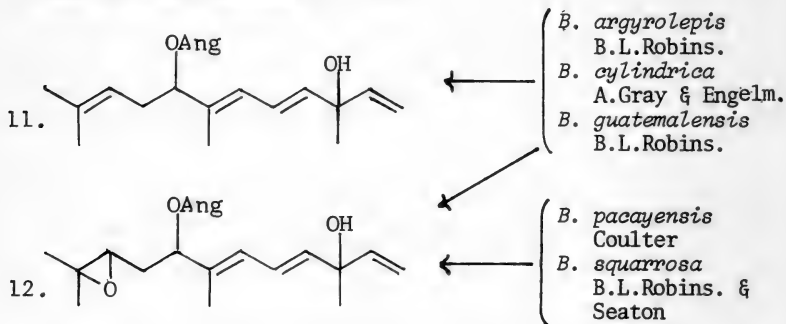
This has also been seen in one species of *Pentacalia* in the Senecioneae. In spite of the occurrence of the tertiary alcohol in both tribes, other specializations in the compounds result in none of these derived forms of acyclics being precisely alike in both tribes.

In the Eupatorieae other specializations occur in various members of the tribe which do not occur in the Anthemideae. In *Ageratina*, *Brickellia*, *Eupatorium*, *Eupatoriadelphus* and *Peteravenia* there are tertiary alcohols formed by introduction of an O-function at C-6 by allylic rearrangement starting with (7). Examples are 9 and 10.



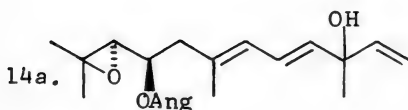
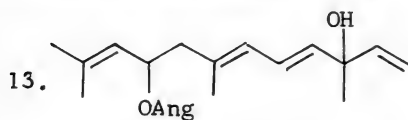
One of the examples shows an additional specialization, the altered stereoisomerism of the 9,10-double bond (9). At least two basic phyletic lines in the Eupatorieae are represented by each of these specializations and they are regarded as markers at the tribal level only.

Within the Eupatorieae the most phyletically significant elaboration seems to be the further transformation of nerolidol (8) to 5-hydroxydehydro nerolidol and esterification with Angelic acid. This specialization is found only in the genus *Brickellia* where it is seen in five species (11, 12).

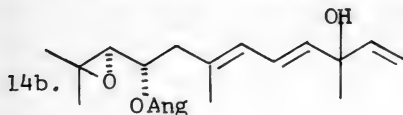


A genus related to *Brickellia*, *Pseudokyrsteniopsis*, has been examined but no acyclic sesquiterpenes have been found.

Introduction of an angeloyloxy group at C-4 is common in the tribe, found in 8 genera, in potentially 6 subtribes, but it has been found in only one *Brickellia*. The simpler form (13) is known from *Brickellia vernonicaefolia* A. Gray, *Eupatoriadelphus dubius* (Willd. ex Poir.) K & R., *Eupatorium hyssopifolium* L., and *Radlkoferotoma cistifolium* (Less.) O. Kuntze. The derived forms with the ester can be divided technically into two groups depending on the stereoisomerism derived from the oxidation at C-2 and 3.

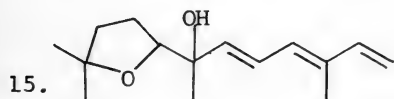






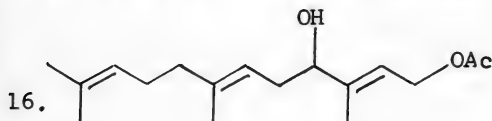
The stereoisomer 14a is found in *Bishovia*, *Eupatorium*, *Eupatoriadelphus*, *Heterocondylus* and *Peteravenia*. Stereoisomer 14b is found only in *Ageratina scorodonoides* (A. Gray) K. & R. and *Hebeclinium macrophyllum* (L.) DC. The two genera containing 14b are not in the same subtribe and the last is actually closer in relation to *Peteravenia* than to *Ageratina*.

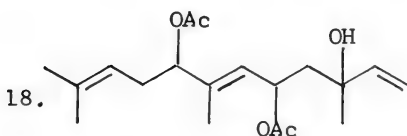
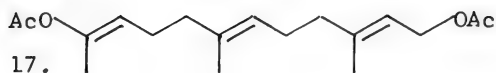
The epoxidation of the carbon 2-3 bond occurs in numerous members of the Eupatorieae with ester formation at C-4 but it also occurs in most acyclics of the five *Brickellia* species with ester formation at C-5. This precise form of oxidation is not found in the absence of the Angelic acid esters. Still, an interesting variant occurs in *Ageratina bustamenta* (DC) K. & R. (15) which indicates the form that oxidation would take in the absence of the ester side chains.



The acyclic sesquiterpenes of the Anthemideae also are elaborated by oxidation and esterification, but the esters are acetates and the oxygen is often in the form of ketones or furans. There is also an example of alcohol formation in a secondary position at C-9 instead of C-10 (16).

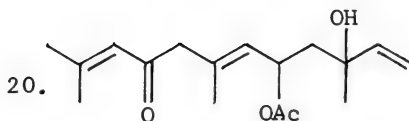
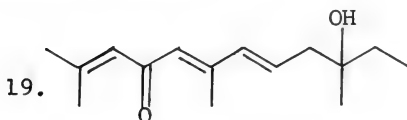
The acetates may form at C-12 or on both ends of the molecule or at C-5 or C-8 (16, 17, 18) (Bohlmann, et al, 1974).



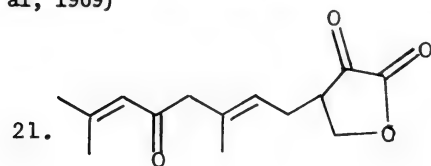


All in *Tanacetum*

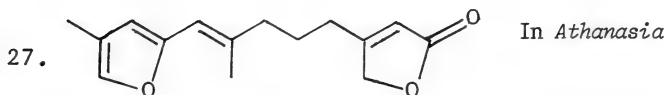
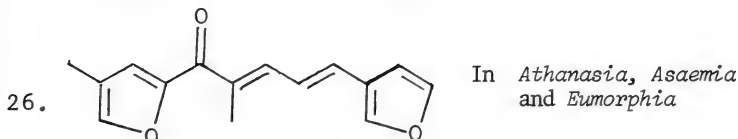
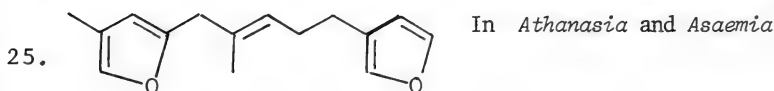
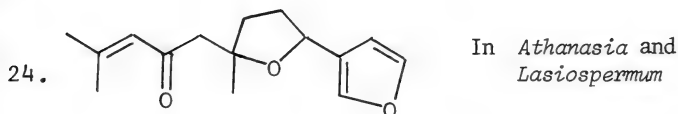
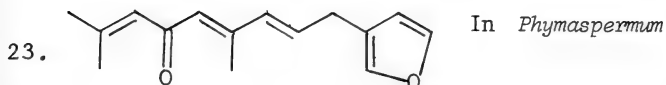
Ketone formation at C-4 is found in comparatively simple acyclics in *Anthemis austriaca* (19, 20) (Bohlmann, et al, 1974) but is not known in *Tanacetum*.



The ketone unit is also present in combination with a highly modified oxidized end unit in *Anthemis cotula* (21) (Bohlmann, et al, 1969)



Furanosesquiterpenes occur in a distinctive series of South African genera of the Anthemideae, *Asaemia*, (1 sp. examined) *Athanasia*, (13 sp.) *Eumorphia*, (2 sp.) *Lasiospermum*, (4 sp.) *Phymaspermum*, (2 sp.) *Stilpnophytum*, (1 sp.) and *Ursinia*, (5 sp.). There are 35 different types of these compounds known. The following are examples taken from Greger (1977).



The occurrence of Furanosesquiterpenes in this distinctive group of genera correlates with an absence of Polyacetylenes that is unusual in the Anthemideae. The exact relationship of the group to the Anthemideae has been questioned (Heywood & Humphries, 1977) and *Ursinia* has been placed in the far removed Arctotideae in the traditional systems of Bentham and Hooker (1873) and Hoffmann (1890-1894). The erroneous positioning was the result of the geographical and pappus similarity between *Ursinia* and *Arctotis*. Corrections of the position of *Ursinia* and placement in or near the Anthemideae (Beauvard, 1915; Prassler, 1967; Robinson & Brettell, 1973) have relied on structural considerations. The correlation of Furanosesquiterpene presence and Polyacetylene absence provides confirmation of the relationship of *Ursinia* at least to the distinctive series of genera in South Africa that have been consistently included in the Anthemideae.

The further position of the *Athanasia-Ursinia* group in the Anthemideae seems to be confirmed in three ways by the Furanosesquiterpenes. Initially, elaborated acyclic sesquiterpenes are known only from the two tribes Eupatorieae and Anthemideae. Secondly, the ketone formation at C-4 seen in *Anthemis* is also seen in some of the most widely distributed Furanosesquiterpenes, though ketone units at C-5 are seen also. A final and more tenuous link is in the presence of the furan units. Though polyacetylenes are absent when Furanosesquiterpenes are present, the furan units are reminiscent of furan units in Polyacetylenes of other members of the Anthemideae. The general picture from an over-view of Polyacetylenes in the Asteraceae shows a tendency for highly oxygenated products in the Anthemideae in comparison to some other tribes such as the Heliantheae and Eupatorieae. It seems significant that the acyclic sesquiterpenes of the tribe would show the same tendency for highly oxygenated products. It is suggested that the same enzymatic pathways are operating in the elaboration of both Acyclic sesquiterpenes and Polyacetylenes in the Anthemideae, and that these pathways are not evident in either group of chemicals in the Eupatorieae or in the Polyacetylenes of most tribes of the Asteraceae.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXIV.

A NEW GENUS, NOTHOBACCHARIS.

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For almost 150 years the species best known by the latter homonym Baccharis microphylla DC. has been represented only by the type specimen collected by Haenke from an unspecified locality in Peru in the Decandolle herbarium at Geneva. The Eupatorian nature of the species has been recognized for almost 80 years though the efforts to assign the species first to Brickellia and later to Eupatorium were un insightful. The species has remained enigmatic and it seemed unlikely to be resolved in time for the generic review of the tribe now in final stages of preparation. During 1978, three additional specimens from Departamento of Lima in Peru have been seen allowing for detailed examination of some characters not previously available.

The details of the flowers, the simple style base, shortly clavate style tips, short oblong anther appendages, smooth corolla surfaces and clustered glands on the corolla lobes are consistent with a position in the Cironioid Eupatorieae near Koanophyllon and close relationship to that genus is assumed here. The species is technically excluded from that genus on the basis of the corolla lobes, the broadly triangular lobes of Koanophyllon being the most consistent binding feature of the more than 100 species of that genus. To the corolla character can be added other details such as the scarious-margined laciniate-tipped involucre bracts and the distinctive aspect from the small leaves in densely spiralled phyllotaxy. The rather spicate form of the branches of the inflorescences are approached by some of the more typical members of the genus Koanophyllon. Nothobaccharis is also close to Ophryosporus but has a well-developed anther appendage, has a less enlarged style tip and lateral heads do not arise from axils of lower involucre bracts.

The name chosen reflects the strong superficial resemblance of the new genus to some members of the Asterean genus Baccharis. The original misplacement of the species is thoroughly understandable. In spite of the close relationship with Koanophyllon, no problems in recognition are anticipated in that direction. It is far more likely that future collections will continue to be mis-determined as Baccharis.

Nothobaccharis R. M. King & H. Robinson, gen. nov.

Plantae frutescentes interdum dense ramosae. Caules teretes subtiliter striati glandulo-punctati et dense minute puberuli. Folia dense alternata breviter petiolata; laminae suborbiculares vel ellipticae 5-10 mm longae paucè dentatae vel crenatae utrinque resino-punctatae subtrinervatae. Inflorescentiae dense thrysiformes, ramis recto-patentibus plerumque spiciformibus; squamae involucri ca. 15 subimbricatae 3-4 seriatae vix deciduae valde inaequales oblongae vel ellipticae margine scariosae superne saepe laciniatae extus glandulo-punctatae; receptacula plana vel leniter convexa, glabra. Flores 6-8; corollae pallidae 4 mm longae infundibulares extus et intus laeves inferne glabrae, tubis vix angustioribus, ca. 1.5 mm longis, cellulis elongatis, parietibus leniter sinuatis, lobis 5 oblongo-ovatis ca. 0.7 mm longis et 0.4-0.5 mm latis extus dense glanduliferis raro unisetiferis; filamenta laevia in parte superiore anguste cylindrica, cellulis breviter oblongis in parietibus minute noduliferis; cellulae endotheciales subquadratae; appendices antherarum breviter oblongae leniter latiores quam longiores; basi stylorum glabri non noduliferi, appendices stylorum inferne dense mamillosae ad apicem breviter clavatae truncatae. Achaenia prismatica 5-costata glandulifera et sparse minute plerumque in costis setifera base vix angustiora; carpodia breviter capitata superne abrupte delimitata, cellulis superficialibus 6-7-seriatis subquadratis vel breviter oblongis ca. 15  $\mu$ m latis et 15-30  $\mu$ m longis, parietibus uniformiter incrassatis; setae pappi capillariformes uniseriatae 30-35 inferne minute scabridae superne sparse barbellatae, cellulis apicalibus argute acutis. Grana pollinis 20-23  $\mu$ m in diam. minute spinulifera.

Type: Baccharis candolleana Steud.

The genus contains a single species.

Nothobaccharis candolleana (Steud.) R. M. King & H. Robinson  
comb. nov. Baccharis candolleana Steud., Nomenclator  
Bot. ed. 2, 1: 177. 1840. Synonyms: Baccharis microphylla  
D.C., Prodr. 5: 406. 1836, not B. microphylla HBK.; Brickellia  
microphylla [DC] Hieron., Bot. Jahrb. 28:583. 1901; Eupatorium  
incarum B. L. Robinson, Mem. Gray Herb 1: 122. 1917.

Specimens seen: PERU: Dept. Lima: Prov. Lima: Chosica, stony slope, alt. c. 900 m 24 IX 1940. Asplund 13766 (S); Chosica, alt. 900-1200 m 30 Aug. 1950. Vargas 9626 (US); Prov. Canete: Chilca, sandy plain near seashore. 5 X 1940. Asplund 13846 (S).

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XVI.

A NEW SUBTRIBE, ENHYDRINAE.

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Smithsonian Institution, Washington, DC., 20560.

The completed review of the tribe Heliantheae shows the need to recognize an additional subtribe which is validated here.

Enhydrinae H. Robinson, subtribus nov.

Plantae herbaceae aquaticae; folia opposita. Inflorescentiae axillares sessiles. Capitula paleacea. Flores radii fertiles feminei; corollae minute limbatae adaxialiter laeves; flores disci hermaphroditi; corollae adaxialiter laeves; thecae antherarum pallide nigrescentes, cellulis endothecialibus quadratis in parietibus transversalibus 1-noduliferis; appendices antherarum ovatae abaxialiter glanduliferae; lineae stigmataeae duplices; canales resiniferi in faucis solitarii interdum rubrescentes, ductis in stylis interioribus. Achaenia prismatica nigrescentia striata; cellulae superficiales ovularum inornatae. Pappus nullus. Grana pollinis ca. 27-35  $\mu$  in diam.

Type genus: Enhydra Lour.



ADDITIONAL NOTES ON THE GENUS VERBENA. XXX

Harold N. Moldenke

VERBENA RUFIFLORA Rojas

Additional bibliography: Moldenke, *Phytologia* 41: 182 & 374. 1979.

It seems probable to me that this binomial name applies either to V. incisa Hook. or to to V. peruviana (L.) Britton since both of these red-flowered species are native to Corrientes.

VERBENA RUNYONI Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 295 (1977) and 41: 171. 1979.

Recent collectors refer to this plant as "an annual herb", much-branched from the base, and found it growing in fields and "frequent to abundant in open ground, widespread in the Lower Rio Grande Valley" and "rigidly erect". The corollas are said to have been "blue" on Correll 36820 and the species has been collected in anthesis in March.

Additional citations: TEXAS: Brazoria Co.: Fleetwood 9459 (Au—289988), 9526 (Au—290157). Cameron Co.: D. S. Correll 36820 (Ld); Correll & Correll 38275 (Ld); Ecology Class s.n. [Palm Grove, 3.1. 30] (Au—122645); Lundell & Lundell 10753 (Au—122643); R. Runyon 522 (Au—290482), 2485 (Au—268740—isotype), 2588 (Au—266164), 4872 (Au—290476), 6011 (Au—294797).

VERBENA xRYDBERGII Moldenke

Additional bibliography: Mohlenbrock, *Guide Vasc. Fl. Ill.* 366—367. 1975; Moldenke, *Phytologia* 36: 295. 1977; Mohlenbrock & Ladd, *Distrib. Ill. Vasc. Pl.* [247] & 276. 1978.

Mohlenbrock (1975) says that in Illinois this hybrid occurs in "Wet ground; scattered throughout the state".

VERBENA SAGITTALIS Cham.

Additional synonymy: Verbena sagittalis Cham. & Schl., in herb.

Additional bibliography: Moldenke, *Phytologia* 36: 296. 1977.

Material of this species has been misidentified and distributed in some herbaria as "Labiatae".

Additional citations: BRAZIL: Paraná: Dombrowski 1985 [Kuniyoshi 1709] (N).

VERBENA SANTIAGUENSIS (Covas & Schnack) Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 296 & 298. 1977.

The corollas on Burkart & al. 30589 are said to have been "lilac" in color when fresh and the limb "small". It was collected in anthesis in November.

Additional citations: ARGENTINA: Santa Fé: Burkart, Troncoso, Baccigalupo, Guaglionone, Rotman, & Ulibarri 30589 (N).

#### VERBENA SCABRA Vahl

Additional bibliography: Stalter, *Castanea* 40: 13. 1975; Hocking, *Excerpt. Bot. A.28*: 170. 1976; Moldenke, *Biol. Abstr.* 64: 6575. 1977; Moldenke, *Phytologia* 36: 296—298, 460, & 461. 1977; Poppeton, Shuey, & Sweet, *Fla. Scient.* 40: 384. 1977; Powell, *Econ. Bot.* 31: 424. 1977; Moldenke, *Phytologia* 41: 155 & 180. 1979.

Recent collectors describe this plant as large, much-branched, and to 1.5 meters tall. They have found it flowering in April and July, fruiting in July. Stalter (1975) records it from the Isle of Palms, Charleston County, South Carolina. The corollas on Correll & Popenoe 48330 are said to have been "lavender-purple" when fresh, while those on Correll & Correll 48999 were "light-lavender".

The Corrells encountered V. scabra "scattered among tall herbs", and their collection is the first record of the species from the Bahama Islands. Duncan describes the plant as "5 feet tall, all branching in upper half or third, leaves 2 or 3 to a node, blades to 4 1/2 inches long, corolla-lobes light lavender-pink, the tube violet, hairs in throat white, anthers yellow" and found it growing in the open in low areas.

The G. Watson H.9, distributed as V. scabra, actually is v. aleni Moldenke, while R. S. Mitchell 3742 is V. urticifolia L.

Additional citations: NORTH CAROLINA: Carteret Co.: Wilbur 9217 (Au—277798). GEORGIA: Sapelo Island: Duncan 20268 (Mi). FLORIDA: Dade Co.: Correll & Popenoe 48330 (N). Sanibel Island: Brumbach 8786 (Mi). TEXAS: Jeff Davis Co.: Correll & Correll 35426 (Ld). Val Verde Co.: Smith & Butterwick 161 (Ld). NEW MEXICO: Eddy Co.: Crutchfield 2407 (Ld). BAHAMA ISLANDS: Eleuthera: Correll & Correll 48999 (N). JAMAICA: Proctor 23622 (Ld).

#### VERBENA SCABRA var. TERNIFOLIA Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.28*: 170. 1976; Moldenke, *Phytologia* 36: 298. 1977.

Duncan 20268, from Sapelo Island, Georgia, is said to have had its leaves arranged both in 2's and in 3's.

#### VERBENA SEDULA Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 298. 1977.

Van der Werff encountered this plant along a roadside at 580 feet altitude, flowering and fruiting in July, the corollas "pale-blue, almost white".

Additional citations: GALAPAGOS ISLANDS: Chatham: Van der Werff 2181 (Ld).

#### VERBENA SEDULA var. FOURNIERI Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 298. 1977.

Van der Werff reports this plant "common on pampa", at 2000 feet altitude, the corollas "pale-blue", flowering and fruiting in July.

Additional citations: GALAPAGOS ISLANDS: Chatham: Van der Werff 2205 (Ld).

#### **VERBENA SELLOI** Spreng

Additional bibliography: Flook, Sida 5: 169. 1973; Moldenke, Phytologia 36: 283, 296, & 298—299. 1977.

#### **VERBENA SESSILIS** (Cham.) Kuntze

Additional bibliography: Hocking, Excerpt. Bot. A.28: 170. 1976; Moldenke, Phytologia 36: 299 & 302. 1977.

Additional citations: ARGENTINA: Corrientes: Krapovickas & Cristóbal 16357 (Ld).

#### **VERBENA SIMPLEX** Lehm.

Additional bibliography: Mohlenbrock, Guide Vasc. Fl. Ill. 366. 1975; Baskin & Baskin, Castanea 42: 144. 1977; McGregor & al., Fl. Great Plains 281, map 1124. 1977; Moldenke, Biol. Abstr. 64: 6575. 1977; Moldenke, Phytologia 36: 299—301. 1977; R. L. Thompson, Castanea 42: 88. 1977; Thompson & Heineke, Trans. Ill. Acad. Sci. 70: 126. 1977; Mohlenbrock & Ladd, Distrib. Ill. Vasc. Pl. [247] & 276. 1978; Moldenke, Phytologia 40: 468. 1978.

The Baskins (1977) list this species as a member of the cedar glade community, while Thompson (1977) refers to it as "rare" in Newton County, Arkansas. Mohlenbrock (1975) says that in Illinois it occurs in "Prairies, fields, waste ground; occasional and scattered throughout the state"; Thompson & Heineke (1977) list it from Jackson County.

Additional citations: NEW JERSEY: County undetermined: Knieskern s.n. (M). VIRGINIA: Fairfax Co.: Blake 8473 (Ld). NORTH CAROLINA: Durham Co.: Radford 44754 (Ld). KANSAS: Allen Co.: Ackerman Kan.2-234 (Ld). Douglas Co.: Horr E.76 (Ld). OKLAHOMA: Choctaw Co.: Taylor & Taylor 15953 (Ld).

#### **VERBENA STRICTA** Vent.

Additional bibliography: Asai, Journ. Jap. Bot. 50: 311—316. 1975; Mohlenbrock, Guide Vasc. Fl. Ill. 366 & 367. 1975; McGregor & al., Fl. Great Plains 282, map 1125. 1977; Moldenke, Biol. Abstr. 64: 6575. 1977; Moldenke, Phytologia 36: 300, 302—307, 451, & 461. 1977; R. L. Thompson, Castanea 42: 88. 1977; Mohlenbrock & Ladd, Distrib. Ill. Vasc. Pl. [247] & 276. 1978; A. L. Moldenke, Phytologia 39: 184. 1978.

Swanson refers to this species as "abundant in open spots in dry sandy formerly cultivated fields mixed with shrubs, pioneer herbs, and young hardwoods" — a photograph of the locality is included with his no. 1704 — and "common in sunny open areas". He asserts that the corollas were "purple" on his no. 2175, as they were also on Webster 4280. Thompson (1977) refers to the species as only "occasional" in Newton County, Arkansas. Asai (1975) re-

ports finding it in waste places in Tokyo, Japan, as an introduced weed. Mohlenbrock (1975) says that in Illinois the species occurs in "Prairies, pastures, fields, common; in every co[unty]".

Additional citations: ILLINOIS: Pike Co.: Moldenke & Moldenke 31509 (Lc). WISCONSIN: Vernon Co.: Swanson 1704 (N), 2175 (N). MISSOURI: Reynolds Co.: D'Arcy 4644 (Ld). ARKANSAS: Craighead Co.: Demaree 5085 (Mi). OKLAHOMA: Custer Co.: Seigler 1569 (Au—284502). Osage Co.: Webster 4280 (Mi). Sequoyah Co.: Taylor & Taylor 10823 (Ld).

**VERBENA STRICTA f. ALBIFLORA** Wadmond

Additional bibliography: Moldenke, *Phytologia* 28: 390. 1974; Mohlenbrock, *Guide Vasc. Fl. Ill.* 366. 1975; Moldenke, *Phytologia* 36: 303. 1977; A. L. Moldenke, *Phytologia* 39: 184. 1978.

Brooks & Hauser encountered this plant in sandy brushy areas, flowering in July.

Additional citations: KANSAS: Butler Co.: Brooks & Hauser 13225 (N).

**VERBENA STRICTA f. ROSEIFLORA** Benke

Additional bibliography: Moldenke, *Phytologia* 28: 391. 1974; Mohlenbrock, *Guide Vasc. Fl. Ill.* 366. 1975.

**VERBENA STRIGOSA** Cham.

Additional bibliography: Moldenke, *Phytologia* 36: 307—308. 1977.

Additional citations: BRAZIL: Paraná: Hatschbach 32594 (Mi).

**xVERBENA STRUPOSA** Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.* 25: 379. 1975; Moldenke, *Phytologia* 30: 171. 1975.

**VERBENA SUBINCANA** (Troncoso) Shinnars

Additional bibliography: Flook, *Sida* 5: 169. 1973; Moldenke, *Phytologia* 30: 171. 1975.

**VERBENA SULPHUREA** D. Don

Additional bibliography: Moldenke, *Biol. Abstr.* 64: 6575. 1977; Moldenke, *Phytologia* 36: 308. 1977; Markgraf & D'Antoni, *Pollen Fl. Argent.* 99. 1978.

Additional citations: CHILE: Valparaíso: Zöllner 8208 (N).

**VERBENA SULPHUREA var. INTERMEDIA** Kuntze

Additional synonymy: Verbena macrosperma Speg., *Rev. Argent. Bot.* 1: 218—220. 1926. Glandularia macrosperma (Speg.) Tronc., *Darwiniana* 18: 317. 1974.

Additional & emended bibliography: Speg., *Rev. Argent. Bot.* 1: 218—220. 1926; A. W. Hill, *Ind. Kew. Suppl.* 8: 246. 1933; Fedde & Schast. in *Just, Bot. Jahresber.* 54 (2) 747. 1934; Fedde in *Just, Bot. Jahresber.* 59 (2): 417. 1939; Moldenke, *Known Geogr.*

Distrib. Verbenac., [ed. 1], 42, 44, 101, & 102 (1942) and [ed. 2], 102, 106, 107, 198, & 199. 1949; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 44361. 1958; Moldenke, Résumé 122, 127, 128, 376, 472, & 474. 1959; Moldenke, Phytologia 10: 119—121. 1964; Hocking, Excerpt. Bot. A.9: 365. 1965; Moldenke, Phytologia 14: 289 (1967) and 16: 100. 1968; Moldenke, Fifth Summ. 1: 193, 201, & 202 (1971) and 2: 699, 916, & 920. 1971; Moldenke, Phytologia 23: 298 (1972), 24: 227 (1972), and 28: 254, 441, & 457. 1974; Troncoso, Darwiniana 18: 317, 318, 409, & 412. 1974; Moldenke, Phytologia 30: 154. 1975.

#### VERBENA SULPHUREA var. LONGITUBA Kuntze

Additional bibliography: Moldenke, Phytologia 24: 227. 1972.

Zöllner encountered this plant at 2600 meters altitude, flowering in October.

Additional citations: CHILE: Coquimbo: Zöllner 9944 (2).

#### VERBENA SUPINA L.

Additional bibliography: T. Johnson, Gerard Herbal, ed. 3, 717—719, fig. 2. 1975; Moldenke, Phytologia 36: 451—453. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

Additional illustrations: T. Johnson, Gerard Herbal, ed. 3, 717, fig. 2. 1975.

Additional citations: HUNGARY: Koren s.n. [26 Julio 1877] (Au—276918).

#### VERBENA TAMPENSIS Nash

Additional bibliography: Moldenke, Phytologia 36: 453. 1977; Poppeton, Shuey, & Sweet, Fla. Scient. 40: 384. 1977.

#### VERBENA xTEASII Moldenke

Additional bibliography: Moldenke, Phytologia 28: 394. 1974; Arora, Biol. Abstr. 66: 2513. 1978; Arora, Cytologia 43: 91—96, fig. 1—8. 1978.

Illustrations: Arora, Cytologia 43: 92 & 93, fig. 1C, 3, & 4. 1978.

Arora (1978) reports that "The hybrid, known as V. xteasii is intermediate between the parents (V. tenuisecta and V. hybrida) in morphology and shows complete male sterility but reasonable amount of female fertility, despite normal pairing at metaphase I. This sterility could not be altered by colchipoidy indicating a genetic nature of male sterility. The amphidiploid has predominant bivalent pairing which indicates that the genomes of the parent species are structurally differentiated."

#### VERBENA TENERA Spreng.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 560 & 654. 1977; Moldenke, Phytologia 36: 453—454. 1977.

#### VERBENA TENUISECTA Briq.

Additional bibliography: Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 434. 1963; Gubanov, Pavlov, & Yunus, Byull. Mosk. O-va Ispyt. Prir. Otd. Biol. 80: 82—91. 1975; Arora, Biol.

Abstr. 65: 3288. 1977; Arora, Cytologia Tokyo 42: 653—660. 1977; Gubanov, Pavlov, & Yumus, Biol. Abstr. 64: 710. 1977; Lelong, Sida 7: 140. 1977; López-Palacios, Fl. Venez. Verb. 560, 575—578, 653, & 654, fig. 135. 1977; Moldenke, Biol. Abstr. 64: 6574. 1977; Moldenke, Phytologia 36: 453—457. 1977; K. E. Rogers, Sida 7: 78. 1977; Arora, Biol. Abstr. 66: 2513. 1978; Arora, Cytologia 43: 91, 92, 94, & 95, fig. 1A & 2. 1978; Liogier, Moscosoa 1: 38. 1978; Moldenke, Biol. Abstr. 65: 71. 1978; Moldenke, Phytologia 41: 157, 177, & 366. 1979.

Additional illustrations: Arora, Cytologia 43: 92, fig. 1A & 2. 1978.

It seems most probable to me that the V. tenera Spreng., recorded for Nigeria by Hepper (1963), will turn out to be V. temisecta on re-examination, since the latter is a very widespread species in gardens and introduced, while the former is not. On the other hand, the "Verbena temisecta" illustrated by López-Palacios (1977) is certainly not that species and probably is V. monacensis Moldenke instead.

Gubanov and his associates (1975) record V. temisecta from Afghanistan. Bayliss, misidentifying it as V. bonariensis L., reports it "introduced but now widespread [in Cape Province, South Africa] on roadsides in sandy conditions, semi-prostrate but sometimes straggling in low vegetation", the corollas "bright-mauve". Lelong (1977) asserts that it is "Rare, in dry open woods" in Mobile County, Alabama, while Rogers (1977) reports it "Common along roads and in other open sandy sites. Introduced" in Forrest and Perry Counties, Mississippi. Walker (1976) lists it as cultivated on Okinawa island.

Arora (1977) selfed autotriploids of V. temisecta and then crossed these with the diploid type ( $2n = 10$ ). The progeny yielded plants with chromosomes varying in count from 10 to 16. The different polysomics were analyzed morphologically and cytologically. Some triploids ( $3x = 15$ ) were morphologically distinctive and their karyotypic analysis showed that they had a constitution of  $3n = 15 + 1 - 1$ , being tetrasomic and disomic for 1 chromosome each. The nature and extent of transmission of extra chromosomes in different polysomics are discussed by him. The presence of an extra satellite chromosome induces larger flower size and profuse flowering, whereas its absence in the hypotriploid adversely affects plant habit and flower size.

López-Palacios (1977) cites the following collections from Venezuela (but it is not certain which of these actually represent V. temisecta and which are V. tenera Spreng. or V. monacensis Moldenke: Aragua: Trujillo 3373. Federal District: Lesser 3480; Ll. Williams 10138. Mérida: Ruiz-Terán & López-Palacios 6201. Trujillo: Ruiz-Terán & López-Palacios 7599. Yaracuy: Trujillo 1636. He records the vernacular name, "Virginia". Liogier (1978) cites his no. 23071 as cultivated and escaped in the Dominican Republic.

Material of V. temisecta has been misidentified and distributed

in some herbaria as V. incisa Hook.

Additional citations: FLORIDA: Jackson Co.: B. M. Davis s.n. [Mar. 2, 1933] (Mi). SOUTH AFRICA: Cape Province: Bayliss BS.7344 (W-2778880). CULTIVATED: Dominican Republic: Ekman H.12615 (Ld). MOUNTED CLIPPINGS: E. H. Walker, Fl. Okin. & South. Ryuk. 448. 1976 (W).

VERBENA TEUCRIIFOLIA Mart. & Gal.

Additional bibliography: Moldenke, Phytologia 36: 457. 1977.

Recent collectors have encountered this plant "in ridgetop meadows, dark-brown loamy clay soil, common", along "roadsides in valley between farms or corn and Agave with shrubs and many Lupinus marshalliams", and in pine forests with "suelo cafe arcillozo algo rocoso, muy frio". They describe it as a perennial herb to 25 cm. long, creeping, rooting at the nodes, forming colonies 0.5 m. in diameter. They have found it 2700-3155 m. altitude, flowering in January and July. Calzada reports it as "rare". The corollas were "purple" on Calzada 2127 and "pinkish-lavender" on Sanders 74119.

Additional citations: MEXICO: México: Wieder, Dunn, Bennett, & Torke 77 (N). Veracruz: Calzada 2127 (N). GUATEMALA: Totonicapan: Sanders 74119 (Mi).

VERBENA TOWNSENDII Svenson

Additional bibliography: Moldenke, Phytologia 36: 458 (1977) and 41: 169. 1979.

Van der Werff describes what he regards as this species as often prostrate, the leaf shape variable, the corollas light-blue, and encountered it on wet southwest slopes of a volcano at 3000 feet altitude, flowering and fruiting in August.

Additional citations: GALAPAGOS ISLANDS: Albemarle: Van der Werff 2286 (Z).

VERBENA TRACHEA R. A. Phil.

Additional bibliography: Moldenke, Phytologia 24: 243. 1972.

Zöllner found this species growing at 2600 m. altitude, flowering in November.

Additional citations: CHILE: Coquimbo: Zöllner 9974 (Z).

VERBENA TRIFIDA H.B.K.

Additional bibliography: Moldenke, Phytologia 36: 458 (1977) and 41: 179. 1979.

López-Palacios, in a personal communication to me, reports the vernacular name, "cinamono", in Colombia "según ejemplar 3685 (6) de Triana".

VERBENA URTICIFOLIA L.

Additional bibliography: Russell, Ann. Ent. Soc. Am. 56: 151. 1963; E. M. Bush, Castanea 41: 304. 1976; McGregor & al., Fl.

Great Plains 282, map 1126. 1977; Moldenke, *Phytologia* 36: 458--462. 1977; Musselman, Nickrent, & Levy, *Rhodora* 79: 264. 1977; Noblick, *Annot. List Herb. Spec. M. Mitch. Assoc.* 179. 1977; Powell, *Econ. Bot.* 31: 424. 1977; E. E. Rogers, *Sida* 7: 78. 1977; R. L. Thompson, *Castanea* 42: 88. 1977; Thompson & Heineke, *Trans. Ill. Acad. Sci.* 70: 126. 1977; Frankel, *Bull. Torrey Bot. Club* 105: 154. 1978; Mohlenbrock & Ladd, *Distrib. Ill. Vasc. Pl.* [247] & 276. 1978; Moldenke, *Biol. Abstr.* 65: 71. 1978; A. L. Moldenke, *Phytologia* 39: 184. 1978; Mound & Halsey, *Whitefly World* 216. 1978; Moldenke, *Phytologia* 41: 173. 1979.

Rogers (1977) refers to this species as "infrequent or rare in disturbed low woods. Native" in Forrest and Perry Counties, Mississippi, while Thompson (1977) avers that it is "common" in Newton County, Arkansas. Bush (1976) records it from Barbour County, West Virginia, but all the material I have thus far seen from this county is var. *leiocarpa* Perry & Fernald. Brooks & Hauser refer to typical *V. urticifolia* as "common in moist sandy soil of shaded roadside ditches" in Butler County, Kansas. Frankel (1978) lists it from Westchester County, New York. Noblick (1977) cites *G. B. Gardner s.n.* [Aug. 30, 1909] from Nantucket County, Massachusetts. Mohlenbrock (1975) comments: "Leaves hirsute on the lower surface; nutlets about 2 mm. long, corrugated on [the] back" and says that in Illinois the species occurs in "Fields, thickets, disturbed woods, common in every co[unty]"; Thompson & Heineke (1977) reports it from Jackson County.

Russell (1963) and Mound & Halsey (1978) report *V. urticifolia* as host to a whitefly, *Trialeurodes packardii* (Morrill) Quaint. & Bak.

**Additional citations:** MASSACHUSETTS: Norfolk Co.: Blake 11077 (Ld). NEW JERSEY: Hunterdon Co.: Moldenke & Moldenke 31463 (Ac, Lc, Ld, N). NORTH CAROLINA: Catawba Co.: Bell s.n. [Sept. 8, 1958] (Ld). SOUTH CAROLINA: Union Co.: Bell 10497 (Au--179479). ILLINOIS: Pike Co.: Moldenke & Moldenke 31508 (Lc). KANSAS: Atchison Co.: Horr & McGregor E.531 (Ld). Butler Co.: Brooks & Hauser 13215 (N). ARKANSAS: Garland Co.: R. Runyon 1487 (Au). OKLAHOMA: Cherokee Co.: R. S. Mitchell 3742 (Ld). Cleveland Co.: J. Taylor 23015 (Ld). Comanche Co.: Taylor & Taylor 20906 (Ld). Murray Co.: Correll & Correll 39028 (Ld). TEXAS: Franklin Co.: Correll & Correll 36583 (Ld). Lamar Co.: D. S. Correll 37530 (Ld). Wheeler Co.: Martins 2278 (Ld).

**VERBENA URTICIFOLIA var. LEOCARPA PERRY & Fernald**

Additional bibliography: Mohlenbrock, *Guide Vasc. Fl. Ill.* 367. 1975; Moldenke, *Phytologia* 36: 460--462. 1977; Mohlenbrock & Ladd, *Distrib. Ill. Vasc. Pl.* [247] & 276. 1978; A. L. Moldenke, *Phytologia* 39: 184. 1978.

Mohlenbrock (1975) says of this variety: "Leaves velutinous on the lower surface; nutlets about 1.5 mm long, not corrugated on



the back" and says that in Illinois it occurs in "Low ground; Cook and Kane" counties.

Additional citations: NEW JERSEY: Ocean Co.: Moldenke & Moldenke 31537 (Ac, Lc, Ld).

**VERBENA VALERIANOIDES** H.B.K.

Additional bibliography: Garcis Barriga, Fl. Med. Colomb. 2: 514. 1975; Moldenke, Phytologia 36: 462 (1977) and 41: 179. 1979.

In a personal communication to me, López-Palacios reports the vernacular name, "verbena negra", for this species in Colombia.

**VERBENA VILLIFOLIA** Hayek

Additional bibliography: Moldenke, Phytologia 36: 462. 1977.

Richardson refers to this plant as prostrate and found it scattered in rocky soil along roadsides, flowering in March, the corollas described as having been "blue" when fresh.

Additional citations: PERU: Junín: Richardson 2066 (N).

**VERBENA VIOLATA** Rojas

Additional bibliography: Moldenke, Phytologia 36: 462-463. 1977.

Rojas Acosta (1897) calls this plant "margarita morada".

**VERBENA WRIGHTII** A. Gray

Additional bibliography: McGregor & al., Fl. Great Plains 569. 1977; Moldenke, Phytologia 36: 463. 1977; Moldenke, Biol. Abstr. 65: 71. 1978; Moldenke, Phytologia 39: 161 (1977) and 41: 164 & 165. 1979.

Recent collectors refer to this plant as having erect stems and as "locally common to frequent on rocky slopes", "common in grassy openings in oak-juniper woodlands", "locally common around edge of intermittent ponds", and "locally common on grassland and sparse creosote-bush deserts". They have found it growing at 4400-6000 feet altitude, flowering in April, May, and July. The corollas are said to have been "pink" on Holmgren & Holmgren 7040 & 6080, "purple" on Webster 4466, and "mauve" on Dechamps 4012.

McGregor (1977) reports this species from Harding, Quay, and Union counties, New Mexico, and Cimarron and Harper counties, Oklahoma.

The Sample 420, distributed as V. wrightii, actually is V. ambrosifolia Rydb., while Edwards & Repass 4754 is V. bipinnatifida Nutt., Reskind, Henrickson, Wendt, Chiang, & Johnston 11858 is V. delticola Small, and N. H. Holmgren 6692 and Holmgren & Holmgren 6784 are V. wrightii var. intermedia Moldenke.

Additional citations: TEXAS: Brewster Co.: Webster 4466 (M). NEW MEXICO: Chaves Co.: Holmgren & Holmgren 6907 (N). Hidalgo Co.: Dechamps 4012 (Ld). ARIZONA: Graham Co.: Holmgren & Holmgren 7040 (N), 7080 (N).

**VERBENA WRIGHTII** var. **INTERMEDIA** Moldenke, *Phytologia* 39: 161. 1978.

Bibliography: Moldenke, *Phytologia* 39: 161. 1978.

The Holmgrens found this plant growing on creosotebush-mesquite-cholla deserts, at 2900--5000 feet altitude, flowering and fruiting in April, and "locally common to frequent" in pinyon-juniper-oak woodland on southwest-facing slopes. The corollas are said to have been "pink, withering blue".

Citations: ARIZONA: Pima Co.: N. H. Holmgren 6692 (N); Holmgren & Holmgren 6784 (N--type).

**VERBENA XUTHA** Lehm.

Additional bibliography: Moldenke, *Phytologia* 36: 463--464. 1977; Moldenke, *Biol. Abstr.* 63: 1852 (1977) and 65: 71. 1978; Moldenke, *Phytologia* 41: 171 & 173. 1979.

Recent collectors refer to this plant as "bushy, procumbent to erect" and have found it growing among Acacia farnesiana and "in arid scrub with a purple scrophulariaceae shrub", at 2100 feet altitude. The corollas are said to have been "blue" on Killip 42107, "bluish-lavender" on Lundell 15082, "lavender" on Correll 35266 and on Correll & Correll 38983, and "pinkish-white with white throat" on Traverse 2510.

Material of this species has been misidentified and distributed in some herbaria as V. hastata L. On the other hand, the Ecology Class Univ. Texas s.n. [Palm Grove, 3.1.30], previously cited by me as V. xutha, actually represents V. runyonii Moldenke as does also Fleetwood 9526 distributed as V. xutha.

Additional citations: OKLAHOMA: McCurtain Co.: J. Taylor 22823 (Ld). TEXAS: Brazoria Co.: Killip 42107 (Au--122886). Brazos Co.: Parks s.n. [6-7-47] (Au--122890). Chambers Co.: Traverse 2510 (Ld). Galveston Co.: Correll & Correll 38983 (Ld). Lavaca Co.: Tharp, Rogers, & York 49199 (Au--122829). Liberty Co.: C. L. Lundell 15082 (Ld--287008). McLennan Co.: L. D. Smith 736 (Au--122872). Polk Co.: Correll & Correll 38819 (Ld). San Jacinto Co.: D. S. Correll 35266 (N). MEXICO: Nuevo León: Bennett, Torke, Wieder, & Dunn 612 (Au).

## ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXXXI

Harold N. Moldenke

For a detailed explanation of the herbarium acronyms employed in this paper and in all other papers in this series in this journal, see my Fifth Summary 2: 795--801 (1971).

### ERIOCAULACEAE Lindl.

**Additional & emended bibliography:** Stapf in Johnston, *Liberia* 2: 662. 1906; Koidz., *Icon. Pl. Koisak.* 1: 157, pl. 79. 1913; Matsum., *Icon. Pl. Koisikav.* 1: 158, pl. 79. 1913; Lecomte, *Bull. Soc. Bot. Lyon.* 38: 114. 1914; Ule, *Engl. Bot. Jahrb.* 52, Beibl. 115: 42--53. 1914; Fedde & Schust., *Justs Bot. Jahresber.* 41: 13. 1916; Koidz., *Feddes Repert. Spec. Nov.* 15: 174. 1918; Fedde & Schust., *Justs Bot. Jahresber.* 42: 12--13. 1920; Wangerin, *Justs Bot. Jahresber.* 42: 395. 1921; Haines, *Bot. Bihar & Orissa*, ed. 1, 6: 1066--1071. 1924; Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 1, 2: 324 & 326--328, fig. 292. 1931; Bond, *Wild Fls. Ceyl. Hills* xiii, 232--233, & 239, pl. 120. 1953; Haines, *Bot. Bihar & Orissa*, ed. 2, 3: 1114--1120. 1961; Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 57--67 & 540, fig. 336--339. 1968; Anon., *Bibliog. Agricult.* 35: 174 & 425. 1971; Fonseca & Vinasithamby, *Prov. List Local Names Flow. Pl. Ceyl.* 29, 49, & 70. 1971; Shosteck, *Flow. & Pl.* 208. 1974; Hocking, *Excerpt. Bot. A.25:* 378--380 (1975) and *A.26:* 29 & 89--90. 1975; Spellman, Dwyer, & Davidse, *Rhodora* 77: 124. 1975; Bouchard & Hay, *Rhodora* 78: 256. 1976; Hocking, *Excerpt. Bot. A.25:* 378--380 (1975), *A.26:* 29 & 89--90 (1975), and *A.28:* 170, 171, & 259. 1976; Cleens & De Ley, *Bot. Rev.* 42: 403. 1976; Kral, *Rhodora* 78: 444. 1976; Moldenke, *Biol. Abstr.* 61: 4884. 1976; Moldenke in Steyerm. & Brewer-Carías, *Bol. Soc. Venez. Cienc. Nat.* 132/133: 281--286, fig. 3 & 4. 1976; Monteiro-Scanavacca & Mazzoni, *Bol. Bot. Univ. S. Paulo* 4: [105]--111, fig. 1--16. 1976; Monteiro-Scanavacca, Mazzoni, & Giulietti, *Bol. Bot. Univ. S. Paulo* 4: [61]--72, fig. 1--14. 1976; Rogerson & Becker, *Bull. Torrey Bot. Club* 103: 192. 1976; Steyerm. & Brewer-Carías, *Bol. Soc. Venez. Cienc. Nat.* 132/133: 181--183, 197, 199, 200, 237, & 240. 1976; Batson, *Gen. East. Pl.* 40, 191, 195, & 201. 1977; "M. P. B." [Moldenke], *Biol. Abstr.* 63: 6594. 1977; Lelong, *Sida* 7: 127. 1977; Moldenke, *Biol. Abstr.* 63: 2452, 2461, 3041, & 6590 (1977) and 64: 686, 1838, 2433, 2445, 4787, 5384, & 6581. 1977; Moldenke, *Phytologia* 36: 468--497, 501--504, 506--508, 510, & 511 (1977), 37: 22--58, 68--97, 252--275, 420--423, 485--499, 504, 506, & 508--512 (1977), and 38: 23--50 & 118--134. 1977; H. N. & A. L. Moldenke, *Cord. Greet.* 1 & 4. 1977; Noblick, *Annot. List Herb. Spec. M. Mitch. Assoc.* 81 & 218. 1977; Periasamy, *Proc. India Acad. Sci.* 868: 11. 1977; Poole, *Rhodora* 79: 312. 1977; Poppeton, Shuey, & Sweet, *Fla. Scient.* 40: 372. 1977; Richardson,

Fla. Scient. 40: 302 & 303. 1977; Rogerson, Becker, & Prince, Bull. Torrey Bot. Club 104: 410. 1977; B. C. Stone, Henderson's Malay. Wild Fls. Append. 23. 1977; Stuckey & Roberts, Sida 7: 32. 1977; J. Taylor, Cat. Vasc. Aquat. Wetl. Pl. Okla. [Herb. SE. Okla. St. Univ. Publ. 1:] 24, 49, 54, & 59. 1977; Anon., Biol. Abstr. 65 (8): C.22. 1978; Anon., Roy. Bot. Gard. Kew. Lib. Curr. Aware. List 7: 29 (1978) and 8: 33. 1978; Curtin in Lapedes, Mc Graw-Hill Dict. Scient. Techn. Terms, ed. 2, 555. 1978; Eiten, Vegetatio 36: 174. 1978; Moldenke, Biol. Abstr. 65: 78, 3117, 3719, & 4341. 1978; Moldenke, Phytologia 38: 178—202, 506, 507, 509, & 511 (1978), 39: 161, 510, & 512 (1978), 40: 261, 316, 509, & 511 (1978), and 41: 10. 1978; Rogerson, Becker, & Prince, Bull. Torrey Bot. Club 105: 83—84 & 164. 1978; Satake, Journ. Jap. Bot. 53: 107—111, fig. 1 & 2. 1978; Scoggan, Fl. Canada 2: 459. 1978.

Curtin (1978) gives an interesting "definition" of this family of plants: "an order of monocotyledonous plants in the Subclass Commelinidae, having a perianth reduced or lacking, and having unisexual flowers aggregated on a long peduncle". He uses the Order name Eriocaulales.

#### **BLASTOCAULON Ruhl.**

Additional bibliography: Moldenke, Biol. Abstr. 64: 686. 1977; Moldenke, Phytologia 36: 469 & 501 (1977) and 37: 78 & 504. 1977; Moldenke, Biol. Abstr. 65: 78. 1978.

#### **BLASTOCAULON ALBIDUM (G. Gardn.) Ruhl.**

Additional bibliography: Moldenke, Phytologia 34: 391. 1976.  
Additional citations: BRAZIL: Minas Gerais: Mexia 5779 (Au—26721).

#### **BLASTOCAULON RUPESTRE (G. Gardn.) Ruhl.**

Additional bibliography: Moldenke, Phytologia 34: 391 (1976) and 37: 78. 1977.  
Additional citations: BRAZIL: Minas Gerais: Mexia 5780 (Au—26801).

#### **CARPTOTEPALA Moldenke**

Additional bibliography: Moldenke, Phytologia 36: 469 & 502. 1977; Moldenke, Biol. Abstr. 64: 686 (1977) and 65: 78. 1978.

#### **COMANTHERA L. B. Sm.**

Additional bibliography: Moldenke, Phytologia 36: 469 & 503 (1977) and 37: 493. 1977; Moldenke, Biol. Abstr. 64: 686 (1977) and 65: 78. 1978.

#### **COMANTHERA KEGELIANA (Körn.) Moldenke**

Additional bibliography: Moldenke, Phytologia 36: 469 (1977) and 37: 493. 1977; Moldenke, Biol. Abstr. 65: 78. 1978.

#### **ERIOCAULON Gron.**

Additional & amended bibliography: Stapf in Johnston, Liberia 2:

662. 1906; Fedde & Schust., Justs Bot. Jahresber. 41: 13. 1916; Koidz., Feddes Repert. Spec. Nov. 15: 174. 1918; Fedde & Schust., Justs Bot. Jahresber. 42: 12—13. 1920; Haines, Bot. Bihar & Orissa, ed. 1, 6: 1066—1071. 1924; Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 324 & 326—327. 1931; Bond, Wild Fls. Ceyl. Hills xiii, 232—233, & 239, pl. 120. 1953; R. C. Foster, Contrib. Gray Herb. 184: 39. 1958; Haines, Bot. Bihar & Orissa, ed. 2, 3: 1114—1120. 1961; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 57—64, fig. 336—338. 1968; Fonseka & Vinasithamby, Prov. List Local Names Flow. Pl. Ceyl. 29, 49, & 70. 1971; Shosteck, Flow. & Pl. 208. 1974; Spellman, Dwyer, & Davidse, Rhodora 77: 124. 1975; Hocking, Excerpt. Bot. A.25: 378 & 479 (1975) and A.28: 170. 1976; Bouchard & Hay, Rhodora 78: 256. 1976; Mold. in Steyerl. & Brewer-Carias, Bol. Soc. Venez. Cienc. Nat. 132/133: 281. 1976; Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: 65 & 66. 1976; Batson, Gen. East. Pl. 40 & 191. 1977; Lelong, Sida 7: 127. 1977; Moldenke, Biol. Abstr. 63: 2461 (1977) and 64: 686. 1977; Moldenke, Phytologia 36: 469—493 & 504 (1977), 37: 24, 26, 30, 31, 45, 50, 55, 58, 69, 76, 77, 79, 80, 87—89, 257, 263, 264, 271, 272, 422, 423, 485—489, 496, & 506 (1977) and 38: 23, 26, 39, 40, 46, 47, 118, 120, 126, 129, 131, & 132. 1977; Noblick, Annot. List Herb. Spec. M. Mitch. Assoc. 81 & 218. 1977; Poppeton, Shuey, & Sweet, Fla. Scient. 40: 372. 1977; Richardson, Fla. Scient. 40: 302. 1977; Stuckey & Roberts, Sida 7: 32. 1977; Periasamy, Proc. Indian Acad. Sci. 868: 11. 1977; B. C. Stone, Henderson's Malay. Wild Fls. Append. 23. 1977; J. Taylor, Cat. Vasc. Aquat. Wetl. Pl. Okla. [Herb. SE. Okla. St. Univ. Publ. 1:] 24, 49, 54, & 59. 1977; Craig, Proc. Fla. State Hortic. Soc. 90: 110. 1978; Moldenke, Biol. Abstr. 65: 78. 1978; Moldenke, Phytologia 38: 180, 190—192, 203, & 506. 1978; Satake, Journ. Jap. Bot. 53: 110. 1978; Scoggan, Fl. Canada 2: 459. 1978.

The W. V. Brown s.n. [June 18, 1941] and Taylor & Taylor 5215, distributed as Eriocaulon sp., actually are Lachnocaulon beyrichi-amm Sporleder, while Cardona Puig 2864 is a species of Xyris.

#### **ERIOCAULON ABYSSINICUM** Hochst.

Additional & emended bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 326. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 61, & 63, fig. 338/19. 1968; Moldenke, Phytologia 34: 392. 1976.

Additional illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 61, fig. 338/19. 1968.

Meikle (1968) characterizes this species as "Small and inconspicuous; scapes few, 1 1/2 — 3 1/2 in. high; leaves narrowly subulate; capitula greyish-fuscous, subglobose, 2—3 mm. diam.", citing Hesper 1126 and Lely P.786 from Northern Nigeria, listing it also from Ethiopia, Kenya, Uganda, Tanzania, Rhodesia, and South Africa, flowering in October.

**ERIOCAULON ACHITON** Körn.

Additional & emended bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1067 & 1070—1071 (1924) and ed. 2, 3: 1115 & 1119. 1961; Moldenke, Phytologia 36: 470. 1977; Moldenke, Biol. Abstr. 65: 78. 1978.

**ERIOCAULON ADAMESII** Meikle

Additional & emended bibliography: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 61, & 64, fig. 338/26. 1968; Moldenke, Phytologia 29: 87. 1974.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 61, fig. 338/26. 1968.

Meikle (1968) characterizes this species as a "Slender annual; scapes erect, to about 4 in. high; leaves numerous, narrowly subulate; capitula globose, 2—3.5 mm. diam., greenish, without noticeable involucre bracts", citing Adames 91, 97, & s.n. [Herb. Deighton 4151], Deighton 5630, Dinklage 3009, Harvey 112, and Jordan 621, all from Sierra Leone, flowering in January and from September to November.

**ERIOCAULON AFZELIANUM** Wikstr.

Additional synonymy: Eriocaulon heterochiton Lecomte (in part) apud Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 62, in syn. 1968 [not E. heterochiton Körn., 1867, nor "sensu Lecomte", 1968, nor A. Chev., 1959].

Additional bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 326 & 327. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 59, & 62—63, fig. 336/10. 1968; Moldenke, Phytologia 34: 392. 1976.

Illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 59, fig. 336/10. 1968.

Meikle (1968) includes here as synonyms E. kouroussense Lecomte and E. heterochiton Lecomte, in part (not E. heterochiton Körn.). He characterizes the species as having "Scapes erect, few to numerous, peduncles shining, pale brown, capitula depressed-globose, to about 5 mm. diam., involucre bracts pale brownish". He cites the following collections: SENEGAL: Berhaut 6633 & 6769, Raynal 6795. GUINEA: Chevalier 1881obis, Jacques-Félix 7327, Pobéguin 615, Schnell 7448. SIERRA LEONE: Adames 246, Afzelius s.n., Dawe 417, Jordan 163, Melville & Hooker 283. IVORY COAST: DeWilde 937. GHANA: Hall CC.905, Harris s.n., Morton GC.9823b, Vigne FH.4607. NIGERIA: Northern: Barter 1019, Hepper 1236. Southern: Stanfield 561. He lists the species also from Chad.

The "E. heterochiton sensu Lecomte" of Meikle (1968) is E. irregulare Meikle, while the E. heterochiton of Chevalier is E. plumale N. E. Br.

**ERIOCAULON ALPINUM** Van Royen

Additional bibliography: Moldenke, Phytologia 34: 393. 1976.

Recent collectors describe this plant as having leaves "mid- to dark-green, shiny or semi-glossy", the "flowers light-green" or the "corolla more or less colorless, anthers black", the roots white, forming small, flat, hard mats in Gleichenia vulcanica dominated subalpine recently fired bogs or forming hard compact cushions extending under water in hard cushion bogs surrounding tarns, the submerged leaves larger, darker, and more attenuate, at 3000--3300 meters altitude, flowering in April and May.

Additional citations: NEW GUINEA: Territory of New Guinea: Barker LAE.66938 (Mu); Croft & Leleal LAE.65869 (Mu).

#### ERIOCAULON ANGUSTIFOLIUM Körn.

Additional bibliography: Moldenke, *Phytologia* 32: 464. 1975.

Recent collectors describe this plant as an aquatic herb in very slowly running water to 1 meter deep, the leaves submerged, and the flowers borne only about 3 cm. above the water level. They have found it in flower and fruit in September.

Additional citations: BRAZIL: Goiás: Haas, Haas, & Belém 227 [Herb. Brad. 49021] (N).

#### ERIOCAULON AQUATICUM (J. Hill) Druce

Additional bibliography: Moldenke, *Phytologia* 36: 471. 1977; Scoggan, *Fl. Canada* 2: 459. 1978.

#### ERIOCAULON ARGENTINUM Castell.

Additional bibliography: Moldenke, *Phytologia* 36: 471 & 480. 1977.

Additional citations: ARGENTINA: Corrientes: Krapovickas, Cris-tóbal, Arbo, Maruñak, Maruñak, & Irigoyen 17252 (Id).

#### ERIOCAULON ATRATUM Körn.

Additional bibliography: Moldenke, *Phytologia* 36: 472. 1977.

Hepper refers to this plant as "shortly tufted" and encountered it "in wet flush with melastomaceous shrubs" at 6300 feet altitude.

Additional citations: SRI LANKA: Hepper 4428 (N); Sohmer & Sumithraarachchi 9863 (N).

#### ERIOCAULON ATRATUM var. MAJOR Thwaites

Additional bibliography: Moldenke, *Phytologia* 36: 472. 1977

Recent collectors describe this plant as an herb, 33 cm. tall, the flower-heads white or fuscous, and found it growing in montane or in secondary montane forests, at 1700--1735 meters altitude, flowering in February and December.

Additional citations: SRI LANKA: Bernardi 16091 (W--2876012); Waas 1138 (W--2769021).

#### ERIOCAULON BENTHAMII Kunth

Additional bibliography: Moldenke, *Phytologia* 36: 473. 1977.

Additional citations: MEXICO: Jalisco: R. McVaugh 20473 (Au--

263333). Michoacán: Barkley, Paxson, & Webster 2736 (Au-166193); Iltis, Koeppen, & Iltis 409 (Au--226948).

**ERIOCAULON BIFISTULOSUM** Van Heurck & Muell.-Arg.

Additional & emended bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 326. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 62. 1968; Moldenke, Phytologia 34: 395. 1976.

Additional illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 60, fig. 337/9. 1968.

Hutchinson & Dalziel (1931) characterize this species as "An almost submerged aquatic in swamps" and cite Barter 1021, Caille s.n. [Herb. Chevalier 14958], Chevalier 22251, and Lane-Poole 431 from French Guinea, Sierra Leone, Ivory Coast, Northern Nigeria, Sudan, and Rhodesia, flowering in March, August, September, and November. Meikle (1968) adopts E. setaceum L. as the proper name for the species; in fact, he regards E. limosum Engl. & Ruhl., E. bifistulosum Van Heurck & Muell.-Arg., and E. melanocephalum Kunth as synonyms of E. setaceum L., characterizing the species as a "Floating aquatic; stems elongate, clothed with numerous filiform leaves; scapes generally numerous; capitula blackish, small, seldom exceeding 4 mm. diam." He cites the following African collections: SENEGAL: Berhaut 6502. MALI: Davey 22, Monod s.n. GUINEA BISSAU: Esp. Santo 2195. GUINEA: Adames 374, Jacques-Félix 7361, Schnell 7056. SIERRA LEONE: Adames 94, Deighton 2794, Jordan 815, Marmo 226. LIBERIA: Adames 566. GHANA: Hall CC.431. NIGERIA: Northern: Barter 1021, Hepper 1030, Latilo & Daramola FHI.28884, Lawlor & Hall 441. He lists it as flowering from August to December and in February.

**ERIOCAULON BONGENSE** Engl. & Ruhl.

Additional & emended bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 325-327. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 61, & 63, fig. 338/18. 1968; Moldenke, Phytologia 29: 94 (1974) and 31: 397. 1975.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 61, fig. 338/18. 1968.

Meikle (1968) says of this species: "Plants robust, sometimes 1 ft. high; leaves rather few; capitula depressed-globose or sometimes subconical when fully mature, 5-8 mm. diam.; involucrel bracts stramineous, flowers and floral bracts shining silvery-grey". He cites the following collections: SENEGAL: Berhaut 6662, Dawe 23. GHANA: Adams & Akpabla 4155, 4398, Hall CC.905a, Morton GC.6272. NIGERIA: Northern: Barter 1019a, Dalziel 239, Meikle 1015. Southern: Daramola FHI.438, Stanfield 55, 132, 133. He lists it also from the Sudan and Central African Empire.



**ERIOCAULON BREVISCAPUM** Körn.

Additional bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 1068 (1924) and ed. 2, 3: 1116. 1961; Moldenke, Phytologia 36: 473. 1977.

**ERIOCAULON BROWNIANUM** Mart.

Additional & emended bibliography: Bond, Wild Fls. Ceyl. Hills xiii, 232, 233, & 239, pl. 120. 1953; Moldenke, Phytologia 36: 473—474, 485, & 493. 1977.

Emended illustrations: Bond, Wild Fls. Ceyl. Hills 233, pl. 120. 1953.

**ERIOCAULON BROWNIANUM** var. **LATIFOLIUM** Moldenke

Additional bibliography: Moldenke, Phytologia 36: 473—474. 1977.

Additional citations: SRI LANKA: Hepper 4418 (Ac).

**ERIOCAULON CHRISTOPHERI** Fyson

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 42: 12. 1920; Moldenke, Phytologia 24: 349. 1972.

**ERIOCAULON CINEREUM** R. Br.

Additional & emended bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1066 & 1068 (1924) and ed. 2, 3: 1114 & 1116. 1961; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 60, & 63, fig. 337/21. 1968; Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 540. 1972; Moldenke, Biol. Abstr. 64: 686. 1977; Moldenke, Phytologia 36: 474 & 492 (1977), 37: 422 & 423 (1977), and 38: 46 & 47. 1977.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 60, fig. 337/21. 1968.

In regard to the Nelson 1173, cited below, the collector describes it as having "leaves basal, stems fine, to 3 1/2 inches high, inflorescence whitish, common in mud in low-lying swamp in creek-bed". It was in flower and fruit in June. Miss Sheila S. Hooper, at Kew, writes in a letter to me dated July 11, 1977: "The heads are smaller than in the type of E. ciliiflorum but the floral structure agrees." In regards to Dunlop 3388, previously cited as E. schultzi Benth., the collector notes that it was growing as an "annual in organic sludge in rock hole in sandstone conglomerate. It was found in flower and fruit in February and Miss Hooper says of it: "NOT completely matched. It can not be E. schultzi because the anthers are yellow not black and the flowers and seeds are much smaller. It looks rather like E. monoscapum but the anthers are black there too. A specimen which someone has labelled cf. sieboldianum seems close".

Meikle (1968) describes E. cinereum as having "Scapes slender, usually less than 4 in. high; leaves numerous, setaceous; capitula small, about 2.4—3 mm. diam.; brownish or fuscous", re-

ording it from "Chad, Tanzania, tropical Asia, China, Japan and Australia" and citing the following collections: SENEGAL: Heudelot 677. MALI: DeWailly 5002, 5006a, Jaeger 5581. GUINEA: Maclaud 03.9.105, Pitot s.n. SIERRA LEONE: Jordan 943. GHANA: Hall CC. 742, CC.885, Hinds 5005. He regards as synonyms E. sieboldianum Sieb. & Zucc. and E. heudelotii N. E. Br.

Wirawan reports E. cinereum common along margins of villus and refers to the heads as white.

Additional citations: LOUISIANA: Vermilion Par.: R. H. Blanchet s.n. [14 October 1970] (Ld). SRI LANKA: Moldenke, Moldenke, & Albert 28320 (Ld); Wirawan 1018 (N). AUSTRALIA: Northern Territory: C. Dunlop 3388 (Z); D. J. Nelson 1173 [Herb. North. Terr. 11305] (Z).

#### ERIOCAULON COLLINUM Hook. f.

Additional & emended bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1066 & 1069 (1924) and ed. 2, 3: 1114 & 1117. 1961; Hocking, Excerpt. Bot. A.25: 379. 1975; Moldenke, Phytologia 36: 475 & 492. 1977.

Additional citations: SRI LANKA: Sohmer & Sumithraarachchi 10029 (N).

#### ERIOCAULON COMPRESSUM Lam.

Additional bibliography: Moldenke, Phytologia 36: 475 (1977) and 37: 271 & 272. 1977; Poppeton, Shuey, & Sweet, Fl. Scient. 40: 372. 1977.

Lakela and her associates assert that in the Tampa Bay area of Florida this species grows in "wet soil and shallow waters [of] swamps", flowering in summer. They call it the "lesser pipewort".

The R. McVaugh 8456, W. P. Rhodes s.n. [August 1925], and Turner 68, distributed as E. compressum, actually are E. decangulare f. parviceps Moldenke.

Additional citations: SOUTH CAROLINA: Berkeley Co.: Ahles, Radford, Ornduff, & Baker 56515 (Ld). Jasper Co.: Ahles, Radford, & Ornduff 56507 (Au—218439). FLORIDA: Jackson Co.: Hood 1551 (Au—26757). Martin Co.: Correll & Popenoe 48037 (Ld). Walton Co.: R. Kral 19844 (Au—245598); Taylor & Taylor 5255a (Ld). LOUISIANA: Saint Tammany Par.: R. Kral 16508 (Ld). TEXAS: Hardin Co.: G. E. Watson s.n. [March 15, 1971] (Ld).

#### ERIOCAULON COMPRESSUM var. HARPERI Moldenke

Additional bibliography: Moldenke, Phytologia 32: 470. 1975.

Recent collectors have encountered this plant "in grassy openings adjacent to streams with Acer, Cyrilla, Taxodium, and Nyssa biflora", as well as in pine barrens.

The Blake 10665, previously cited by me as E. compressum var. harperi, may actually represent E. decangulare f. parviceps Moldenke.

Additional citations: FLORIDA: Bay Co.: R. Kral 19800 (Au—245582). Escambia Co.: R. Kral 19880 (Au—245553, Ld). Walton Co.: R. Kral 19808 (Au—245550, Ld). ALABAMA: Baldwin Co.: Crockett 438 (Ld). Mobile Co.: R. Kral 26526 (Au—245572). MISSISSIPPI: George Co.: R. Kral 19854 (Au—245584). Jackson Co.: Demaree 28664 (Au—26758). LOUISIANA: Saint Tammary Par.: Thieret 19753 (Ld).

#### ERIOCAULON DALZELLII Körn.

Additional & emended bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1066—1068 (1924) and ed. 2, 3: 1114—1116. 1961; Hocking, Excerpt. Bot. A.25: 379. 1975; Moldenke, Phytologia 36: 474 & 476. 1977.

#### ERIOCAULON DECANGULARE L.

Additional bibliography: Lelong, Sida 7: 127. 1977; Moldenke, Phytologia 36: 476 & 490. 1977; Richardson, Fla. Scient. 40: 302. 1977; J. Taylor, Cat. Vasc. Aquat. Wetl. Pl. Okla. [Herb. SE. Okla. St. Univ. Publ. 1:] 24. 1977; Scoggan, Fl. Canada 2: 459. 1978.

Lelong (1977) found this species "infrequent" along pond margins. Other recent collectors have found it growing in "borrow-pits in chalky rock", by ponds, and "common in moist sandy soil and seasonally wet depressions". The label on Lundell & Lundell 11902, in the Austin herbarium, states "perennial herb, corolla yellow, anthers orange", undoubtedly due to some error in transcription from fieldbook notes.

The N. C. Henderson 63-1136, distributed as typical E. decangulare, seems better placed as var. latifolium Chapm., while Lundell & Lundell 12954 is var. minor Moldenke, and Blake 7989 & 10665, Cory 49945, Gould & Leinweber 6532, C. L. Lundell 11793, Lundell & Lundell 11527, Shacklette 7150, J. Taylor 22110, Tharp, Gimbrede, & Yang 51-1449, and Tharp, Turner, & Johnston 54922 are f. parviceps Moldenke.

Additional citations: NEW JERSEY: County undetermined: Knieskern s.n. (Mi). NORTH CAROLINA: Brunswick Co.: Godfrey 48396 (Ld). Carteret Co.: Helms & Helms 1188 (Au—272136, Ld). Columbus Co.: W. V. Brown s.n. [August 13, 1941] (Au—217136). Craven Co.: W. V. Brown 2338 (Au—26752). SOUTH CAROLINA: Berkeley Co.: Ahles & Haesloop 26429 (Ld). Darlington Co.: Radford & Stewart 397 (Au—26754). Hampton Co.: Bell 3891 (Au—179631). GEORGIA: Glynn Co.: W. V. Brown s.n. [June 22, 1940] (Au—211573). Blackbeard Island: Duncan 20365 (Au—164915, Mi). FLORIDA: Escambia Co.: M. Morgan P.1 (Au—20352, Au—232212). Hernando Co.: Howard 12953 (Au—26760). Hillsborough Co.: Lakela 24288 (Ld); Ray, Lakela, & Patman 10062 (Ld—68000). Martin Co.: Correll & Popenoe 48038 (Ld). Orange Co.: Howard 12953 (Mi). Taylor Co.: Lazor 3748 (Ld). ALABAMA: Pike Co.: Leland 21 (Au—26745). MISSISSIPPI: Harrison Co.: Demaree 29766 (Au—26755, Au—26756), 32447a (Au—26746). Jackson Co.: Demaree 32202 (Au—26747); A. S. Seymour 16 (Au—26743),

91831 (Au--180362). Pearl River Co.: R. Kral 17331 (Au--245564). LOUISIANA: Vernon Par.: R. Kral 20651 (Au--245570). TEXAS: Angelina Co.: R. S. Mitchell 4007 (Ld). Bastrop Co.: Duval 174 (Au--291120). Hardin Co.: Lundell & Lundell 11482 (Ld--288861), 11902 (Ld, Ld).

**ERIOCAULON DECANGULARE var. LATIFOLIUM** Chapm.

Additional bibliography: Moldenke, *Phytologia* 29: 103, 107, & 109. 1974.

Recent collectors have found this plant growing in roadside ditches. Additional citations: FLORIDA: Wakulla Co.: N. C. Henderson 63-1136 (Au--229896).

**ERIOCAULON DECANGULARE var. MINOR** Moldenke

Additional bibliography: Moldenke, *Phytologia* 29: 107 & 109. 1974.

Recent collectors have found this plant growing in moist places in bogs, "abundant in peatbogs surrounded by hardwood and tupelo woodland with Sisyrinchium, Sarracenia, Carex, and Xyris", "occasional in marsh areas with scattered trees and hillside seepage from springs", "in peatbogs associated with Sarracenia, Iris, and Myrica", in marshes and bogs, and "scattered but frequent in muck with Sphagnum and Sarracenia". The flowers are described as "white" on Crutchfield 2640 and Nixon & Chambless 1848. The plant has been collected in anthesis and fruit in May. The heads are rather stiff and hard on Kral 17208, much more like those of f. parviceps Moldenke.

The Lundell & Lundell 12954, cited below, was previously cited by me as typical E. decangulare before the present taxon was recognized.

Additional & amended citations: LOUISIANA: Beauregard Par.: R. Kral 17208 (Au--245568). Vernon Par.: R. Kral 17223 (Au--245567). TEXAS: Freestone Co.: Lundell & Lundell 12954 (Ld, Ld). Hardin Co.: D. S. Correll 32965 (Ld). Jasper Co.: Nixon & Chambless 1848 (Ld). Leon Co.: Crutchfield 2640 (Ld). Robertson Co.: Massey 911 (Ld); McCaleb 92 (Au--26775); Rowell 8071 (Au--26772); Waddle 298 (Au--194568).

**ERIOCAULON DECANGULARE f. PARVICEPS** Moldenke

Additional bibliography: Moldenke, *Phytologia* 36: 476. 1977.

Recent collectors have encountered this plant along the marshy edges of brooks in pinelands, "in severely cutover longleaf pine 'crayfish flats' with much myrtle and sweetgum shrubbery", at the edges of swamps in pinelands, in wet pinelands, in clumps on savannas, in savanna-evergreen shrub bogs", "abundant in sandy soil along brooks in cutover longleaf pine woods", "abundant in ditches bordering Muhlenbergia-Arundinaria grass savannas with some Clethra and Cyrilla", "frequent in Sarracenia bogs", "in Sphagnum bogs in forests on hillsides", "common in marshy areas", in bogs and "adjacent areas in Antlers Sand formation [Oklahoma]", roadside pools, pine-palmetto swamps, and "abundant in saturated soil, muck, or standing water of bogs in sun or shade with Myrica, Xyris, Rhexia, and Sarracenia". It has been found flowering and fruit-

ing from May to October. The heads are described as "white", "whitish" or "bright-white". The vernacular name, "pipewort", is recorded. The Shacklette 7150, collected "in sandy muck soil and dense shade of swamp forest", has flower-heads which have pressed flat, much like those of E. compressum Lam.

Material of this taxon has been distributed in many herbaria as E. compressum Lam., E. compressum var. harperi Moldenke, E. decangulare L., E. texense Körn., and Lachnocaulon anceps "(Walt.) Moray". Of the collections cited below Blake 10665 was previously incorrectly cited by me as E. compressum var. harperi Moldenke, Tharp, Turner, & Johnston 54954 as E. texense Körn., and Cory 49945, Gould & Leinweber 6532, Lundell 11793, Lundell & Lundell 11527, Tharp, Gimbrede, & Yang 51-1149, and Tharp, Turner, & Johnston 54922 as typical E. decangulare L. Taylor & Taylor 24563 is a mixture with grasses and other vegetation.

Additional & emended citations: MARYLAND: Prince Georges Co.: Blake 7989 (Ca—841791, Ld), 10665 (Du—167971, Gg—163954, Gg—207025, I, Ld, Mg, Or—22061, Fl—65180, Fl—172502, S); A. Chase 3824 (Mi, Mi). NORTH CAROLINA: Alexander Co.: Radford & Stewart 1657 (Au—26753). Jones Co.: W. V. Brown s.n. [June 20, 1940] (Au—217128). New Hanover Co.: Williamson s.n. [Wilmington, 1892] (Ld). Pender Co.: H. F. L. Rock 631 (Au—26751). GEORGIA: Emanuel Co.: Shacklette 7150 (Mi). Jeff Davis Co.: Shacklette 6919 (Mi), 7121 (Mi). Wilcox Co.: W. P. Rhodes s.n. [August 1925] (Au—188369). LOUISIANA: Allen Par.: R. Kral 20970 (Au—245565). Vernon Par.: R. McVaugh 8456 (Au—26744). OKLAHOMA: Pushmataha Co.: J. Taylor 22110 (Ld), 22410 (N); Taylor & Taylor 24563 in part (N). TEXAS: Anderson Co.: Marsh 250 (Au—26723), 271 (Au—23722); Tharp & Graham 57-6 (Au—32802). Freestone Co.: Lundell & Lundell 12954 (Ld, Ld). Hardin Co.: Lundell & Lundell 11527 (Ld—288850, Ld), 11902 (Ld); Tharp 50-116 (Au—26736); Tharp, Gimbrede, & Yang 51-1149 (Au—25002, Ms—11031); Tharp & Tyson s.n. [6/27/52] (Au—26782); Tharp, Turner, & Johnston 54922 (Au—26728, St). Jasper Co.: C. L. Lundell 11793 (Ld); Turner 68 (Au—229753). Robertson Co.: Massey 372 (Ld); Webster & Rowell 1903 (Au—26777). San Augustine Co.: Gould & Leinweber 6532 (Au—26730, Ca—978707). Tyler Co.: D. S. Correll 35842 (Ld); Correll & Correll 36026 (Ld); Cory 49945 in part (Au—26727, Ca—754800); Tharp, Turner, & Houston 54954 (Au—26729, St); Webster & Wilbur 3199 (Au—194272).

#### ERIOCAULON DEIGHTONII Meikle

Additional & emended bibliography: Meikle in Hutchins. & Dals., Fl. W. Trop. Afr., ed. 2, 3: 59, 62, & 63, fig. 336/15. 1968; Moldenke, Phytologia 32: 489. 1976.

Emended illustrations: Meikle in Hutchins. & Dals., Fl. W. Trop. Afr., ed. 2, 3: 59, fig. 336/15. 1968.

Meikle (1968) describes this species as having "Scapes very ma-

merous; leaves numerous, narrow, subulate; capitula subglobose, about 4 mm. diam.; involucrel bracts inconspicuous", citing the following collections: GUINEA: Chillou 726; Pitot s.n. SIERRA LEONE: Adames 245, 881; Deighton 2795; Jordan 533, 574. They have found it in flower in September and October.

**ERIOCAULON DIAGUISSENSE** Bourdu

This taxon has now been reduced to synonymy under E. sessile Meikle, which see.

**ERIOCAULON DIANAE** Fyson

Additional bibliography: Moldenke, *Phytologia* 32: 489—490 (1976) and 34: 392 & 399. 1976.

Recent collectors describe this plant as having the "heads flat, grayish" and being a "light-green plant". They have encountered it at 400 meters altitude in disturbed evergreen forests on moist impervious hardpan, inhabiting open wet places along roadsides.

Additional citations: THAILAND: Beusekom & Smitinand 2129 (Ac).

**ERIOCAULON ECHINULATUM** Mart.

Additional bibliography: Moldenke, *Phytologia* 36: 478 & 481. 1977.

Recent collectors describe this plant as being light-green, the heads pale yellowish-brown, and found it to be "common on moist impervious hardpan", at 400 meters altitude, growing in association with E. smitinandi Moldenke

Additional citations: THAILAND: Beusekom & Smitinand 2143 (Ac).

**ERIOCAULON EDWARDII** Fyson

Additional & emended bibliography: Haines, *Bot. Bihar & Orissa*, ed. 1, 6: 1067, 1070, & 1071 (1924) and ed. 2, 3: 1115, 1118, & 1119. 1961: Moldenke, *Phytologia* 29: 195. 1974.

**ERIOCAULON EDWARDII** var. **CLARKEI** Haines

Additional & emended bibliography: Haines, *Bot. Bihar & Orissa*, ed. 1, 6: 1071 (1924) and ed. 2, 3: 1119—1120. 1961; Moldenke, *Phytologia* 24: 358. 1972.

**ERIOCAULON EHRENBERGIANUM** Klotzsch

Additional bibliography: Moldenke, *Phytologia* 36: 478 & 483. 1977.

Additional citations: MEXICO: Chiapas: Breedlove 9240 (Id).

**ERIOCAULON ELEGANTULUM** Engl.

Additional & emended bibliography: Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 58, 59, & 63, fig. 336/14. 1968; Moldenke, *Phytologia* 29: 195—196 & 235. 1974.

Emended illustrations: Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 59, fig. 336/14. 1968.

Meikle (1968) characterizes this species as having "Scapes generally numerous, erect; capitula quite globose, about 4 mm. diam.,

white-papillose, without any visible involucre bracts", citing Hall 3729 and Morton GC.6250b from Ghana and Onochie s.n. from Southern Nigeria. He lists the species also from Sudan, Tanzania, Mozambique, and Rhodesia, flowering in July, August, and December.

**ERIOCAULON FLUVIATILE** Trimen

Additional bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1068 (1924) and ed. 2, 3: 1116. 1961; Moldenke, Phytologia 32: 492 (1976), 33: 14 (1976), and 34: 263. 1976.

**ERIOCAULON FULIGINOSUM** C. Wright

Additional bibliography: Spellman, Dwyer, & Davidse, Rhodora 77: 124. 1975; Moldenke, Phytologia 36: 478. 1977.

**ERIOCAULON FULVUM** N. E. Br.

Additional & emended bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 326. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 61--63, fig. 338/20. 1968; Moldenke, Phytologia 32: 493. 1976.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 61, fig. 338/20. 1968.

Meikle (1968) characterizes this species as having "Scapes usually numerous, rather rigidly erect, to about 5 in. high; leaves few, often conspicuously short; capitula subglobose, 2.5--4 mm. diam." He cites the following collections: SENEGAL: Berhaut 1175. MALI: Raynal 5202 bis; Roberty 13305. GUINEA: Roberty 16336a. GHANA: Hall CC.454, 747; Morton GC.6248. NIGERIA: Northern: Barter s.n.; Hepper 940, 985, 1060, 1236a, 1237. Southern: Stanfield 36, 54, 143, 144. He comments that it is "Closely akin to E. maculatum Schinz (S. Africa) and E. strictum Milne-Redhead (Tanzania)".

**ERIOCAULON GRISEUM** Körn.

Additional & emended bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1071 (1924) and ed. 2, 3: 1120. 1961; Moldenke, Phytologia 29: 198. 1974.

**ERIOCAULON HEUDELOTII** N. E. Br.

Additional bibliography: Hutchins. & Dalz., Fl. W. Trop. Agr., ed. 1, 2: 326. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 63. 1968; Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 540. 1972; Moldenke, Phytologia 29: 199. 1974.

Hutchinson & Dalziel (1931) cite Chevalier 33988 & 34011 and Heudelot 677 from Sénégal, flowering in November. Meikle (1968) reduces the species to synonymy under a wide-ranging E. cinereum R. Br.

**ERIOCAULON HIRSUTULUM** Moldenke

This taxon is now regarded as a synonym of Mesanthemum albidum H. Lecomte, which see.

**ERIOCAULON HUMBOLDTII** Kunth

Additional bibliography: Moldenke, *Phytologia* 36: 479—480 (1977) and 37: 88 & 89. 1977.

Recent collectors refer to this species as "locally common" in moist sandy soil of savannas (campo) and in "rocky igneous soil forming small clumps in recently burned areas", at 5500 feet altitude, flowering in November, and refer to the inflorescences as "cream"-color or "grayish-white".

Material of this species has been misidentified and distributed in some herbaria as Paepalanthus sp.

Additional citations: COLOMBIA: Vichada: Davidse & Llanos 5228 (N). VENEZUELA: Guiana: Irwin 715 (Au—173753). BRAZIL: Amapa: Murça Pires & Cavalcante 52037 (Au—250278). Roraima: Coradin & Cordeiro 987 (N).

**ERIOCAULON INFIRMUM** Steud.

Additional bibliography: Moldenke, *Phytologia* 36: 480. 1977.

Recent collectors describe this plant as having pale-green leaves and "bluish" inflorescences and have found it growing commonly in moist open places along roadsides in evergreen forests at 1200 m. altitude.

Additional citations: THAILAND: Beusekom & Charoenpol 1682 (Ac).

**ERIOCAULON INFIRMUM** var. **PUBERULENTUM** (Moldenke) Van Royen

Additional bibliography: Moldenke, *Phytologia* 34: 266, 267, 401—402, & 494. 1976.

Additional citations: GREATER SUNDA ISLANDS: Sumatra: Bartlett 7457 (Mi, W—1552243).

**ERIOCAULON INTRUSUM** Meikle

Additional & emended bibliography: Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 1, 2: 324, 326, & 327. 1931; Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 58, 60, & 62, fig. 337/2. 1968; Hepper in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 540. 1972; Moldenke, *Phytologia* 32: 496. 1976.

Emended illustrations: Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 60, fig. 337/2. 1968.

Meikle (1968) asserts that this taxon is the "E. lacteum" of F. W. T. A., ed. 1, 2: 327, not of Rendle" and characterizes it as "Each plant generally with only one scape; peduncles up to 16 in. long; capitulum white-papillose with conspicuous pale brown, blunt involucral bracts". He cites only Lely 283 from Northern Nigeria, flowering in June.

**ERIOCAULON INUNDATUM** Moldenke

Additional & emended bibliography: Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 59, 62, & 63, fig. 336/13. 1968; Moldenke, *Phytologia* 26: 459. 1973.

Emended illustrations: Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 59, fig. 336/13. 1968.

Meikle (1968) characterizes this species as having "Scapes erect,



about 4 in. high; leaves acuminate; capitula globose, pale brown, about 4 mm. diam.", citing only Monod s.n. from Sénégal, flowering in October.

#### ERIOCAULON IRREGULARE Meikle

Additional synonymy: Eriocaulon heterochiton Lecomte (in part) apud Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 63, in syn. 1968 [not E. heterochiton A. Chev., 1959, nor Körn., 1867].

Additional & emended bibliography: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 57, 60, & 62-64, fig. 337/23. 1968; Moldenke, Phytologia 32: 496. 1976.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 60, fig. 337/23. 1968.

Meikle (1968) characterizes this species as having "Scapes numerous, erect, less than 1 1/2 in. high; leaves narrowly subulate or setaceous; capitula generally less than 5 mm. diam. with whitish glossy involucre bracts". He cites the following collections: GUINEA: Adames 353; Chevalier 18488; Schnell 7379. SIERRA LEONE: Jaeger 184. The plant has been found flowering in September and October.

#### ERIOCAULON JAUENSE Moldenke

Synonymy: Eriocaulon jauense Moldenke in Steyerl. & Brewer-Carias, Bol. Soc. Venez. Cienc. Nat. 132/133: 281. 1976.

Additional bibliography: Moldenke in Steyerl. & Brewer-Carias, Bol. Soc. Venez. Cienc. Nat. 132/133: 281. 1976; Moldenke, Phytologia 36: 480. 1977.

#### ERIOCAULON JORDANI (Moldenke) Meikle

Additional synonymy: Syngonanthus jordani Moldenke apud Meikle in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 61, in syn. 1968.

Additional & emended bibliography: Meikle in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 61, & 63, fig. 338/17. 1968; Moldenke, Phytologia 32: 496-497. 1976.

Emended illustrations: Meikle in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 61, fig. 338/17. 1968.

Meikle (1968) characterizes this species as having "Scapes numerous, about 6 in. high; capitula subglobose, 5-6 mm. diam., glossy, stramineous, conspicuously echinate with protruding bracts", citing only Jordan 721 & 1051 from Sierra Leone, flowering in December and January.

#### ERIOCAULON KÖRNICKIANUM Van Heurck & Muell.-Arg.

Additional synonymy: Eriocaulon kornickianum Van Heurck, in herb.

Additional bibliography: Moldenke, Phytologia 34: 273 & 402 (1976) and 36: 30. 1977; J. Taylor, Cat. Vasc. Aquat. Pl. Okla. [Herb. SE. Okla. St. Univ. Publ. 1:] 24. 1977.

Kral says that "this is the only Eriocaulon known from the Interior Highlands province, although more populations of it have

been found in Oklahoma, Texas (It is also reported from the lower Coastal Plain of Texas)." The Taylors have encountered it in bogs "and adjacent area in [the] Antlers Sand formation" in Oklahoma, flowering and fruiting in June and July.

Additional citations: ARKANSAS: Logan Co.: R. Kral 24579 (Au, Ld). OKLAHOMA: Pushmataha Co.: J. Taylor 22421 (N, Z); Taylor & Taylor 24554 (N).

#### ERIOCAULON LATIFOLIUM J. E. Sm.

Additional synonymy: Eriocaulon thunbergii Wikstr. ex Körn., Linnaea 27: 677-679. 1856. Eriocaulon vittifolium H. Lecomte, Bull. Soc. Bot. France 55: 645-646. 1909. Eriocaulon bonani Lecomte ex Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 326, in syn. 1931. Eriocaulon natans Afzel. ex Moldenke, Résumé Suppl. 1: 17, in syn. 1959 [not E. natans F. Muell., 1875]. Eriocaulon thunbergii Wickstr. ex Koern. apud Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 640, in syn. 1972.

Additional & emended bibliography: Stapf in Johnston, Liberia 2: 662. 1906; Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 326-327. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 59, & 62, fig. 336/4. 1968; Moldenke, Phytologia 34: 402. 1976.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 59, fig. 336/4. 1968.

Meikle (1968) cites as synonyms of this species E. rivulare G. Don, E. thunbergii Wikst., E. bonani Lecomte, E. latifolium f. proliferum Moldenke, and Mesanthemum radicans Stapf [not (Benth.) Körn.] He characterizes the species as a "Robust aquatic perennial; capitula densely white-papillose, to 14 mm. diam.", citing the following collections: MALI: Chevalier 524, 803. GUINEA BISSAU: Pereira 2999. GUINEA: Adames 416; Dalziel 8247; Des Abbayes 699; Langdale-Brown 2638. SIERRA LEONE: Adames 206; Afzelius s.n.; Capstick s.n. [Herb. Deighton 5301]; Deighton 1031; Jaeger 8096; Jordan 427. LIBERIA: Adames 808; Baldwin 10091, 10946; Whyte s.n. It has been collected in flower from October to May. Meikle also lists the species from Congo and Angola.

Hutchinson & Dalziel (1931) describe the species as "Tufted, in running water; flower-heads white, listing it from French Soudan, French Guinea, Sierra Leone, and Liberia, citing Chevalier 524, 803, 13121; Dalziel 8247; Dawe 407; Deighton 1031; Lane-Poole 182; Pobéguin s.n.; Thomas 7879; Whyte s.n. They list E. vittifolium Lecomte as a synonym.

#### ERIOCAULON LATIFOLIUM f. PROLIFERUM Moldenke

Additional bibliography: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 62. 1968; Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 540. 1972; Moldenke, Phytologia 24: 470. 1972.

Meikle (1968) places this form in the synonymy of typical E. latifolium J. E. Sm.

**ERIOCAULON LEPTOPHYLLUM** Kunth

Additional bibliography: Moldenke, *Phytologia* 36: 480. 1977.

The vernacular names, "capim-manso", "capipoatinga", "gravatá-manso", and "sempre-viva-do-campo", are recorded for this species and it is said to flower from December to February.

**ERIOCAULON LEUCOMELAS** Steud.

Additional bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 42: 12. 1920; Moldenke, *Phytologia* 32: 497 (1976) and 33: 18. 1976.

**ERIOCAULON LINEARE** Small

Additional bibliography: Moldenke, *Phytologia* 36: 481. 1977.

Additional citations: GEORGIA: Baker Co.: R. Kral 27079 (N).

FLORIDA: Bay Co.: R. Kral 15671 (Au--245604). Jackson Co.: Godfrey 62934 (Au--22974). Leon Co.: Godfrey 62886 (Ld); N. C. Henderson 63-1687 (Au--229869); Kral & Godfrey 15575 (Au--245609, Ld), 15585 (Au--245605). Wakulla Co.: R. Kral 23024 (Au--245623, Ld).

**ERIOCAULON LINEARIFOLIUM** Körn.

Additional bibliography: Moldenke, *Phytologia* 36: 481. 1977.

Recent collectors have encountered this species in brejo (wet sedge meadows), flowering in July.

Additional citations: BRAZIL: Goiás: Hatschbach 40065 (Z). Mato Grosso: Hatschbach 24560 (Ld).

**ERIOCAULON LIVIDUM** F. Muell.

Additional bibliography: Moldenke, *Phytologia* 34: 402. 1976.

The Latz 3703, cited by me in 1976 as E. lividum, seems to me now better placed as E. schultzei Benth.

**ERIOCAULON LONGICUSPE** Hook. f.

Additional & emended bibliography: Thwaites & Hook. f., *Enum. Pl. Zeyl.*, imp. 1, 341 (1864) and imp. 2, 341. 1964; Hocking, *Excerpt. Bot. A.28*: 170. 1976; Moldenke, *Phytologia* 36: 472 & 481. 1977.

**ERIOCAULON LONGICUSPE** var. **ZETLANICUM** Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.28*: 170. 1976; Moldenke, *Phytologia* 32: 498 (1976), 33: 14 (1976), and 34: 263. 1976.

**ERIOCAULON LONGIPEDUNCULATUM** H. Lecomte

Additional bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 41: 13. 1916; Moldenke, *Phytologia* 24: 473. 1972.

**ERIOCAULON LUZULAEFOLIUM** Mart.

Additional bibliography: Moldenke, *Phytologia* 36: 481. 1977.

Additional citations: THAILAND: Larsen & Larsen 34463 (N).

**ERIOCAULON MACULATUM** Schinz

Additional & emended bibliography: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 63. 1968; Moldenke, Phytologia 26: 460. 1973.

Meikle (1968) avers that this species is closely allied to E. fulvum N. E. Br. and E. strictum Milne-Redhead.

**ERIOCAULON MAGNUM** Abbiatti

Additional bibliography: Moldenke, Phytologia 36: 482. 1977.

Additional citations: PARAGUAY: Krapovickas & Cristóbal 13454 (Ld--279793), 13474 (Ld--279710).

**ERIOCAULON MANFEEENSE** Meikle

Additional & emended bibliography: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 59, & 62, fig. 336/3. 1968; Moldenke, Phytologia 32: 499. 1976.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 59, fig. 336/3. 1968.

Meikle (1968) characterizes this species as "Each plant with several scapes; peduncles 1 ft. long, shining; capitula subglobose, densely white-papillose", citing from CAMEROONS: Migeod 276; Morton K.676; Richards 5245; Tamajong FHI.22107. It has been found in flower in November and March.

**ERIOCAULON MEIKLEI** Moldenke

Additional & emended bibliography: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 60, & 63, fig. 337/16. 1968; Moldenke, Phytologia 26: 460. 1973.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 60, fig. 337/16. 1968.

Meikle (1968) characterizes this species as having "Scapes usually numerous, less than 6 in high; leaves rather thick and opaque, acuminate; capitula hemispherical, pallid or fuscous, about 4--5 mm. diam., distinctly echinate with protruding bracts". He cites the following collections: SÉNÉGAL: Berhaut 6691, 6739, 6983. MALI: Chevalier 218; Monod s.n. GUINEA: Pitot s.n. NIGERIA: Northern: Hepper 1450; Meikle 1043. It has been collected in anthesis from November to February and in April.

**ERIOCAULON MICROCEPHALUM** H.B.K.

Additional bibliography: Moldenke, Phytologia 36: 479 & 482--483 (1977) and 37: 263 & 264. 1977.

Additional citations: MEXICO: Federal District: J. Rzedowski 20389 (Au--249511). México: J. Rzedowski 25963 (Ld), 25994 (Ld).

**ERIOCAULON MIQUELIANUM** var. **LUTCHUENSE** (Koidz.) T. Koyama

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 42: 13. 1920; Moldenke, Phytologia 34: 404. 1976.

**ERIOCAULON MISERUM** Körn.

Additional bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1068 (1924) and ed. 2, 3: 1116. 1961; Moldenke, Phytologia 36: 483. 1977.

**ERIOCAULON MISSIONUM** Castell.

Additional bibliography: Moldenke, Phytologia 32: 501. 1976.  
Additional citations: ARGENTINA: Misiones: Ekman 1909 (Ld).

**ERIOCAULON MODESTUM** Kunth

Additional bibliography: Moldenke, Phytologia 36: 483—484. 1977.

Additional citations: BRAZIL: Goiás: Haas, Haas, & Belém 145 [Herb. Brad. 48648] (N).

**ERIOCAULON MODESTUM** var. **BREVIFOLIUM** Moldenke

Additional bibliography: Moldenke, Phytologia 36: 484. 1977.  
Additional citations: BRAZIL: Goiás: Irwin, Harley, & Smith 32175 (Ld).

**ERIOCAULON MONODII** Moldenke

This taxon is now reduced to synonymy under E. transvaalicum var. hanningtonii (N. E. Br.) Meikle, which see.

**ERIOCAULON MONTANUM** Van Royen

Additional bibliography: Moldenke, Phytologia 34: 404—405. 1976.

Recent collectors describe this plant as a rosular herb, the leaves semiglobose, olive-green or "midgreen", the flower-heads light-green or "brown/purple" and have found it forming large cushions in wet spots on creekbanks, at 2660—3500 meters altitude, flowering in May.

Additional citations: NEW GUINEA: Papua: Croft & Hope LAE.65932 (Mu); Van Royen 10862 (W—2831161).

**ERIOCAULON NANUM** R. Br.

Additional bibliography: Moldenke, Phytologia 32: 502 (1976), 34: 268 (1976), and 36: 488. 1977.

**ERIOCAULON NIGERICUM** Meikle

Additional & emended bibliography: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 59, 62, & 63, fig. 336/12. 1968; Moldenke, Phytologia 34: 405. 1976.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 59, fig. 336/12. 1968.

Meikle (1968) characterizes this species as having "Scapes numerous, usually less than 4 in. high; leaves often rather blunt; capitula 4—5 mm. diam., involucre bracts conspicuous, pale, shining". He cites the following collections: SÉNÉGAL: Raynal 6879. SIERRA LEONE: Jordan 522. LIBERIA: Baldwin 9145, 9456, 10088, & 10336. NIGERIA: Southern: Hamblen 739; Jones FHL.20718; Keay FHL.22595,

25471; Stanfield 140, 189. It has been found in anthesis from August to November.

**ERIOCAULON NILAGIRENSE** Steud.

Additional bibliography: Hocking, Excerpt. Bot. A.25: 379. 1975; Moldenke, Phytologia 36: 473 & 485. 1977.

Sohmer & Sumithraarachchi refer to this plant as "common in wet areas along trails" and as occurring in "large clumps along seepage areas in forest patches", the flower-heads "white".

Additional citations: SRI LANKA: Sohmer & Sumithraarachchi 9801 (N), 9922 (N), 10141 (N).

**ERIOCAULON NILAGIRENSE** f. **PARVIFOLIUM** Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.25: 379. 1975; Moldenke, Phytologia 36: 485. 1977.

**ERIOCAULON ODORATUM** Dalz.

Additional bibliography: Moldenke, Phytologia 36: 486. 1977.

Recent collectors describe this as a light-green plant, slightly fragrant, to 16 cm. tall, the heads "gray-white", borne at different heights, and report it common on moist impervious hardpan or "rare among Drosera burmani, Striga, and grasses along deciduous forest canals", flowering and fruiting in May.

Additional citations: INDIA: Andhra Pradesh: V. S. Raju 652f (Ld). THAILAND: Beusekom & Smitinand 2144 (Ac).

**ERIOCAULON OLIVERI** Fyson

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 42: 12. 1920; Moldenke, Phytologia 32: 503. 1976.

**ERIOCAULON ORYZETORUM** Mart.

Additional & emended bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1067 & 1069—1070 (1924) and ed. 2, 3: 1115 & 1117—1118. 1961; Moldenke, Phytologia 36: 486. 1977.

Recent collectors describe this plant as pale-green and have found it common in muddy places between short grass in dry dipterocarp forests and in wet grasslands, at 600—1000 m. altitude.

Additional citations: THAILAND: Beusekom & Smitinand 2517 (Ac); Larsen & Larsen 24135 (N), 34135 (N).

**ERIOCAULON PANCHERI** H. Lecomte

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 42: 12. 1920; Moldenke, Phytologia 32: 504. 1976.

**ERIOCAULON PARKERI** B. L. Robinson

Additional bibliography: Moldenke, Phytologia 36: 486. 1977; Scoggan, Fl. Canada 2: 459. 1978.

Scoggan (1978) recognizes this taxon as a species (rather than as a mere variety of E. pellucidum and gives its distribution as "Tidal

(rarely fresh) mud and estuaries of Que. (Ottawa R. near Hull; Témiscamie R. e of L. Mistassini at ca. 51° N (type locality of E. rollandii); St. Lawrence R. estuary from L. St. Peter to Portneuf and Bellechasse counties) and along the coast from Maine to Va. [E. septangulare var. park. (Rob.) Boivin & Cayouette; incl. the dwarf extreme, E. rollandii Rousseau]. Maps: Raymond 1950b: fig. 38, p. 105; M. L. Fernald, Rhodora 42 (502): map 17, p. 378. 1940; Fassett 1928: fig. 3, pl. 11." It should be noted that his statement that the species may be found in fresh water applies only because he includes E. rollandii in its synonymy, a disposition which I do not accept.

Additional citations: MASSACHUSETTS: Bristol Co.: Blake 10776 (Ld). Plymouth Co.: Blake 10964 (Ld, Ld, Z), 10995 (Ld). MARYLAND: Kent Co.: Blake 9695 (Ld). Saint Marys Co.: Edwin 372 (Ld). VIRGINIA: Fairfax Co.: Blake 8921 (Ld), 11089 (Ld).

#### ERIOCAULON PELLUCIDUM Michx.

Additional bibliography: Shosteck, Flow. & Pl. 208. 1974; Bouchard & Hay, Rhodora 78: 256. 1976; Batson, Gen. East. Pl. 40. 1977; Moldenke, Phytologia 36: 486—488. 1977; Noblick, Annot. List Herb. Spec. M. Mitch. Assoc. 81. 1977; Periasamy, Proc. Indian Acad. Sci. 868: 11. 1977; Stuckey & Roberts, Sida 7: 32. 1977; Scoggan, Fl. Canada 2: 459. 1978; Moldenke, Phytologia 41: 428. 1979.

Additional illustrations: Batson, Gen. East. Pl. 40. 1977.

Bouchard & Hay (1976) list this species from Newfoundland. Periasamy (1977) reports the embryonic number of this species as 111. Stuckey & Roberts (1977) list it as one of the rare and endangered species of Ohio, discovered there first in 1913 and last recorded from Portage and Summit counties in 1915.

The form with very long peduncles, growing in deep water, is well illustrated by Rouleau 1229, while that with very short peduncles, growing in very shallow or in no water at all by Erlanson s.n. [17 Sept. 1929], cited below.

Scoggan (1978) calls this "white-buttons" or "duckgrass" and gives its distribution as "Shallow pools and streams and muddy or peaty shores from Ont. (N to near Graham, NW of Thunder Bay at 49°14' N; CAN) to Que. (N to Duncan L. near James Bay at 53°33' N, the Côte-Nord, and Gaspé Pen.), S Labrador (Hamilton R. basin), Nfld., N.B., P.E.I., and N.S., S to Ind., N Ohio, Va., and Del.; E Ireland and W Scotland. [E. articulatum (Huds.) Morong; E. pellucidum Michx.; E. decangulare and E. sexangulare of Canadian reports, not L.]. Maps: Hultén 1958: map 199, p. 207 (also citing a 1953 total-area map by Heslop-Harrison); Fernald 1929: map 40, p. 1505."

Noblick (1977) cites from Nantucket County, Massachusetts, the following collections in the Maria Mitchell Association herbarium: Collector undetermined s.n., G. B. Gardner s.n., Wyatt s.n.

Additional citations: QUÉBEC: Argenteuil Co.: Rolland-Germain s.n. [August 21, 1946] (Au—26768). Terrebonne Co.: Rouleau 1229 (Mi). Madore Island: Boivin 4395 (Au—26771). MAINE: Waldo Co.: Friesner

23054 (Au—26764). Washington Co.: Blake 4097 [Herb. Blake 5495] (Ld). NEW HAMPSHIRE: Merrimack Co.: W. V. Brown s.n. [September 2, 1940] (Au—211507). VERMONT: Chittenden Co.: Blake 2101 (Ld), 2572 [Herb. Blake 3694] (Ld). Franklin Co.: Blake 2776 [Herb. Blake 3910] (Ld), 3086 [Herb. Blake 4233] (Ld). MASSACHUSETTS: Middlesex Co.: Blake 4669 [Herb. Blake 6099] (Ld). Norfolk Co.: Blake 4366 [Herb. Blake 5776] (Ld), 4408 [Herb. Blake 5820] (Ld), 8824 (Ld), 10715 (Ld), 10944 (Ld). Plymouth Co.: Blake 4494 [Herb. Blake 5911] (Ld). NEW YORK: Essex Co.: Erlanson s.n. [17 Sept. 1929] (Mi). NEW JERSEY: Cumberland Co.: R. Kral 22590 (Au—245579, Ld). County undetermined: Knieskern s.n. (Mi). VIRGINIA: Augusta Co.: A. B. Massey 3090 [Herb. Va. Polyt. Inst. 21090] (Ld). NORTH CAROLINA: Washington Co.: Radford & Pence 45084 (Au—251933). WISCONSIN: Marquette Co.: Iltis, Bell, Malchert, Patman, & Witt 12548 (Au—299009).

#### ERIOCAULON PERPLEXUM Satake & Hara

Additional bibliography: Moldenke, *Phytologia* 29: 219. 1974; Satake, *Journ. Jap. Bot.* 49: 180. 1974.

#### ERIOCAULON PLUMALE N. E. Br.

Additional synonymy: Eriocaulon senegalense N. E. Br. in *Thiselt.-Dyer, Fl. Trop. Afr.* 8: 251. 1901.

Additional & emended bibliography: Ruhl. in *Engl., Pflanzenreich* 13 (4-30): 103, 106, 286, & 287. 1903; Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 1, 2: 326 & 327. 1931; Moldenke, *Known Geogr. Distrib. Erioc.* 20, 35, & 38-40. 1946; Moldenke, *Résumé* 133, 135, 136, 288, 292, 482, & 483. 1959; Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 58, 60, & 62, fig. 337/6. 1968; Moldenke, *Phytologia* 19: 35, 88, & 104. 1969; Moldenke, *Fifth Summ.* 1: 210, 214, 216, & 218 (1971) and 2: 502, 511, 940, & 941. 1971; Moldenke, *Phytologia* 25: 73 (1972), 29: 219 & 225-226 (1974), and 41: 412 & 423. 1979.

Illustrations: Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 60, fig. 337/6. 1968.

Meikle (1968) regards E. senegalense as a synonym of E. plumale and I see no reason to doubt this. He characterizes the typical form of E. plumale as "Each plant with numerous leaves and scapes; leaves narrow, linear-subulate; capitula subglobose, white, plumose; involucrel bracts pale shining brown". He cites the following collections: SÉNÉGAL: Berhaut 1121, 1258. GUINEA: Heudelot 680. SIERRA LEONE: Deighton 1867; Jordan 632, 658, 944. IVORY COAST: Aké Assi 8294. It has been found in anthesis from October to December. Hutchinson & Dalziel (1931) reduce E. rufum Lecomte and E. heterochiton A. Chev. (not Körn.) to synonymy here, citing Chevalier 18419 (in part), Deighton 1867, Farmer 167a, Heudelot 148, 680, and Pobéguin 1312, 2205, 2276 from Sénégal, French Guinea, and Sierra Leone.

[To be continued]



## THE FERN GENUS CHEILANTHES IN CONTINENTAL UNITED STATES

John T. Mickel

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Ever since *Cheilanthes* was described by Swartz in 1806, botanists have had great difficulty in delimiting the genus. It is clearly part of a large complex in which the species are fairly distinct but the generic limits are unclear. Customarily three larger genera have been recognized--*Cheilanthes*, *Notholaena*, and *Pellaea*--and occasionally several small splinter genera have been recognized as well. However, there is a great problem in distinguishing *Cheilanthes* from *Notholaena* and to a lesser extent from *Pellaea*. It is the purpose of this paper to examine the distinction between *Cheilanthes* and *Notholaena*.

Classically, *Cheilanthes* has been distinguished from *Notholaena* by the former having a recurved, differentiated margin to protect the sori, whereas *Notholaena* possesses a plane or slightly recurved, undifferentiated margin (many authors, including Cronquist et al., 1972; Dittmer et al., 1954; Knobloch and Correll, 1962; Munz, 1965). In preparing keys to the ferns of the United States, it has become quite clear to me that the two genera cannot in fact be distinguished using this character. Careful examination of the species of *Cheilanthes* and *Notholaena* shows that many species of *Cheilanthes* in fact do not have a well differentiated margin. Frequently, the margin curves back slightly without developing a false indusium and does not cover the sori. In most species of *Notholaena*, the margin curves back in precisely the same manner. In the northwestern United States, for example, *Notholaena parryi* is distinguished on the margin character from *Cheilanthes feei* (Cronquist et al., 1972), but the margins are so covered with hairs that only careful observation will show that the margins of both species are the same. Another anomaly lies in that *Cheilanthes cooperae* has never been placed in *Notholaena* even though its margin is almost perfectly plane and entirely undifferentiated.

Efforts have been made to find additional characters, such as stipe and blade anatomy, hairs, spore morphology, and chromosome numbers (Knobloch, 1969; Knobloch et al., 1975; Knobloch and Volz, 1964, 1968; Lellinger, 1965; Tryon and Tryon, 1973), but none have been found. A basic problem seems to lie in the assumption that *Notholaena* and *Cheilanthes* are indeed separate genera and that therefore there are characters to be found to distinguish them. I think this is a misconception. I have examined the plants thoroughly and can find no character that will support the maintenance of *Notholaena* as commonly circumscribed. Rather, I see distinct groups of species that can be

defined on characters of the rhizome scales, blade indument, stipe and rachis anatomy, and to a lesser extent the nature of the margin. Since I cannot find any characters that will adequately distinguish *Notholaena* from *Cheilanthes*, I can see no rational recourse other than to combine the two.

There are, as mentioned above, several species groups that are fairly distinct, and some of these groups have already been given generic recognition. *Adiantopsis*, with its very short, discrete sori, is very distinct in the form of one species, *A. radiata*, but other species, such as *A. chlorophylla*, approach *Cheilanthes* in their form. *Mildella*, with its inframarginal sorus, is somewhat distinct. *Aspidotis*, although it has discrete, short sori in three species, the other and most widespread one, *A. densa*, has a continuous sorus along the margin, the only character holding the genus together being the shiny, elongated cells in the upper epidermis, a character not unique to this group. *Aleuritopteris* is largely represented by the widespread *A. farinosa*, supposedly distinguished by its waxy lower surface and well developed false indusium. Several species of *Notholaena* (*N. candida* et aff.) have much the same architecture and anatomy and, though lacking the false indusium of *A. farinosa*, are probably allied to it. *Sinopteris* is distinguished from *Cheilanthes* and *Aleuritopteris* on the basis of having only one sporangium at the end of each vein. The veins that run parallel to the segment margins, however, have two or three sporangia, and other groups of *Cheilanthes* have a tendency toward low numbers of sporangia, so the justification for upholding *Sinopteris* is rather tenuous.

The cheilanthoid complex appears to be one in the process of early generic separation. Evolution has not isolated them enough yet nor made them distinct enough to make genera clear-cut. There are grounds both for lumping the entire complex or splitting off several groups with intermediates between most groups. However, the current status of separating a broad *Notholaena* does not seem to be one of the options. We have a large complex with many lobes. *Notholaena* in its strict sense includes only those which are strongly scaly on the lower blade surface and are not finely divided--e.g., *N. marantae*, *N. sinuata*, et aff. To include the waxy backed species or the very hairy species is to include representatives of other lobes of the complex which probably are not closely allied. Certainly such hairy species as *Notholaena parryi*, *N. newberryi*, and *N. jonesii*, are much closer to *Cheilanthes feei* and *C. lanosa*, the supposed differences in the margin notwithstanding.

In the cyatheoid tree ferns it was found that the loss of indusium (*Alsophila*) or partial loss (*Hemitelia*) had occurred independently several times and the genera were artificial. Holttum and Sen (1961) lumped them all back into *Cyathea*, point-

ing out several natural groups within it. Tryon (1970) then developed the evidence for separating six genera based on characters other than the sorus, largely of the indument. The situation in *Cheilanthes* is much the same. The current broadly construed *Notholaena* is unnatural, and the first step to provide a rational taxonomy of the complex is to combine it with *Cheilanthes*. It would be premature to carve out additional splinter genera until more detailed work on individual species groups is accomplished.

Below is a list of the North American species of *Cheilanthes* (north of Mexico) with some basionyms and common synonyms.

*Cheilanthes aemula* Maxon

*Cheilanthes alabamensis* (Buckl.) Kunze

CHEILANTHES ALIENA (Maxon) Mickel, comb. nov.

*Notholaena aliena* Maxon, Contrib. U.S. Nat. Herb. 17: 605. 1916.

CHEILANTHES ARIZONICA (Maxon) Mickel, stat. nov.

*Cheilanthes pyramidalis* ssp. *arizonica* Maxon, Amer. Fern J. 8: 116, pl. 6. 1918.

*Cheilanthes aschenborniana* (Kl.) Mett.

*Notholaena aschenborniana* Kl.

*Cheilanthes bonariensis* (Willd.) Proctor

*Notholaena aurea* (Poir.) Desv.

*Cheilanthes californica* (Hooker) Mett.

CHEILANTHES CANCELLATA Mickel, nom. nov.

*Notholaena fendleri* Kunze, Farnkr. 2: 87, t. 136. 1851.

*Cheilanthes candida* Mart. & Gal. var. *candida*

*Notholaena candida* (Mart. & Gal.) Hooker

CHEILANTHES CANDIDA var. COPELANDII (C.C. Hall) Mickel, comb. nov.

*Notholaena candida* var. *copelandii* C.C. Hall, Amer. Fern J. 40: 181, t. 16. 1950.

*Cheilanthes carlotta-halliae* W.H. Wagner & Gilbert

*Cheilanthes clevelandii* D.C. Eaton

CHEILANTHES COCHISENSIS (Goodd.) Mickel, comb. nov.

*Notholaena cochisensis* Goodd., Muhlenbergia 8: 93. 1912.

*Cheilanthes cooperae* D.C. Eaton

*Cheilanthes covillei* Maxon

*Cheilanthes dealbata* Pursh

*Notholaena dealbata* (Pursh) Kunze

CHEILANTHES DESERTI Mickel, nom. nov.

*Notholaena californica* D.C. Eaton, Bull. Torr. Bot. Club 10:  
27. 1883.

*Cheilanthes eatonii* Baker ex Hooker & Baker

*Cheilanthes feei* Moore

*Cheilanthes fendleri* Hooker

*Cheilanthes fibrillosa* Davenp. ex Underw.

*Cheilanthes gracillima* D.C. Eaton

*Cheilanthes grayi* (Davenp.) Domin

*Notholaena grayi* Davenp.

CHEILANTHES GREGGII (Mett. ex Kuhn) Mickel, comb. nov.

*Pellaea greggii* Mett. ex Kuhn, Linnaea 36: 86. 1869.

*Notholaena greggii* (Mett. ex Kuhn) Maxon

*Cheilanthes horridula* Maxon

CHEILANTHES INTEGERRIMA (Hooker) Mickel, comb. nov.

*Notholaena sinuata* var. *integerrima* Hooker, Sp. Fil. 5: 108.  
1864.

*Notholaena integerrima* (Hooker) Hevly

*Cheilanthes intertexta* (Maxon) Maxon

CHEILANTHES JONESII (Maxon) Mickel, comb. nov.

*Notholaena jonesii* Maxon, Amer. Fern J. 7: 108. 1917.

*Cheilanthes kaulfussii* Kunze

*Cheilanthes lanosa* (Michx.) D.C. Eaton

*Cheilanthes lemmonii* (D.C. Eaton) Domin

*Notholaena lemmonii* D.C. Eaton, Bull. Torr. Bot. Club 7: 63.  
1880.

*Cheilanthes lendigera* (Cav.) Sw.

*Cheilanthes leucopoda* Link

CHEILANTHES LIMITANEA (Maxon) Mickel var. LIMITANEA, comb. nov.

*Notholaena limitanea* Maxon, Amer. Fern J. 9: 70. 1919.

CHEILANTHES LIMITANEA var. MEXICANA (Maxon) Mickel, comb. nov.

*Notholaena limitanea* ssp. *mexicana* Maxon, Amer. Fern J. 9: 72. 1919.

*Cheilanthes lindheimeri* Hooker

*Cheilanthes microphylla* Sw.

*Cheilanthes nealleyi* (Seaton ex Coulter) Domin var. *nealleyi*

*Notholaena schaffneri* var. *nealleyi* (Seaton ex Coulter) Weath.

*Notholaena nealleyi* Seaton ex Coulter

CHEILANTHES NEALLEYI var. MEXICANA (Davenp.) Mickel, comb. nov.

*Notholaena nealleyi* var. *mexicana* Davenp., Bot. Gaz. 16: 54. 1891.

*Notholaena schaffneri* var. *mexicana* (Davenp.) Davenp.

*Notholaena schaffneri* (Fourn.) Underw. ex Davenp.

*Aleuritopteris schaffneri* Fourn., Bull. Soc. France 27: 328.

1880; not *Cheilanthes schaffneri* Moore, 1861, which was a renaming of *Myriopteris rufa* Fée.

CHEILANTHES NEGLECTA (Maxon) Mickel, comb. nov.

*Notholaena neglecta* Maxon, Contrib. U.S. Nat. Herb. 17: 602. 1916.

*Cheilanthes newberryi* (D.C. Eaton) Domin

*Notholaena newberryi* D.C. Eaton

*Cheilanthes notholaenoides* (Desv.) Maxon

*Cheilanthes* X *parishii* Davenp.

*Cheilanthes parryi* (D.C. Eaton) Domin

*Notholaena parryi* D.C. Eaton

CHEILANTHES PARVIFOLIA (R. Tryon) Mickel, comb. nov.

*Notholaena parvifolia* R. Tryon, Contrib. Gray Herb. 179: 98.

1956, which is in turn based on *Pellaea microphylla* Mett.

ex Kuhn, Linnaea 36: 86. 1869, not *P. microphylla* Fée, nor

*Notholaena microphylla* Bolle, nor *N. microphylla* (Sw.) Keys.

which is *Cheilanthes microphylla* Sw.

*Cheilanthes pringlei* Davenp.

*Cheilanthes siliquosa* Maxon

*Cheilanthes sinuata* (Lag. ex Sw.) Domin

*Notholaena sinuata* (Lag. ex Sw.) Kaulf.

CHEILANTHES STANDLEYI (Maxon) Mickel, comb. nov.

*Notholaena standleyi* Maxon, Amer. Fern J. 5: 1. 1915.

*Cheilanthes tomentosa* Link

*Cheilanthes villosa* Davenp. ex Maxon

*Cheilanthes viscida* Davenp.

*Cheilanthes wootonii* Maxon

*Cheilanthes wrightii* Hooker

#### Acknowledgments

I thank Dr. Rupert Barneby for his valuable advice. This study was supported in part by National Science Foundation Grant DEB 77-25582.

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## BOOK REVIEWS

Alma L. Moldenke

"STARTING FROM SCRATCH — A Guide to Indoor Gardening" by John Whitman & Mary Maguire, xii & 212 pp., 116 b/w line draw. Quadrangle/The New York Times Book Co., New York, N. Y. 10022. 1976. \$8.95.

This is a pleasant little book about growing plants ever so reasonably from slips scrounged from friends, seeds from store fruits, pineapple tops and spores from some ferns put into all sorts of household items as containers. Effective directions are given and even graded from brown, light green, green and deep green thumb stages. It is spoiled, rather than enhanced, by mediocre to totally unrecognizable line drawings as, for instance, that of the pomegranate on p. 169.

"A FIELD GUIDE TO THE BUTTERFLIES OF THE WEST INDIES" by Norman D. Riley, 224 pp., 29 b/w & 338 color illus., 1 map, & 1 tab. Demeter Press Book of Quadrangle/The New York Times Book Co., New York, N. Y. 10022. 1975 [1976]. \$12.50.

This is a very well prepared field guide to the 292 butterfly species of the Greater and Lesser Antilles. The text gives scientific name, author, date, common name, description, distribution, early stages and food plants where known. At the end there is a really useful combined check list and distribution table including North America, each of the islands or island groups and the mainland south. The introduction describes butterfly gross anatomy, specimen collection and preservation and the need for conservation of this rather limited fauna. The illustrations are excellent, usually life size, true for color with the attached left half showing the upperside and the right detached the underside. In cases of sexual dimorphism both male and female are shown.

"INTRODUCTION TO BIOPHYSICAL PLANT PHYSIOLOGY" by Park S. Nobel, xiii & 488 pp., 68 b/w illus. & 9 tab. W. H. Freeman & Co., San Francisco, California 94104. 1974. \$13.50.

In 1970 this author and this publisher prepared "Plant Cell Physiology: A Physicochemical Approach" which proved to be a useful text. This newer work includes not only more modern data and new appendices but also new chapters on environmental interactions of the leaf and of the whole plant. The other chapters treat cells, water, solutes, light, photosynthesis, and bioenergetics.



The problems posed at the end of each chapter are apt, difficult, and require using much of the subject matter in order to get answers that coincide with those in the back of the book — as it should be for an advanced text. This is a fine major or auxiliary text for senior or graduate courses under a variety of names — photochemistry, physiological ecology, phytophysiology, etc. More detailed drawings in the first chapter would be more in keeping with the complexity and thoroughness of the rest of the text.

"ORGANISMIC EVOLUTION" by Verne Grant, xiii & 418 pp., 66 b/w illus. W. H. Freeman & Co., San Francisco, California 94104. 1977. \$15.95.

Directed toward "A wide range of readers...and the specific needs of students" in a senior-level course on evolution, this truly excellent book is oriented toward plant and animal rather than molecular or primitive organic evolution or the mathematical modelling of it, toward principles and fundamentals rather than details and current topics. Throughout clarity in explanations and reasoning make for stimulating reading and facile comprehension of the following three evolutionary phenomena: "evolutionary changes within populations (microevolution), evolution of races and species (speciation), and evolution of major groups (macroevolution)." Different methods of research by different types of scientists yield different types of evidence. For answers to the creationists still attacking the teaching of evolution in high school Grant lists the evidences for macroevolution that today is more fact than theory. Grant stresses that the top non-human primates are the product of organic evolution alone, while man is the product of additional cultural evolution.

The outstanding worth of this text will certainly be appreciated on the university level, but I hope that it will be read by thousands of high school biology teachers and community college teachers of biology who have come "up" from the secondary level.

"BIO GRAFFITI — A Natural Selection" by John M. Burns, xv & 112 pp., 52 b/w illus. A Demeter Press Book, Quadrangle/The New York Times Book Co., New York, N. Y. 10022. 1975. \$6.95.

This little book is a charmer — Ogden Nash style — with its biologically oriented clever short verses and their excellently reproduced illustrations from older works. Such a nice gift for the young biology student, the worker and teacher in the field, the old retiree from it and yourself!

"ENCYCLOPEDIA OF FISH" by Maurice & Robert Burton, 253 pp., 258 color & 76 b/w photos, 10 maps & 15 b/w line draw. Crescent Books of Crown Publishers, Inc., New York, N. Y. 10016. 1978. \$9.98.

This and the other volumes in this series have been adapted from the British Purnell's "Encyclopedia of Animal Life" with which I am not yet familiar. But that is why the large size format and very large number of small to large, well executed color prints can be included at so reasonable a price. A few hundred fish are described, classified, and have their special features and habits related very interestingly. Of course, several known fish could not be mentioned. I missed most pictured accounts of lungfish and of coelocanths. In the volume on reptiles and other cold-blooded animals there are most satisfactory illustrated accounts of these and other fish in the chapter on "The Emergence onto Land".

This book and its companions will be very good for school, family, nature center and public libraries for the general reader and for grade and high school students.

"ENCYCLOPEDIA OF REPTILES, Amphibians & Other Cold-Blooded Animals" by Maurice & Robert Burton, 252 pp., 311 color & 70 b/w plates, 28 maps & 13 b/w draw. Crescent Books of Crown Publishers, Inc., New York, N. Y. 10016. 1976. \$5.98.

Like the volume on fish, this one has been adapted from the British Purnell's "Encyclopedia of Animal Life" and its American issue entitled "International Wild Life". This one gives fascinatingly descriptive and behavioral details as well as classification for almost 200 reptiles, almost 100 amphibians and the balance in invertebrates and prevertebrate chordates. Oh, yes, there are fish here, too, effectively discussed and beautifully and copiously illustrated. Since this work is an encyclopedia on animals rather than a treatise on evolution, I would prefer to hunt for fish in the fish volume. This book is at a bargain price!

"WORLD OF BIRDS" New & Revised Edition by James Fisher & Roger Tory Peterson, 191 pp., 192 color plates & 210 b/w fig. Crescent Books of Crown Publishers, Inc., New York, N. Y. 10016. 1978. \$5.98.

The first edition of 1964, directed to student and professional ornithologists and "advanced" bird watchers, is a well known classic by now. This new edition, planned for widening the horizon of new or local bird enthusiasts, has about 100 less pages, facts and figures updated according to recent scientific findings, the interesting Fisher text and the beautiful Peterson bird paintings, all for an unbelievably low price.

# PHYTOLOGIA

*Designed to expedite botanical publication*

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Vol. 41

March 1979

No. 7

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Published by Harold N. Moldenke and Alma L. Moldenke

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

Price of this number \$2.50; per volume \$10.00 in advance or \$11.00 after close of the volume; \$2.00 extra to all foreign addresses; 512 pages constitute a full volume; claims for numbers lost in the mails must be made immediately after receipt of the next following number.



PLANTS COLLECTED IN THE SANDWICH ISLANDS BY  
THOMAS NUTTALL

HAWAIIAN PLANT STUDIES 85

Harold St. John  
Bishop Museum, Honolulu, Box 6037, Hawaii 96818, USA.

Introduction

Thomas Nuttall (1786-1859) made several botanical explorations. He collected in the eastern and southern United States, in the Rocky Mountains, Oregon, California, and the Sandwich Islands.

On Jan. 4, 1835 he arrived off Diamond Hill, Oahu, landed, and botanized in Nuuanu Valley. Soon he moved to Koloa, Kauai, where he spent a month. On March 26, 1835 he sailed from Honolulu toward the Columbia River.

At the end of Sept. 1835 he sailed from the Columbia toward Honolulu. He stayed for four months, and made a visit to the island of Hawaii, then left in Jan. 1836 for California.

Nuttall collected in the Hawaiian Islands at least 118 species, but it is worth noting that he collected no ferns. He published fundamental studies on the flora of eastern and of western North America, and a large percentage of his American novelties are still accepted as correct. Of his Hawaiian plants he published only five as new species, but four of these proved to be synonyms. Of his 118 Hawaiian specimens, he marked and named 62 as new species, but these were never published. He was unaware of several of the earlier publications that described Hawaiian plants. Numerous of his proposed Hawaiian species were unnecessary synonyms. His Hawaiian specimens are in the herbarium of the British Museum of Natural History, London.

Enumeration

Monocotyledones

Gramineae

*Chrysopogon aciculatus* (Retz.) Trin.

*Echinochloa colonum* (L.) Link, Ouau =Oahu,  
as a new species.

*Heteropogon contortus* (L.) Beauv.

Cyperaceae

*Cyperus javanicus* Houtt. Owhyhee =Hawaii.

*C. trachysanthos* H. & A. Ouau.

*Fimbristylis pycnocephala* Hbd. Ouau.

- Gahnia Beecheyi Mann, Ouau.  
Commelinaceae
- Commelina diffusa Burn. f., as a new species.  
Taccaceae
- Tacca Leontopetaloides (L.) Ktze.,  
T. oceanica Nutt.  
Liliaceae
- Cordyline terminalis (L.) Knuth, var. Ti (Schott)  
J. G. Baker, as a new species.
- Dianella sandwicensis H. & A. Wahoo.  
Smilax sandwicensis Kunth, Wahoo.  
Dicotyledones
- Piperaceae
- Peperomia leptostacya H. & A., Wahoo, as a new  
species of Piper.
- Peperomia Macraeana C. DC.
- Peperomia membranacea H. & A., var. membranacea,  
Wahoo, as a new species of Piper.
- Peperomia sandwicensis Miq., Wahoo etc., two  
specimens each as a different new species  
of Piper.
- Peperomia tetraphylla (Forst. f.) H. & A., Wahoo.  
var. parvifolia (C. DC.) Deg. & Deg., Wahoo,  
as a new species of Piper.
- Piper methysticum Forst. f., Wahoo, "kava."  
Santalaceae
- Santalum ellipticum Gaud., f. ellipticum,  
Owhyhee, two specimens.
- Santalum paniculatum H. & A., Owhyhee, as a new  
species.
- Santalum pyrularium Gray, Atooi (=Kauai), as a  
new species.  
Chenopodiaceae
- Chenopodium oahuense (Meyen) Aellen, Wahoo, in  
runderatis, two specimens, each as a new species.  
Amaranthaceae
- Achyranthes splendens Mart. ex Moq., var.  
rotundata Hbd., Wahoo, as a new species.
- Amaranthus viridis L., Wahoo, in ruderatis,  
as a new genus and species.
- Charpentiera ovata Gaud., Wahoo.  
Nyctaginaceae
- Boerhavia diffusa L., Wahoo, in ruderatis.  
Phytolaccaceae
- Phytolacca sandwicensis Endl., var. sandwicensis,  
Wahoo, as a new species.  
Aizoaceae
- Sesuvium Portulacastrum (L.) L., Wahoo, three  
specimens, two of them as different new species.

## Portulacaceae

*Portulaca* ?*cyanosperma* Egler, Atooi.

## Capparaceae

*Cleome sandwicensis* Gray, Woahoo, plains.

## Cruciferae

*Lepidium o-waihiense* C. & S., Woahoo, in rupes montosis, as a new species.

## Pittosporaceae

*Pittosporum terminalioides* Planch. ex Gray, Wahoo, sylvis rupestris, as a new species.

## Saxifragaceae

*Broussaisia arguta* Gaud., f. *arguta*, Owhyhee, C. Deal.

## Rosaceae

*Osteomeles anthyllidifolia* (Sm.) Lindl., Ouau.

## Leguminosae

*Caesalpinia Bonduc* (L.) Roxb., Atooi, as a new species.

*Canavalia galeata* (Gaud.) Vogel, as a new genus.

*Cassia Gaudichaudi* H. & A., Wahoo west of the Parri (= Nuuanu Pali).

*Sesbania tomentosa* H. & A., Owhyhee.

## Zygophyllaceae

*Tribulus Cistoides* L., Wahoo, in ruderalis, as a new species.

## Rutaceae

*Pelea elliptica* (Gray) Hbd., Wahoo, sylvis, as a new genus.

*Pelea*, two species in flower and leaf only, as a new genus.

*Zanthoxylum dipetalum* Mann, Ouau.

## Euphorbiaceae

*Aleurites moluccana* (L.) Willd., two specimens, one from Owhyhee, Deal, as a new species.

*Euphorbia celastroides* Boiss., var. *haupuana* Sherff, Wahoo, Parri (= Nuuanu Pali), as a new species.

*Euphorbia hirta* L., Wahoo, in montis.

*Phyllanthus sandwicensis* Muell. Arg., var. *sandwicensis*, Wahoo, Parri (= Nuuanu Pali), as a new species.

## Anacardiaceae

*Rhus sandwicensis* Gray, Owhyhee, Dr. Deal (= Diehl).

## Aquilifoliaceae

*Ilex anomala* H. & A., Wahoo.

## Celastraceae

*Perrottetia sandwicensis* Gray, Ouau, as a new genus.

## Rhamnaceae

*Colubrina asiatica* (L.) Brongn., Atooi.

## Malvaceae

*Abutilon incanum* (Link) Sweet, Wahoo.

*Hibiscus Kokio* Hbd., ex Wawra, Wahoo, as a new species.

*Hibiscus tiliaceus* L., Wahoo, as a new species.

*Hibiscus Youngianus* Gaud. ex H. & A., Wahoo, in campis elatioribus, as a new species.

*Sida sertum* Nutt., holotype, used for garlands.

## Sterculiaceae

*Waltheria indica* L., Wahoo, two sheets, as a new species.

## Flacourtiaceae

*Xylosma hawaiiense* Seem., no. 6. Ouau.

## Myrtaceae

*Metrosideros macropus* H. & A., Ouau.

*Metrosideros polymorpha* Gaud., var. *polymorpha*, Wahoo, Parri (=Nuuanu Pali).

*Metrosideros tremuloides* (Heller) Knuth, Wahoo, as a new species.

## Araliaceae

*Cheirodendron trigynum* (Gaud.) Heller, Wahoo, in sylvis, as a new species.

## Ericaceae

*Vaccinium calycinum* Sm., f. *calycinum*.

*Vaccinium dentatum* Sm., Wahoo Parry (=Nuuanau Pali), rocks, as a new genus.

*Vaccinium reticulatum* Sm., as a new genus.

## Epacridaceae

*Styphelia Tameiameiae* (Cham.) F. Muell.

## Plumbaginaceae

*Plumbago zeylanica* L., Atooi.

## Apocynaceae

*Alyxia olivaeformis* Gaud.

## Convolvulaceae

*Cuscuta sandwichiana* Choisy, Atooi, as a new species.

## Hydrophyllaceae

*Nama sandwicensis* Gray, two sheets, from Atooi, and Wahoo, each as a new species.

## Boraginaceae

*Heliotropium anomalum* H. & A., var. *argenteum* Gray, Atooi, two sheets, each as a new species.

## Labiatae

*Phyllostegia glabra* (Gaud.) Benth., var. *Macraei* (Benth. in A. DC.) Sherff, Wahoo.

*Phyllostegma grandiflora* (Gaud.) Benth., Wahoo.



*Phyllostegia hirsuta* Benth., Wahoo, as a new species.

*Phyllostegia parviflora* (Gaud.) Benth., var. *parviflora*, in montis Ouau.

*Stenogyne kaalae* Wawra, var. *latisejala* Sherff, Wahoo, rocks nr. the summit of the Parri (=Nuuanu Pali).

## Solanaceae

*Lycium sandwicense* Gray, Atooi; Wahoo, as a new species.

*Solanum nigrum* L., Wahoo, as a new species.

## Scrophulariaceae

*Bacopa Monnieria* (L.) Wettst., Wahoo, ad lit. maris (=by the seashore).

## Gesneriaceae

*Cyrtandra cordifolia* Gaud., Woahoo, montes.

*Cyrtandra Garnotiana* Gaud. (?), two scraps, Wahoo.

*Cyrtandra grandiflora* Gaud., Wahoo.

*Cyrtandra Lessoniana* Gaud., var. *Lessoniana*, Wahoo, as a new species, two sheets.

*Cyrtandra paludosa* Gaud., Wahoo, "moa" of the islanders.

## Plantaginaceae

*Plantago princeps* C. & S., var. *acaulis* Wawra, Wahoo, falls of a stream, as a new species.

*Plantago princeps* C. & S., var. *Queleniana* (Gaud.) Rock, Ouau.

## Rubiaceae

*Bobea elatior* Gaud., Wahoo, in sylvis, two sheets.

*Coprosma ernodeoides* Gray, Owhyhee, F. Deal legit, as a new genus.

*Coprosma foliosa* Gray, Wahoo, as a new genus.

*Gouldia terminalis* (H. & A.) Hbd., not determined to the variety, arbor, Wahoo, two sheets, as two new species.

*Hedyotis acuminata* (C. & S.) Steud., f. *Grayana* Fosb., nom. vern. "etaha." As a new genus.

*Hedyotis Remyi* (Hbd.) Fosb., var. *Nuttallii* (Fosb.) Fosb., Ouau, probably an isotype.

*Psychotria Fauriei* (Lévl.) Fosb., Wahoo, as a new genus.

*Psychotria kaduana* (C. & S.) Fosb., Wahoo, two sheets, each as a new species.

*Psychotria longissima* (Rock) St. John, Wahoo, as a new species.

*Psychotria Mariniana* (C. & S.) Fosb., Ouau, as a new species.

## Lobeliaceae

Clermontia kakeana Meyen, (C. macrophylla Nutt.),  
Wahoo.

Cyanea acuminata (Gaud.) Hbd., Wahoo.

Cyanea Grimesiana Gaud.

Rollandia lanceolata Gaud., Owhyhee.

## Goodeniaceae

Scaevola X cerasifolia Skottsbo., (S. pubescens  
Nutt.), holotype, Wahoo.

Scaevola coriacea Nutt., holotype, Atooi.

Scaevola Gaudichaudiana Cham., Ouau, as a new  
species.

Scaevola mollis H. & A., as a new species.

Scaevola Taccada (Gaertn.) Roxb., Atooi, in  
montes, as a new species.

## Compositae

Argyroxiphium sandwicense DC., Owhyhee, Volcano,  
Mr. Deale (=Diehl).

Artemisia australis Less., Wahoo, Parre (=Nuuanu  
Pali), as a new genus.

Bidens asymmetrica (Lévl.) Sherff, Wahoo, as a  
new species.

Gnaphalium sandwicense Gaud., var. sandwicen-  
sium, Ouau.

Lipochaeta connata (Gaud.) DC., Wahoo, as a  
new genus.

Lipochaeta integrifolia (Nutt.) Gray, Atooi,  
Wahoo, as a new genus.

Lipochaeta micrantha (Nutt.) Gray, (Schizophyllum  
micranthum Nutt.), holotype, Atooi, in sylvis  
opacis.

Tetramolopium tererrimum (Less.) Nees, Wahoo, in  
rupibus Parry dictu (=Nuuana Pali).

A NEW COMBINATION IN LINUM

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A review of the Linaceae for the checklist of the vascular flora, being developed under the direction of the Biota of North America Committee, reveals that a minor nomenclatural change for one of the populations comprising the western American flax, Linum lewisii Pursh, would make uniform the treatment of the infraspecific taxa of this species and would express as well as possible at this time the relationships between them.

Like Mosquin (1971), I think that the homostylous American plants warrant recognition as a species distinct from the heterostylous Eurasian L. perenne L. As such, L. lewisii consists of three more or less well-defined populations: typical L. lewisii, blue- or rarely white-flowered plants, ranging from northern Alaska southward through the foothills and the mountains to central Mexico; var. alpicola, high alpine plants of California and Nevada, characterized by their dwarf stature and small floral parts; and var. lepagei, mostly white-flowered plants found in the vicinity of Hudson Bay and James Bay.

The complete synonymy for the three varieties, including the distinctive color forms of var. lewisii and var. lepagei, is as follows:

Linum lewisii Pursh, Fl. Am. Sept. 1:210.1814.

Var. lewisii

- L. sibiricum DC. var. lewisii (Pursh) Lindl., Bot. Reg. 14: pl. 1163.1828.
- L. perenne L. var. lewisii (Pursh) Eat. & Wright, N. Am. Bot. 302.1840.
- L. decurrens Kellogg, Proc. Calif. Acad. 3:44.1863.
- L. lyallianum Alef., Bot. Zeit. 25:251.1867.
- L. perenne L. f. albiflorum Cockerell, W. Am. Sci. 3:217.1887.
- L. lewisii Pursh f. albiflorum (Cockerell) St. John, Fl.S.E. Wash. & Adj. Ida. 244.1937.
- L. perenne L. subsp. lewisii (Pursh) Hulten, Fl. Alaska & Yuk. 7:1122.1947.

Var. alpicola Jepson, Fl. Calif. 2:398.1936.

- L. lewisii Pursh var. saxosum Maguire & Holmgren, Leafl. West. Bot. 4:265.1946.
- L. perenne L. ssp. lewisii (Pursh) Hulten var. saxosum (Maguire & Holmgren) Reveal, Rhodora 70:38.1968.

- Var. lepagei (Boivin) Rogers, comb. nov.  
L. lepagei Boivin, Natur. Can. 75:219.1948.  
L. perenne L. subsp. lepagei (Boivin) Lepage ex. Dut., Lep. & Dum., Contr. Arctic Inst. Cathol. Univ. 5:92.1954.  
(It is not clear whether the author really accepted this combination).  
L. lewisii Pursh f. lepagei (Boivin) Lepage, Natur. Can. 84: 61.1957.  
L. perenne L. var. lepagei (Boivin) Boivin, Natur. Can. 93: 643.1966.  
L. lewisii Pursh subsp. lepagei (Boivin) Mosquin, Can. J. Bot. 49:1379.1971.  
L. perenne L. var. lepagei (Boivin) Boivin f. baldwinii Boivin, Phytologia 22:351.1972.

## Reference

- Mosquin, T. 1971. Biosystematic studies in the North American species of Linum, section Adenolinum (Linaceae). Can. J. Bot. 49:1379-1388.

NOTES ON NEW AND NOTEWORTHY PLANTS. CXXI

Harold N. Moldenke

**DURANTA REPENS** f. **ALBA** (Masters) Mold., comb. & stat. nov.

*Duranta plumieri* var. *alba* Masters, Gard. Chron., ser. 3, 3: 44-45, fig. 9. 1888.

**LANTANA MORII** Mold., sp. nov.

Frutex spinosis; ramulis gracilibus tetragonis minutissime puberulis vel glabrescentibus; laminis decussato-oppositis; petioliculis tenuissimis 5-10 mm. longis minutissime puberulis; laminis membranaceis ellipticis 5-9 cm. longis 2-3.5 cm. latis, apicaliter perspicue acuminatis basaliter cuneato-acuminatis marginis obtuse adpresso-serrulatis utrinque glabris; pedunculis pergracillimis 2-4 cm. longis minutissime puberulis vel glabrescentibus; corollis albis.

A spiny shrub; branchlets and twigs very slender, plainly tetragonal even on the smaller parts, minutely puberulent (under a handlens) or glabrescent, stramineous, shiny; leaves decussate-opposite; petioles very slender, 5-10 mm. long, microscopically puberulent or glabrescent; leaf-blades thin-membranous, apparently uniformly green on both surfaces, elliptic, 5-9 cm. long, 2-3.5 cm. wide, apically conspicuously acuminate or even somewhat long-acuminate, basally cuneate-acuminate into the petiole, the margins serrulate with regular, obtuse, and much depressed, antrorse teeth, glabrous and shiny on both surfaces; inflorescences axillary, capitate; peduncles very slender or almost filiform, 2-4 cm. long, microscopically puberulent or glabrescent; heads rather small, to 2 cm. wide in anthesis; bractlets small, narrow-lanceolate, 1-2 mm. long, 0.5-1 mm. wide, apically subacute to obtuse, densely cano-puberulent; corollas hypocrateriform, white.

The type of this species was collected by T. S. dos Santos and L. A. Mattos Silva (no. 3304) in a cacao plantation in the "Município de Camacã, Ramal que liga Biscó (lugarejo) ao povoado de São João do Panelinha, km. 4", Bahia, Brazil, on July 14, 1978, and is deposited in my personal herbarium. The collectors report the vernacular name, "cambará de flor branca". It is named in honor of my friend and colleague, Dr. Scott Mori, who is doing such noteworthy work on the flora of Bahia and who also has collected this plant there.

**LANTANA SALZMANNI** f. **ALBIFLORA** Mold., f. nov.

Haec forma a forma typica speciei corollis albis recedit.

This form differs from the typical form of the species in having its corollas white, with a yellow eye.

The type of the form was collected by S. Mori, T. S. dos Santos, and I. White (no. 10360) along the Estrada Velha de Santa Cruz de Cabrália, 2-4 km. west of Santa Cruz de Cabrália, Bahia, Brazil, on campo, July 28, 1978, and is deposited in my personal

herbarium. The collectors describe the plant as a subshrub, 1 m. tall, the "corola branca com uma mancha amarela no centro do tubo; frutos roxo-claro".

**PETREA ARBOREA** f. **BROADWAYI** (Mold.) Mold., stat. nov.

Petrea arborea var. broadwayi Mold., Feddes Repert. Spec. Nov. 43: 26. 1938.

**PETREA KOHAUTIANA** f. **ALBA** (Freem. & Williams) Mold., stat. nov.

Petrea volubilis var. alba Freem. & Williams, Useful Pl. Trin. 127. 1928.

**PETREA RACEMOSA** f. **ALBA** (Kuhlm.) Mold., stat. nov.

Petrea racemosa var. alba Kuhlm., Flores Bras. 2: 30, in obs. 1955; Angely, Fl. Paran. 16: 68. 1960. Petrea racemosa var. alba Kuhlm. ex Mold., Phytologia 7: 445. 1961.

**PETREA RUGOSA** f. **CASTA** (Mold.) Mold., stat. nov.

Petrea rugosa var. casta Mold., Feddes Repert. Spec. Nov. 43: 48. 1938.

**PHYLA NODIFLORA** var. **GALAPAGENSIS** Mold., var. nov.

Haec varietas a forma typica speciei recedit foliorum laminis elongato-oblongatis 4—6 cm. longis 1—2 cm. latis basaliter longe cuneatis apicaliter argute mucronulato-acutis marginis perconspicue grosseque sublaciniato-serratis.

This variety differs from the typical form of the species in having its leaf-blades elongate-oblongate, 4—6 cm. long, 1—2 cm. wide above the middle, basally long-cuneate into the short and rather obscure petiole, apically triangular-acute and very sharply mucronulate or submucronulate, the margins very conspicuously and coarsely sublacinate-serrate with antrorse very acute or subapiculate teeth.

The type of the variety was collected by H. H. van der Werff (no. 1592) near the Caseta, Santa Cruz (Indefatigable) Island, Galapagos Islands, at 600 feet altitude, in October, 1974, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collector describes it as a creeping herb, rooting at the nodes, the corollas white with a yellow throat, and notes that it prefers wet spots as a habitat. The leaves greatly resemble those of the West Indian var. antillana Mold.

**REHDERA TRINERVIS** f. **MOLLICELLA** (Standl. & Mold.) Mold., stat. nov.

Rehdera mollicella Standl. & Mold., Feddes Repert. Spec. Nov. 39: 51—52. 1935.

**STACHYTARPHETA CANESCENS** var. **MORII** Mold., var. nov.

Haec varietas a forma typica speciei recedit ramis ramulisque brevissime adpresso-pilosis rhachide bracteisque calicibusque puberulis laminis foliorum subtus dense breviterque pubescenti-

bus corollis rubris.

This variety differs from the typical form and other varieties of the species in having the branches and branchlets merely very shortly appressed-pilose with antrorse hairs, the rachis, bracts, and calyxes merely puberulent, the lower leaf-surfaces densely short-pubescent, and the corollas red.

The type of the variety was collected by Scott Mori (in whose honor it is named), T. S. dos Santos, A. Euponino, and C. B. Thompson (no. 10892) near Santa Cruz de Cabrália, 2-4 km. southwards along the old road in the region of Cacaueira da Bahia, Bahia, Brazil, growing in an area of campos and restinga, on August 21, 1978, and is deposited in my personal herbarium. The collectors describe the corollas as red ("roxas") and report the vernacular name, "canela de saracura".

**VERBENA TENERA** f. **ALBIFLORA** (Kuntze) Mold., stat. nov.

Verbena tenera var. albiflora Kuntze, Rev. Gen. Pl. 3 (2): 258. 1898.

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ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXXXII

Harold N. Moldenke

ERIOCAULON PLUMALE N. E. Br.

Additional bibliography: Moldenke, *Phytologia* 41: 430. 1979.

Meikle (1968) feels that E. rufum Lecomte is a species distinct from E. plumale.

ERIOCAULON PLUMALE ssp. JAEGERI (Moldenke) Meikle

Additional & emended bibliography: Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 58, 60, & 62, fig. 337/7. 1968; Moldenke, *Phytologia* 26: 462. 1973.

Emended illustrations: Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 60, fig. 337/7. 1968.

Meikle (1968) characterizes this plant as having "Scapes and leaves numerous; leaves subulate-filiform; capitula white, plumose, 5-7 mm. diam., subglobose; involucrel bracts rather rigid, dark brown", citing Adames 342, Chillou 906, Jaeger 4917, and Schnell 7393 from Guinea, flowering in September and October.

ERIOCAULON PLUMALE ssp. KINDIAE (H. Lecomte) Meikle

Additional & emended bibliography: Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 1, 2: 326. 1931; Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 58, 60, & 62, fig. 337/8. 1968; Moldenke, *Phytologia* 26: 462. 1973.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 60, fig. 337/8. 1968.

Meikle (1968) includes in the synonymy of this subspecies "E. pumilum of F.W.T.A., ed. 1, 2: 326, partly, not of Afzel. ex Koern.", characterizing the subspecies as having "Scapes and leaves numerous; leaves subulate-filiform; capitula hemispherical, 3--5 mm. diam., white, plumose, said to be fragrant; involucre bracts pale brown or greenish, not rigid". He cites the following collections: GUINEA: Boissaré 385 [Herb. Chillou 3903], Chillou 716, 717; Pobéguin 1359. SIERRA LEONE: Adames s.n. [Herb. Jordan 554]; Harvey 33; Jordan 303, 554; Melville & Hooker 276. He lists it also from Chad.

#### ERIOCAULON POLYCEPHALUM Hook. f.

Additional bibliography: Moldenke, Phytologia 34: 487. 1976.

Recent collectors describe the inflorescence of this plant as grayish-white and have found it growing "many together in open boggy places on sandstone in rather dense vegetation", at 1200 m. altitude.

Additional citations: THAILAND: Beusekom & Charoenpol 1711 (Ac).

#### ERIOCAULON PULCHELLUM Körn.

Additional & emended bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 326. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 57, 61, 62, & 64, fig. 338/25. 1968; Moldenke, Phytologia 34: 487. 1976.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 61, fig. 338/25. 1968.

Meikle (1968) lists "E. heterochiton Lecomte in Bull. Soc. Bot. Fr. 55: 647 (1909), partly, incl. Chev. 18770a, not of Koern." in the synonymy of E. pulchellum. He also avers that the "E. pumilum of F.W.T.A., ed. 1, 2: 326, partly, not of Afzel. ex Koern." is E. plumale ssp. kindiae (H. Lecomte) Meikle". He characterizes E. pulchellum as "Very slender, usually less than 2 1/2 in. high; leaves numerous, narrowly subulate; capitula to about 5 mm. diam. with conspicuous, white, radiating involucre bracts." He cites the following collections: MALI: Garnier s.n. GUINEA: Adames 329; Baldwin 9800; Boissaré 376 [Herb. Chillou 3894], 408 [Herb. Chillou 3926], Chevalier 18770a; Schnell 6814, 7373. SIERRA LEONE: Afzelius s.n.; Deighton 1306; Glanville 21; Harvey 135; Jaeger 7600; T. S. Jones 99; Jordan 504, 2160; Marmo 31; Melville & Hooker 277; Thomas 2976. LIBERIA: Adames 708; Baldwin 9176; Harley 1679. It has been found in flower from August to November and in January.



ERIOCAULON QUINQUANGULARE L.

Additional & emended bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1066 & 1068—1069 (1924) and ed. 2, 3: 1114 & 1116—1117. 1961; Hocking, Excerpt. Bot. A.25: 379. 1975; Srivastava, Fl. Gorak. 331. 1976; Moldenke, Phytologia 36: 487. 1977.

Raju refers to this plant as "psamophytic on sandy dunes, erect annual," found it growing at sealevel, and mistook it for E. xeranthemum Mart. Srivastava (1976) reports E. quinquangulare as found abundantly "in paddy crops and in other swampy localities" in India, citing his no. 1434. Cramer describes it as an annual, the "stems" [peduncles] 5-angular, and the inflorescences "ashy-white". He states that it "grows in association with Dopatrium nudicaule in soggy ground among short grass, common and abundant" at sealevel, in Sri Lanka, flowering in February.

The Latz 3703, distributed as E. quinquangulare in some herbaria, actually seems to be E. schultzei Benth.

Additional citations: INDIA: Andhra Pradesh: Raju 614 (N). SRI LANKA: Cramer 5096 (N); Koyama 13315 (W—2875485); Wirawan & Fosberg 1026 (N).

ERIOCAULON QUINQUANGULARE var. ELATIUS Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.25: 379. 1975; Moldenke, Phytologia 33: 10. 1976.

ERIOCAULON QUINQUANGULARE var. MARTIANUM Wall.

Additional bibliography: Hocking, Excerpt. Bot. A.25: 379. 1975; Moldenke, Phytologia 34: 488. 1976.

ERIOCAULON RAVENELII Chapm.

Additional bibliography: Moldenke, Phytologia 36: 487 (1977) and 37: 24. 1977.

Additional citations: FLORIDA: Lee Co.: R. Kral 22923 (Au—245571, Ld). Levy Co.: R. Kral 22940 (Au—245610, Ld). Martin Co.: Godfrey 65625 (Ld).

ERIOCAULON REMOTUM H. Lecomte

Additional & emended bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 326. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 57, 61, & 64, fig. 338/24. 1968; Moldenke, Phytologia 26: 462. 1973.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 61, fig. 338/24. 1968.

Meikle (1968) includes in the synonymy of this species "E. heterochiton Lecomte in Bull. Soc. Bot. Fr. 55: 647 (1909) partly, incl. Chev. 18770, not of Koern." and characterizes the species as having "Scapes rather numerous, usually less than 1 1/4 in. high; leaves relatively broad and opaque; capitula 3—4 mm. diam., fuscous, subglobose at maturity; involucre bracts conspicuous,

stramineous, blunt". He cites the following collections at Kew: GUINEA: Chevalier 18770, 18810; Pitot s.n.; Schnell 7372. SIERRA LEONE: Deighton 2178. It has been found in anthesis in October.

**ERIOCAULON ROBUSTO-BROWNIANUM** Ruhl.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 42: 12. 1920; Moldenke, Phytologia 36: 488. 1977.

**ERIOCAULON ROLLANDII** Rousseau

Additional bibliography: Moldenke, Phytologia 36: 488. 1977; Scoggan, Fl. Canada 2: 459. 1978.

It is interesting that Boivin & Cayouette regard this taxon as a variety of E. pellucidum, Lepage regards it a form of that species [all using the epithet "septangulare" for it and intending the Old World E. aquaticum thereby], while Scoggan (1978) reduces it to synonymy under E. parkeri. Obviously it is a puzzling taxon.

**ERIOCAULON RUFUM** H. Lecomte, Bull. Soc. Bot. France 55: 644. 1909.

Bibliography: H. Lecomte, Bull. Soc. Bot. France 55: 644. 1909; Prain, Ind. Kew. Suppl. 4, imp. 1, 82. 1913; Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 327. 1931; Prain, Ind. Kew. Suppl. 4, imp. 2, 82. 1938; Moldenke, Known Geogr. Distrib. Erioc. 39. 1946; Moldenke, Résumé 292. 1959; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 59, & 62, fig. 336/5. 1968; Moldenke, Phytologia 18: 393. 1969; Moldenke, Fifth Summ. 2: 511. 1971; Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 540. 1972; Moldenke, Phytologia 41: 430. 1979.

Illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 59, fig. 336/5. 1968.

Although Hutchinson & Dalziel (1931) regarded this species as a synonym of E. plumale N. E. Br., Meikle (1968) has shown it to be distinct from that taxon and gives "E. plumale of F.W.T.A., ed. 1, 2: 327 partly, not of N. E. Br." in its synonymy. He characterizes it as being "Strictly erect; scapes usually numerous; capitula globose to 10 mm. diam., florets generally concealing involucral bracts in fully developed capitula." He cites the following collections at Kew: GUINEA: Arrieu 230 [Herb. Chillou 3139]; Jacques-Félix 7256; Maclaud s.n.; Pobéguin 1312. SIERRA LEONE: King 55b. It has been found in anthesis from October to December and in February.

**ERIOCAULON SANTAPAU** Moldenke

Additional bibliography: Moldenke, Phytologia 25: 70. 1972.

Raju describes this species as an annual herb, with many small scapes, and rare -- "a few plants scattered among grasses on a sandy river island", at 100 m. altitude.

Additional citations: INDIA: Andhra Pradesh: V. S. Raju 685d (2).

**ERIOCAULON SCHIEDEANUM** Körn.

Additional bibliography: Spellman, Dwyer, & Davidse, *Rhodora* 77: 124. 1975; Moldenke, *Phytologia* 33: 11. 1976.

Spellman and his associates (1975) record this species from Belize, but this seems most doubtful; re-examination of the material will probably show that this record is based on a misidentification.

**ERIOCAULON SCHIPPPII** Standl.

Additional bibliography: Spellman, Dwyer, & Davidse, *Rhodora* 77: 124. 1975; Moldenke, *Phytologia* 29: 224. 1974.

**ERIOCAULON SCHULTZII** Benth.

Additional bibliography: Moldenke, *Phytologia* 34: 489 (1976) and 41: 415 & 425. 1979.

The Latz 3703, cited below, was previously reported by me in this series of notes as E. lividum F. Muell. Miss Sheila S. Hooper, at Kew, in a letter to me dated July 11, 1977, writes of it: "E. schultzii Benth. or near. The leaves are broader than in the type which resembles the Chippendale specimen in that respect. The large cells of the floral bracts give it a strong superficial resemblance to E. lividum but that species has large keeled sepals to the female flowers." It was originally distributed as "E. quinquangulare L. sens. lat." and is described by the collector as an "erect ephemeral, heads white, rare in damp clayey loam in mixed grassland fringing lagoon". It was found in flower and fruit in May. Dunlop encountered it in drainage flats with gray silty clay surface soil, flowering and fruiting in August.

The C. Dunlop 3388, reported as E. schultzii by me in 1976, actually seems to be E. cinereum R. Br.

Additional citations: AUSTRALIA: Northern Territory: C. Dunlop 3457 (Z); Latz 3703 (Z).

**ERIOCAULON SELLOWIANUM** Kunth

Additional bibliography: Moldenke, *Phytologia* 36: 489--490. 1977.

Shepherd and his associates encountered this plant in brejo (wet sedge meadow), flowering in November. Their collection does not match well other collections of this taxon.

Additional citations: BRAZIL: Goiás: Shepherd, Andrade, Kinoshita, & Tamashiro 3756 (N, N).

**ERIOCAULON SELLOWIANUM** var. **PARANENSE** (Moldenke) Moldenke & Smith

Additional bibliography: Moldenke, *Phytologia* 36: 489--490. 1977.

Additional citations: BRAZIL: Santa Catarina: Smith & Klein 13632 (Au-249995).

**ERIOCAULON SESSILE** Meikle

Synonymy: Eriocaulon diaguissense Bourdu, Bull. Soc. Bot.

France 104: 156--158, fig. A--F. 1957.

Additional & emended bibliography: Bourdu, Bull. Soc. Bot.

France 104: 156--158, fig. A--F. 1957; Anon., Assoc. Étud. Taxon.

Fl. Afr. Trop. Index 1957: 33. 1958; Jacques-Félix, Excerpt. Bot.

A.1: 72. 1959; Moldenke, Résumé 426 & 480. 1959; Moldenke, Résumé

Suppl. 1: 8. 1959; G. Taylor, Ind. Kew. Suppl. 13: 52. 1966;

Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 57, 60,

& 64, fig. 337/27. 1968; Moldenke, Phytologia 18: 51 (1968), 19:

34--35 (1968), and 20: 405. 1970; Moldenke, Fifth Summ. 1: 216

(1971) and 2: 934. 1971; Hepper in Hutchins. & Dalz., Fl. W. Trop.

Afr., ed. 2, 3: 540. 1972; Moldenke, Phytologia 24: 355 (1972),

26: 464 (1973), and 41: 420. 1979.

Additional & emended illustrations: Bourdu, Bull. Soc. Bot.

France 104: 157, fig. A--F. 1957; Meikle in Hutchins. & Dalz., Fl.

W. Trop. Afr., ed. 2, 3: 60, fig. 337/27. 1968.

Meikle (1968) characterizes this species as "A remarkable dwarf, less than 1 cm. high; the capitula sessile and forming a central 'disk' surrounded by numerous, narrowly subulate, often reddish, leaves", citing only Des Abbayes 777 from Guinea at Kew, but listing it also from the Central African Empire. It has been found in anthesis in October.

**ERIOCAULON SETACEUM** L.

Additional & emended bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1066 & 1067 (1924) and ed. 2, 3: 1114 & 1115.

1961; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3:

58, 60, & 62, fig. 337/9. 1968; Hocking, Excerpt. Bot. A.25: 379.

1975; Moldenke, Biol. Abstr. 64: 686. 1977; Moldenke, Phytologia

36: 490 (1977) and 41: 414 & 424. 1979.

Recent collectors describe this whole plant as "pale-green" and have found it growing near the edge of ponds in moist evergreen forests and submerged in the water of the ponds, the inflorescence protruding above the water surface, at 650--1200 m. altitude.

Additional citations: THAILAND: Beusekom & Charoenpol 1770 (Ac); Beusekom & Smitinand 1783 (Ac).

**ERIOCAULON SETACEUM** var. **CAPILLUS-NAIADIS** (Hook. f.) Moldenke

Additional & emended bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1067 (1924) and ed. 2, 3: 1115. 1961; Hocking, Ex-

cerpt. Bot. A.25: 379. 1975; Moldenke, Phytologia 36: 490. 1977.

In Sri Lanka this plant is known as "pedakokmota" and "penda" in Sinhalese.

**ERIOCAULON SETICUSPE** Ohwi

Additional bibliography: Moldenke, Phytologia 34: 490. 1976.

Nomura found this plant scattered in very shallow water at the

margin of a large pond in what he says is the type locality, at 100 meters altitude, flowering and fruiting in October.

Additional citations: JAPAN: Kyushu: Nomura 13011 (N).

#### ERIOCAULON SEXANGULARE L.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 42: 13. 1920; Moldenke, Phytologia 36: 472 & 490 (1977), 37: 422 & 423 (1977), and 38: 47. 1977; B. C. Stone, Henderson's Malay. Wild Fls. Append. 23. 1977; Satake, Journ. Jap. Bot. 53: 110. 1978; Scoggan, Fl. Canada 2: 459. 1978; Moldenke, Phytologia 41: 430. 1979.

Recent collectors describe this plant as having "leaves and stems green, heads gray", and have found it growing in slow-moving permanent water and in open wet marshy areas, at 25--850 meters altitude, flowering in June and December, fruiting in December. Scoggan (1978) notes that the "E. sexangulare" reported from Canada by early writers is a misidentification for E. pellucidum Michx.

Additional citations: SRI LANKA: Hepper, Maxwell, & Fernando 4566 (N); Sohmer & Waas 10226 (N). THAILAND: Larsen, Larsen, Nielsen, & Santisuk 31091 (N), 32318 (N).

#### ERIOCAULON SMITINANDI Moldenke

Additional bibliography: Moldenke, Phytologia 34: 492 (1976) and 41: 420. 1979.

Recent collectors describe this plant as "light-green", the "flowers gray-whitish", and have found it to be "common on moist impervious hardpan" in association with E. echinulatum Mart., at 400 meters altitude.

Additional citations: THAILAND: Beusekom & Smitinand 2142 (Ac).

#### ERIOCAULON SOLLYANUM Royle

Additional & emended bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1066 & 1068 (1924) and ed. 2, 3: 1114 & 1116. 1961; Moldenke, Phytologia 36: 491. 1977.

#### ERIOCAULON SOLLYANUM var. SUMATRANUM Van Royen

Additional bibliography: Moldenke, Phytologia 34: 492--493. (1976) and 36: 38. 1977.

Recent collectors describe this plant as a common erect herb to 60 cm. tall, the leaves fleshy and dark-green, the "heads ash-white with pale-brown bracts" and have encountered it in swampy sedge-grassland dominated by Rynchospora rubiginosa and Miscanthus floridulus, at 1550 meters altitude, flowering in December. Material has been misidentified and distributed in some herbaria as "E. hookeriana var. hookeriana".

Additional citations: NEW GUINEA: Territory of New Guinea: Barker & Vinas LAE.67725 (Mu).

**ERIOCAULON SPECTABILE** F. Muell.

Additional bibliography: Moldenke, *Phytologia* 33: 15. 1976.

The G. C. Taylor 92, cited below, is placed here very tentatively; it is far too immature to allow accurate identification and does not closely resemble other material identified as this species. Miss Shiela Hooper, at Kew, writes of it in a letter to me dated July 11, 1977: "very young and I cannot make out the floral structure. The stiff pink-tinged leaves look distinctive but I cannot match it except in E. spectabile which appears a much larger plant. E. nanum has similar small heads with gray floral bracts."

Additional citations: AUSTRALIA: Northern Territory: G. C. Taylor 92 [Herb. North. Terr. 33657] (2).

**ERIOCAULON STEYERMARKII** Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.*28: 170. 1976; Moldenke, *Phytologia* 36: 491. 1977.

**ERIOCAULON STEYERMARKII** var. **BAHIENSE** Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.*28: 170. 1976; Moldenke, *Phytologia* 33: 16. 1976.

**ERIOCAULON STRICTUM** Milne-Redhead

Additional & emended bibliography: Meikle in Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 3: 63. 1968; Moldenke, *Phytologia* 36: 491 (1977) and 41: 426. 1979.

Meikle (1968) avers that this species is closely related to E. maculatum Schinz and E. fulvum N. E. Br.

**ERIOCAULON TAKAE** Koidz.

Additional bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 41: 13. 1916; Koidz., *Feddes Repert. Spec. Nov.* 15: 174. 1918; Fedde & Schust., *Justs Bot. Jahresber.* 42: 12. 1920; Moldenke, *Phytologia* 25: 81. 1972.

**ERIOCAULON TENUIFOLIUM** Klotzsch

Additional bibliography: Hocking, *Excerpt. Bot. A.*28: 170. 1976; Moldenke, *Phytologia* 36: 491. 1977.

**ERIOCAULON TENUIFOLIUM** f. **VIVIPARUM** Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.*28: 170. 1976; Moldenke, *Phytologia* 33: 16—17. 1976.

**ERIOCAULON TEUSCZII** Engl. & Ruhl.

Additional bibliography: Hutchins. & Dalz., *Fl. W. Trop. Afr.*, ed. 1, 2: 326 & 327. 1931; Moldenke, *Phytologia* 29: 233 (1974), 38: 26 & 131 (1977), and 41: 422. 1979.

Hutchinson & Dalziel characterize this plant as having "Peduncles

elongated from a small tuft of leaves; sheaths about 6 cm. long; heads white" and cite only Lely 283 at Kew from Northern Nigeria, flowering in June, commenting "Also is East tropical Africa, Rhodesia and Angola".

#### ERIOCAULON TEXENSE Körn.

Additional synonymy: Eriocaulon texense Horn, in herb.

Additional bibliography: Moldenke, Phytologia 36: 491 (1977) and 41: 419. 1979.

Recent collectors have encountered this species in cleared boggy areas, in seepage areas with pitcherplants, and "frequent in marshy areas with scattered trees and hillside seepage from springs", flowering in June, the flowers described as "white".

Material of E. texense has been misidentified and distributed in some herbaria as Lachnocaulon anceps (Walt.) Morong. On the other hand, the McCaleb 92 and Waddle 298, distributed as E. texense, actually are E. decangulare var. minor Moldenke, while Webster & Rowell 1903 is E. decangulare f. parviceps Moldenke.

Additional citations: ALABAMA: R. Kral 35200 (N). LOUISIANA: Beauregard Par.: R. Kral 20158 (Au--245569, Ld); Kral & Ricks 16992 (Au--245578). Vernon Par.: R. Kral 20078 (Au--245576); Kral & Ricks 16772 (Au--245577); Thieret 32862 (Ld). TEXAS: Henderson Co.: Correll, Correll, & Crutchfield 30952 (Ld). Jasper Co.: Nixon & Chambless 1817 (Ld).

#### ERIOCAULON THWAITESII Körn.

Additional & emended bibliography: Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 1, 341. 1864; Fedde & Schust., Justs Bot. Jahresber. 42: 12. 1920; Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 2, 341. 1964; Moldenke, Phytologia 36: 475 & 492. 1977.

Waas describes this species as an herb, 15 cm. tall, with white flower-heads, and found it growing in secondary forest edges near a stream, at 4400 feet altitude, flowering and fruiting in January.

Additional citations: SRI LANKA: Waas 1000 (W--2801942).

#### ERIOCAULON TOGOËNSE Moldenke

Additional synonymy: Eriocaulon togoense Moldenke ex Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 61, fig. 338/22. 1968.

Additional & emended bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 326. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 57, 61, & 63, fig. 338/22. 1968; Moldenke, Phytologia 29: 234 (1974) and 38: 183. 1978.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 61, fig. 338/22. 1968.

Meikle (1968) characterizes this species as a "Neat tufted annual, usually less than 2 1/2 in. high; scapes numerous; capitula 5--8 mm. diam. with conspicuous whitish involucre bracts", citing

the following collections at Kew: MALI: Raynal 5306 quinto. IVORY COAST: Aké Assi 7243; De Wit 7901 sub 545. GHANA: Adames 4400; Hall CC.92; Morton GC.9582. TOGO: Schroeder 155, 162. NIGERIA: Northern: Barter 7781; Daley FHL.32294; Meikle 703; Parsons L.1021; Philcox 167. Southern: Stanfield 57, 117. It has been found in flower in August and from October to January.

#### ERIOCAULON TRANSSVAALICUM N. E. Br.

Additional & emended bibliography: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 59, & 63, fig. 336/11. 1968; Moldenke, Phytologia 29: 234 (1974) and 38: 131. 1977.

#### ERIOCAULON TRANSSVAALICUM var. HANNINGTONII (N. E. Br.) Meikle

Additional synonymy: Eriocaulon monodii Moldenke, Phytologia 3: 165--166. 1949.

Additional & emended bibliography: Moldenke, Phytologia 3: 165--166 (1949) and 3: 335. 1950; Monod, Bull. Inst. Fr. Afr. Noir 16: 316. 1954; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 59, & 63, fig. 336/11. 1968; Moldenke, Phytologia 18: 319--320 (1969), 24: 480 (1972), 29: 195 & 234--235 (1974), and 41: 427. 1979

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 59, fig. 336/11. 1968.

Meikle (1968) characterizes this plant as having "Scapes numerous, capitula subglobose, about 4 mm. diam., involucrel bracts pale brown", citing only at Kew Monod s.n. from Mali, commenting "Also in Tanzania and Mozambique; typical E. transvaalicum is widespread in tropical Africa outside our area". It has been found in flower in December.

#### ERIOCAULON TRUNCATUM Hamilt.

Additional & emended bibliography: Haines, Bot. Bihar & Orissa, ed. 1, 6: 1067 & 1070. 1924; Bond, Wild Fls. Ceyl. Hills xiii, 232, 233, & 239, pl. 120. 1953; Haines, Bot. Bihar & Orissa, ed. 2, 3: 1115 & 1118. 1961; Moldenke, Phytologia 36: 492. 1977; B. C. Stone, Henderson's Malay. Wild Fls. Append. 23. 1977.

Emended illustrations: Bond, Wild Fls. Ceyl. Hills 233, pl. 120. 1953.

Maxwell describes this plant as having the "inflorescence bracts and flower bracts gray, leaves and scape green" and found it growing in a few cm. of water over a sand-silt bottom, at 25 meters altitude, flowering and fruiting in December. Thwaites (1864) asserts that the species is very common in Sri Lanka, where Bond (1953) says that it occurs "in swampy ground up to the highest elevations, in flower most of the year".

Additional citations: MALAYA: Singapore: Maxwell 76-794 (Ac).



ERIOCAULON WALKERI Hook. f.

Additional bibliography: Moldenke, *Phytologia* 36: 487 & 493. 1977.

Thwaites (1864) asserts that this species is abundant on paddy borders in Sri Lanka.

Additional citations: SRI LANKA: Jayasuriya 2105 (N).

ERIOCAULON WIGHTIANUM Mart.

Additional bibliography: Moldenke, *Phytologia* 33: 19. 1976.

Recent collectors report this species "local on moist impervious hardpan" at 400 m. altitude, in Thailand, while Raju refers to it as an annual herb, with many scapes, white flower-heads, and broad leaves, found in wet places in cultivated rice fields after the crop was cut.

Additional citations: INDIA: Andhra Pradesh: V. S. Raju 675b (Ld). THAILAND: Beusekom & Smitinand 2158 (Ac).

ERIOCAULON WILLDENOVIANUM Moldenke

Emended synonymy: Eriocaulon longifolium "Nees ex Kunth" apud Abeywickrama, Ceyl. *Journ. Sci. Biol.* 2: 141. 1959.

Additional bibliography: Hocking, *Excerpt. Bot. A.25*: 379. 1975; Moldenke, *Phytologia* 36: 472, 490, & 493. 1977; Moldenke, *Biol. Abstr.* 65: 78. 1978.

Recent collectors refer to this species as a "light-green" herb with gray or white flower-heads and found it to be locally frequent on moist impervious hardpan, as well as at the edges of drying-out waterholes, at 400 m. altitude, flowering in November.

Additional citations: SRI LANKA: Waas 923 (W--2769016). THAILAND: Beusekom & Smitinand 2145 (Ac).

ERIOCAULON WILLDENOVIANUM var. FERGUSONII Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.25*: 379. 1975; Moldenke, *Phytologia* 29: 238--239. 1974.

ERIOCAULON XENOPODIUM T. Koyama

Additional bibliography: Moldenke, *Phytologia* 34: 496. 1976.

Maxwell describes this plant as having "bracts tan, heads whitish with black corollas" and encountered it as an erect herb in wet sandy-muddy marshes on savannas, at 550 m. altitude, flowering and fruiting in August.

Additional citations: THAILAND: Maxwell 76-544 (Ac).

ERIOCAULON XERANTHEMUM Mart.

Additional & emended bibliography: Haines, *Bot. Bihar & Orissa*, ed. 1, 6: 1067 & 1070 (1924) and ed. 2, 3: 1115 & 1118. 1961; Moldenke, *Phytologia* 34: 496. 1976.

It is worth noting that Haines (1924, 1961) still follows Hooker in placing E. xeranthemoides Van Heurck & Muell.-Arg. in the synonymy of E. xeranthemum, but that African taxon is now

known as E. togoense Moldenke.

The Raju 614, distributed as possibly E. xeranthemum, actually is E. quinquangulare L.

#### ERIOCAULON ZAMBESIENSE Ruhl.

Additional & emended bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 326 & 327. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 58, 59, & 62, fig. 336/1. 1968; Moldenke, Phytologia 29: 195, 235, & 239. 1974.

Emended illustrations: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 59, fig. 336/1. 1968.

Meikle (1968) characterizes this species as having "Peduncles up to 2 ft. 8 in. high; capitula 5—8 mm. diam., covered with whitish papillae, generally viviparous", citing the following collections at Kew: CAMEROONS: Brunt 1092; Hepper 2021; Maitland 1400.

FERNANDO PO: Monod 10358. It has been found in flower in February, April, June, and December. Meikle notes that "The specimen from F. Po closely resembles typical E. zambesiense, but those from W. Cam[eroons] are altogether more robust, with very broad and blunt leaves, up to 1.5 cm. wide at the base".

#### ERIOCAULON ZOLLINGERIANUM Körn.

Additional bibliography: Moldenke, Phytologia 34: 496—497. 1976.

Recent collectors have found this plant growing in open wet places along roadsides in disturbed evergreen forests on moist impervious hardpan, at 400 meters altitude, flowering in November, and describe it as light-green, the heads "globose to barrel-shaped, yellowish".

Additional citations: THAILAND: Beusekom & Smitinand 2130 (Ac).

#### LACHNOCAULON Kunth

Additional bibliography: Hocking, Excerpt. Bot. A.25: 378.

1975; Kral, Rhodora 78: 444. 1976; Batson, Gen. East. Pl. 40 & 195. 1977; Lelong, Sida 7: 127. 1977; Moldenke, Biol. Abstr. 63: 3041 & 6590. 1977; Moldenke, Phytologia 36: 470, 487, 493—497, & 506 (1977) and 37: 22—25 & 508. 1977; Poppeton, Shuey, & Sweet, Fla. Scient. 40: 372. 1977; Richardson, Fla. Scient. 40: 303. 1977; Moldenke, Biol. Abstr. 64: 78. 1978; Moldenke, Phytologia 41: 411 & 419. 1979.

#### LACHNOCAULON ANCEPS (Walt.) Morong

Additional bibliography: Kral, Rhodora 78: 444. 1976; Batson, Gen. East. Pl. 40. 1977; Lelong, Sida 7: 127. 1977; Moldenke, Phytologia 36: 470 & 493—496 (1977) and 37: 23 & 24. 1977; Poppeton, Shuey, & Sweet, Fla. Scient. 40: 372. 1977; Richardson, Fla.

Scient. 40: 303. 1977; Moldenke, Biol. Abstr. 65: 78. 1978;

Moldenke, Phytologia 41: 419. 1979.

Additional illustrations: Batson, Gen. East. Pl. 40. 1977.

Lelong (1977), calling this plant "bog-buttons", records it as

"Infrequent in moist, open sandy areas" in Mobile County, Alabama. Other recent collectors have found it in sandy peat of flatwoods bogs, on wet prairies, in moist sandy peat of clearings in slash pine - saw palmetto woods, in wet ditches, and on mowed roadbanks, flowering in June and September. Lakela remarks that it is "common throughout" Hillsborough County, Florida, on moist creekbanks. The flower-heads are described as "chalky-gray-white" by D'Arcy. Shacklette found the species "in very wet heavily organic-stained soil in low pine-palmetto woods".

Material of L. anceps has been misidentified and distributed in some herbaria as L. beyrichianum Sporleder and L. minus (Chapm.) Small. On the other hand, the A. S. Hitchcock s.n. [Eustis, June-July 1894], Taylor & Taylor 13348, Williamson 2, and A. Wood s.n. [Tallahassee], distributed as L. anceps, actually are L. beyrichianum Sporleder (not L. minus as previously cited by me). Clare 3001 at Austin bears a label reading "Dichromena nivea Boeckl.", perhaps as a result of mixed labels during the mounting process.

Additional & emended citations: VIRGINIA: Greensville Co.: Smith & Hodgdon Pl. Exsicc. Gray. 1029 (Ld). NORTH CAROLINA: Bladen Co.: Fox & Godfrey 2644 (N). Brunswick Co.: Godfrey 48391 (Ld). Cumberland Co.: Fox & Godfrey 2592 (N). Onslow Co.: W. V. Brown s.n. [June 19, 1940] (Au-217135), s.n. [June 20, 1940] (Au-211611). Pamlico Co.: Godfrey 48295 (Ld). SOUTH CAROLINA: Bamberg Co.: Ahles & Haesloop 30595 (Ld). Darlington Co.: Radford & Stewart 401 (Au-26791). Horry Co.: Bell 7767 (Au-192198). GEORGIA: Clinch Co.: R. Kral 24289 (Au-245580). Jeff Davis Co.: Shacklette 7112 (Mi). Miller Co.: Thorne 4217 (Au-26788). Screven Co.: R. Kral 24052 (Au-245590). FLORIDA: Alachua Co.: D'Arcy 1602 (Ld). Hillsborough Co.: Lakela 25774 (Ld). Levy Co.: Kral & Kral 6918 (Au-232211). Nassau Co.: R. Kral 22729 (Ld). Okeechobee Co.: R. Kral 20478 (Au-245622). Osceola Co.: R. Kral 20468 (Au-245617). Santa Rosa Co.: Godfrey 56687 (Ld). Volusia Co. R. Kral 20443 (Au-245618), 20452 (Au-245573). ALABAMA: Mobile Co.: Taylor & Taylor 13577 (Ld). MISSISSIPPI: Pearl River Co.: Jones & Reynolds 11960 (Au-260902); R. Kral 17332 (Au-245538). LOUISIANA: Beauregard Par.: R. Kral 20156 (Au-245614, Ld), 20197 (Au-245537); Kral & Ricks 16991 (Au-245574). Rapides Par.: R. Kral 20069 (Au-245613). Vernon Par.: R. Kral 20039 (Au-245612); R. McVaugh 8457 (Au-26790). TEXAS: Bexar Co.: Clare 3001 (Au-26779). Hardin Co.: D. S. Correll 32972 (Ld); Correll & Correll 38791 (Ld); Lundell & Lundell 11152 (Ld). Jasper Co.: Gould 5838 (Au-26781); Thompson & Turner 170 (Au-135425). Tyler Co.: D. S. Correll 35836 (Ld), 36995 (Au-284472, Ld), 37246 (Au-284423, Ld), 37248 (Ld); Tharp, Turner, & Johnston 54955 (Au-26780).

**LACHNOCAULON ANCEPS f. GLABRESCENS** Moldenke

Additional bibliography: Kral, Rhodora 78: 444. 1976; Moldenke, Phytologia 36: 494—496 (1977) and 37: 24. 1977.

The Austin sheet of Kral 20420 has all the peduncles completely glabrous and is regarded by me as representing typical L. glabrum Körn. rather than the present form.

**LACHNOCAULON BEYRICHIANUM** Sporleder

Additional bibliography: Moldenke, Phytologia 36: 490 & 496—497 (1977), 37: 23 & 24 (1977), and 41: 411. 1979.

Recent collectors have found this species growing in the "sandy edges of pocosins", in limesink ponds, "in dry sterile white sand beneath Pinus palustris and Quercus virginiana", "in clumps to 20 cm. in diameter in sandy openings in extensive Pinus clausa scrub with many young pines and rather dense shrub cover of Lyonia ferruginea, L. dulcis, glaucous Serenoa repens, Quercus geminata, Q. chapmanii, Befaria racemosa, Persea humilis, Ceratiola, Osmanthus megacarpa, with Rhynchospora megalocarpa, Galactia elliottii and Smilax auriculata", "in wet sandy-peaty soil of roadside savannas", "in pure white sand among scattered Quercus laevis and pines", on lake shores, in dry woods, above highwater-mark on shores of ponds, on mucky wet shores of pools in cypress-gum clearings, in wet places in general, "frequent in low sandy areas bordering grassy depressions on dunes of white sand with low scrub of Quercus, Persea, Bumelia, Befaria, etc.", on sandy lakeshores, and at the "edge of a series of ponds in depressions in sand", at 105 feet altitude, flowering and fruiting from April to October.

Schallert s.n. [4/30/41] in the Britton Herbarium exhibits rather broader leaves than usual, more like those seen on L. minus (Chapm.) Small.

Most of the specimens listed below were previously erroneously cited by me as L. minus before the distinctions between that species and L. beyrichianum were more clearly understood. Material of L. beyrichianum has been misidentified and distributed in many herbaria as Eriocaulon sp., Lachnocaulon anceps (Walt.) Morong, L. michauxii Kunth, and L. minus (Chapm.) Small. On the other hand, the Fox & Godfrey 2592 & 2644, previously regarded as L. beyrichianum actually are L. anceps, Nash 148 is a mixture with L. minus, and Halfert s.n. [13 Apr. 1934] is a mixture with Syngonanthus flavidulus (Michx.) Ruhl.

Additional & emended citations: NORTH CAROLINA: Bladen Co.: R. Kral 27199 (N). Carteret Co.: W. V. Brown s.n. [June 18, 1941] (Au—217145). New Hanover Co.: Blake 12431 (Ld); Godfrey Pl. Exsicc. Gray. 926 (Au, Ba, Bl—76085, Ca—741292, Gg—275556, Hi—22050, Hi—53894, Ld, Ms—80430, N, N, Ok, S, St, W—1823367, Ws); Williamson 2 (N). GEORGIA: Baker Co.: Thorne 4363 (N). Lowndes Co.:

R. M. Harper 1607 (N). Screven Co.: Hardin & Duncan 14748 (Mi).  
 FLORIDA: Broward Co.: Small & Carter 1037 (N). Gadsden Co.: A. Wood s.n. [Quincy] (Pa). Gilchrist Co.: West & Arnold s.n. [5 Oct. 1940] (N). Highlands Co.: Webster 4179 (N). Lake Co.: A. S. Hitchcock s.n. [Eustis, June-July 1894] (Fl--5434, Ka, N); Nash 148 in part (C, Ca--115162, D--703935, Es, Mi, Mm--7950, Ms--15407, W--223264, W--936870 in part), 1855 (Ba, C, Es, Ms--15499, W--252419). Leon Co.: A. Wood s.n. [Tallahassee] (Pa). Martin Co.: R. Kral 20418 (Au--245606, Ld). Nassau Co.: G. S. Schallert s.n. [5/4/41] (N). Polk Co.: P. O. Schallert s.n. [4/30/41] (Ca--811817, Dp--30192, N); Taylor & Taylor 5215 (Ld). Putnam Co.: Barnhart 2117 [Herb. Barnhart 2563] (N). Saint Lucie Co.: R. Kral 20378 (Au--245607). Seminole Co.: Ray, Wood, Smith, & Eaton 10714 (Ld). Volusia Co.: Halfert s.n. [3 Apr. 1934] in part (Mi); R. Kral 20441 (Au--245619, Ld). Wakulla Co.: Godfrey 55667 (N), 64164 (Ld). ALABAMA: Dauphin Island: Taylor & Taylor 13348 (Z).

#### LACHNOCAULON DIGYNUM Körn.

Additional bibliography: Moldenke, *Phytologia* 36: 497. 1977.

Kral encountered this species in "sandy peat of boggy bottoms" and in "sandy peat on roadbanks through pineland bogs".

Additional citations: FLORIDA: Bay Co.: R. Kral 15656 (Ld), 15667 (Au--245603). Escambia Co.: R. Kral 17634 (Au--245599), 23169 (Au--245600, Ld). ALABAMA: Mobile Co.: R. Kral 35642 (N). Washington Co.: R. Kral 35556 (N).

#### LACHNOCAULON ECILIATUM Small

This taxon is now regarded as conspecific with L. minus (Chapm.) Small, which see.

#### LACHNOCAULON ENGLERI Ruhl.

Additional bibliography: Hocking, *Excerpt. Bot. A.25*: 378. 1975; Moldenke, *Biol. Abstr.* 63: 6590. 1977; Moldenke, *Phytologia* 36: 494 & 497 (1977) and 37: 22--23. 1977.

Additional citations: FLORIDA: Martin Co.: R. Kral 18235 (Au--245535, Ld), 20386 (Au--245575, Ld). Volusia Co.: R. Kral 18426 (Au--245524, Ld). Walton Co.: R. Kral 17746 (Au--245601, Ld).

#### LACHNOCAULON ENGLERI f. ABLUDENS Moldenke

Additional bibliography: Moldenke, *Biol. Abstr.* 63: 6590. 1977; Moldenke, *Phytologia* 37: 23. 1977.

#### LACHNOCAULON ENGLERI var. CAULESCENS Moldenke

Additional bibliography: Moldenke, *Phytologia* 29: 286. 1974; Hocking, *Excerpt. Bot. A.25*: 378. 1975.

**LACHNOCAULON FLORIDANUM** Small

This taxon is now regarded as conspecific with L. glabrum Körn., which see.

**LACHNOCAULON GLABRUM** Körn.

Synonymy: Lachnocaulon floridanum Small, Fl. Southeast. U. S., ed. 1, 235 & 1328. 1903.

Additional & emended bibliography: Moldenke, N. Am. Fl. 19 (1): 46—50. 1937; Moldenke, Phytologia 1: 330, 331, 349, 357, 359, & 362. 1939; Moldenke, Alph. List Cit. 3: 753, 760, 777, 822, 841, 877, 899, 941, 942, 944, & 958. 1949; R. Kral, Sida 2: 315, 316, 319, 321—323, 325, 331, & 443, 1966; Long & Lakela, Fl. Trop. Fla., ed. 1, 262 & 938. 1971; Moldenke, Phytologia 29: 103, 204, 286, & 287 (1974), 36: 487 & 494 (1977), and 37: 23 & 24. 1977.

Kral 20420 at Austin has all the peduncles completely glabrous, not mixed with incompletely glabrescent ones as in other sheets of this collection.

Additional citations: FLORIDA: Charlotte Co.: R. Kral 18040 Au—245551). Lake Co.: Nash 1981 (C, Es, Ms—15501, N, W—252418). Lee Co.: R. Kral 18012 (Au—245531). Martin Co.: R. Kral 18288 (Au—245536), 20420 in part (Au—245624). Saint Lucie Co.: R. Kral 20424 (Au—245621, Id).

**LACHNOCAULON MINUS** (Chapm.) Small

Additional synonymy: Lachnocaulon eciliatum Small, Fl. Southeast. U. S., ed. 1, 235 & 1328. 1903.

Additional & emended bibliography: J. K. Small, Man. Southeast. Fl. 256—257. 1933; Moldenke, N. Am. Fl. 19 (1): 46—50. 1937; Moldenke, Phytologia 1: 330, 331, 349, 352—354, 356, 357, 362, & 363. 1939; Moldenke, Alph. List Cit. 1: 37, 42, 90, 138, 139, 240, 257, 283, 284, 287, & 290. 1946; Moldenke, Phytologia 3: 494—496. 1951; Moldenke, Résumé 10—13 & 484. 1959; R. Kral, Sida 2: 315 & 321. 1966; Moldenke, Phytologia 18: 381 & 437 (1969) and 20: 35, 36, 41, 46, 48—50, 52, 81—83, & 252. 1970; Long & Lakela, Fl. Trop. Fla., ed. 1, 260, 262, & 938. 1971; Moldenke, Phytologia 25: 128, 129 & 225 (1973), 26: 43, 184, & 467 (1973), 36: 29, 494, 496, & 497 (1977), and 37: 22—25. 1977; Poppeton, Shuey, & Sweet, Fla. Scient. 40: 372. 1977; Moldenke, Biol. Abstr. 65: 78. 1978.

A note on Kral 17747 asserts that "This is the plant Small called L. eciliatum and it may be that hybrids between L. minus and L. engleri do fit Small's description"; it exhibits thin leaves very much like those seen in typical L. beyrichianum Sporleder. Similar leaves are seen on Godfrey 70114.

The Fox & Godfrey 2592 & 2644, previously regarded and cited as L. minus, seem actually to be L. anceps (Michx.) Ruhl., as is also Shacklette 7112, distributed as L. minus, while Barnhart 2117, Blake

12431, Godfrey 55667, 64164, & Pl. Exsicc. Gray. 926, Hardin & Duncan 14748, R. M. Harper 1607, Herb. A. Wood s.n., A. S. Hitchcock s.n. [Eustis, June-July 1894], Nash 1855, Ray, Wood, Smith, & Eaton 10714, Schallert s.n. [4/30/41] & s.n. [5/4/41], Small & Carter 1037, Thorne 4363, Webster 4179, West & Arnold s.n. [5 Oct. 1940], and Williamson s.n. are L. beyrichianum Sporleder; Nash 148, in at least some herbaria, is a mixture of L. minus and L. beyrichianum.

Additional citations: NORTH CAROLINA: Brunswick Co.: Bradley & Stevenson 3306 (Au-250964, Ld); Godfrey 49350 (Ld); Godfrey & Fox 49742 (Ld). Onslow Co.: R. Kral 22472 (Au-245583). SOUTH CAROLINA: Georgetown Co.: R. Kral 19018 (Au-245587, Ld). FLORIDA: Highlands Co.: Brass 14545 (W-2065050). Lake Co.: Biltmore Herb. 15001d (N, N); Bright 3842 (Ws); Nash 148 in part (W-936870 in part). Leon Co.: Godfrey 62896 (Au-229695); 70114 (Au-290101, Ld); N. C. Henderson 63-1066 (Au-229912); Kral & Godfrey s.n. [15 Aug. 1962] (Au-245616). Putnam Co.: R. M. Harper 7 (N, N, W-513490), 8 in part (W-513491). Seminole Co.: R. Kral 20457 (Au-245602, Ld). Volusia Co.: R. Kral 18427 (Au-245620, Ld). Walton Co.: Curtiss 3022 (Bc, C, Ca-189378, I, Mu-374, N, Pa, W-45319, W-436874); R. Kral 17747 (Au-245615). County undetermined: Eaton 1059 (Ld).

#### LEIOTHRIX Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.25: 378 (1975) and A.28: 170 & 171. 1976; Moldenke, Biol. Abstr. 63: 3041 (1977) and 64: 4787. 1977; Moldenke, Phytologia 37: 25-31, 33, 270, 489, 494, & 508 (1977) and 38: 30, 31, & 507. 1978.

The M. A. Chase 10432, distributed in some herbaria as Leiothrix sp., actually is Paepalanthus cuspidatus Alv. Silv.

#### LEIOTHRIX ANGUSTIFOLIA (Körn.) Ruhl.

Additional bibliography: Moldenke, Phytologia 37: 25. 1977.

Additional citations: BRAZIL: Bahia: Davidse, Ramamoorthy, & Vital 11954 (N).

#### LEIOTHRIX ARGENTEA Alv. Silv.

Additional bibliography: Moldenke, Phytologia 25: 96 (1972) and 37: 494. 1977.

Hatschbach encountered this species in wet sandy soil among rocks, flowering and fruiting in April.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 41345 (Z). MOUNTED CLIPPINGS: Silveira's original description (N, W, Z).

#### LEIOTHRIX ARGYRODERMA var. BREVIPES Moldenke

Additional bibliography: Moldenke, Phytologia 37: 25. 1977.

The Eitens have found this plant growing in a small natural marsh at the side of a pond between rock outcrops in a thin humus layer over the sloping rock face, at 2450 meters altitude, flowering and fruiting in November.

Additional citations: BRAZIL: Minas Gerais: Glaziou 9000 [U. S. Nat. Herb. photo 5889] (W--2830402--fragment & photo of type). Rio de Janeiro: Eiten & Eiten 6606 (N), 6608 (N).

**LEIOTHRIX CURVIFOLIA** (Bong.) Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 25--26, 33, & 270. 1977.

The Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28221, distributed as typical L. curvifolia, seems better placed as var. lanuginosa (Bong.) Ruhl.

**LEIOTHRIX CURVIFOLIA** var. **LANUGINOSA** (Bong.) Ruhl.

Additional bibliography: Moldenke, *Phytologia* 29: 288. 1974.

Recent collectors describe this plant as a tufted herb, the inflorescences to 7 cm. tall, the heads light-gray, and have found it growing on campos in areas of campo, cerrado on the outcrops, and wooded valleys", at 1200 meters altitude, flowering and fruiting in March.

The Irwin & al. 28221, cited below, was distributed as and previously cited by me in error as typical L. curvifolia (Bong.) Ruhl.

Additional & emended citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28221 (N, W--2759063, Z).

**LEIOTHRIX CURVIFOLIA** var. **SETACEA** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 29: 288. 1974.

Recent collectors have found this plant on wet sandy campos, in fruit in January.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 40837 (Ld); Mexia 5799 (Au--26794).

**LEIOTHRIX DIELSII** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 26. 1977.

Additional citations: BRAZIL: Rio de Janeiro: Segadas-Vianna, Lau, Ormond, Machline, & Laredo 1.158 [Herb. Rio de Jan. 108893] (Au--210062).

**LEIOTHRIX DUBIA** Alv. Silv.

Additional bibliography: Moldenke, *Phytologia* 33: 22. 1976.

Hatschbach has encountered this plant in wet sandy soil at the base of some hills, flowering in April. He reports the flowers as "white".

Additional citations: BRAZIL: Minas Gerais: Hatschbach 41288 (Ld). MOUNTED CLIPPINGS: Silveira's original description & illustration (N, W, Z).

**LEIOTHRIX ECHINOCEPHALA** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 26. 1977.

Hatschbach encountered this species on "afloramentos rochosos, depressões, arenosos", flowering and fruiting in January.



Additional citations: BRAZIL: Minas Gerais: Hatschbach 40914 (Z).

**LEIOTHRIX FLAVESCENS** (Bong.) Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 26--27. 1977.  
Recent collectors have found this plant growing in brejo (wet sedge meadow) and in wet soil at the edge of correjo, flowering in April, fruiting in April and July.

Additional citations: BRAZIL: Goiás: Hatschbach 40062 (Ld). Minas Gerais: Hatschbach 41333 (Ld).

**LEIOTHRIX FLUMINENSIS** var. **PUBERULA** Moldenke

Additional bibliography: Moldenke, *Phytologia* 29: 290. 1974.  
Additional citations: BRAZIL: State undetermined: Guillemin 239 [U. S. Nat. Herb. photo 5900] (W--2830403--fragment & photo of type).

**LEIOTHRIX FULGIDA** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 28. 1977.  
Additional citations: BRAZIL: Minas Gerais: Mexia 5882 (Au--26808).

**LEIOTHRIX HATSCHBACHII** Moldenke

Additional bibliography: Moldenke, *Phytologia* 29: 290. 1974;  
Hocking, *Excerpt. Bot. A.25*: 378. 1975.

**LEIOTHRIX HIRSUTA** (Wikstr.) Ruhl.

Additional bibliography: Hocking, *Excerpt. Bot. A.28*: 170. 1976; Moldenke, *Phytologia* 37: 28. 1977.

Recent collectors describe this species as an herb, 25 cm. tall, the leaves pilose, and the inflorescences cream-color. They have found it growing in sandy soil in secondary forests disturbed to extract *Attalea funifera* fiber, as well as in wet places in general, flowering in March and July, in fruit in March.

Additional citations: BRAZIL: Bahia: Mori, Mattos Silva, Kallunki, Santos, & Santos 9664 (Ld), 9695 (Ld); Santos & Mattos Silva 3284 (Ld).

**LEIOTHRIX HIRSUTA** var. **BLANCHETIANA** (Körn.) Ruhl.

Additional bibliography: Moldenke, *Phytologia* 36: 16. 1976.  
Recent collectors have encountered this plant on campos, flowering in September.

Additional citations: BRAZIL: Bahia: Mori, Mattos Silva, & Santos 10508 (Ld).

**LEIOTHRIX HIRSUTA** var. **TONSILIS** Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.28*: 170. 1976; Moldenke, *Phytologia* 33: 23. 1976.

**LEIOTHRIX SINUOSA** Giulietti in Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: [61], 62, 68, & 69, fig. 6 & 7, 1976.

Bibliography: Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [105]. 1976; Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: [61], 62, 68, & 69, fig. 6 & 7. 1976.

Illustrations: Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: 69, fig. 6 & 7. 1976.

This species is based on A. M. Giulietti 4913 from "longo da rodovia Vespasiano-Conceição do Mato Dentro, km. 114--139", município Jaboticaguba, Serra do Cipó, Minas Gerais, Brazil, collected on January 26, 1974, and probably deposited in the herbarium of the University of São Paulo.

**LEIOTHRIX SPERGULA** Ruhl.

Additional bibliography: Moldenke, Phytologia 33: 24 (1976) and 37: 489. 1977.

Additional citations: BRAZIL: Minas Gerais: Mexia 5781 (Au--26795).

**LEIOTHRIX UMBRATILIS** Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.28: 171. 1976; Moldenke, Phytologia 37: 29. 1977.

**LEIOTHRIX UMBRATILIS** var. **BREVIPES** Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.28: 171. 1976; Moldenke, Phytologia 37: 29. 1977.

**LEIOTHRIX VIVIPARA** var. **ANGUSTA** Ruhl.

Additional bibliography: Moldenke, Phytologia 35: 16. 1976.

Additional citations: BRAZIL: Minas Gerais: P. Clausen s.n. [Serra do Caraça; U. S. Nat. Herb. photo 5898] (W--photo).

**MESANTHEMUM** Körn.

Additional & emended bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 324 & 327--328, fig. 292. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 57 & 64--65, fig. 339. 1968; Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 540. 1977; Moldenke, Biol. Abstr. 63: 3041. 1977; Moldenke, Phytologia 37: 30 & 508 (1977) and 41: 421 & 424. 1979.

**MESANTHEMUM ALBIDUM** H. Lecomte

Synonymy: Eriocaulon guineense Moldenke, Résumé Suppl. 4: 6, nom. nud. 1962; Phytologia 8: 386. 1962 [not E. guineense Steud., 1855]. Eriocaulon hirsutulum Moldenke, Résumé Suppl. 4: 6, nom. nud. 1962; Phytologia 8: 387. 1962. Eriocaulon toumouense Moldenke, Résumé Suppl. 17: 4 & 18, hyponym. 1968; Phytologia 19: 468. 1970.

Additional bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 327 & 328. 1931; Moldenke, Phytologia 8: 386--387. 1962;

Moldenke, Résumé Suppl. 4: 6. 1962; Anon., Assoc. Étud. Tax. Fl. Afr. Trop. Index 1962: 29. 1963; Hocking, Excerpt. Bot. A.6: 455. 1963; Moldenke, Biol. Abstr. 42: 1517. 1963; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 65. 1968; Moldenke, Résumé Suppl. 17: 4 & 10. 1968; Moldenke, Phytologia 18: 181 (1969), 19: 468--469 (1970), and 20: 281 & 410. 1970; Anon., Biol. Abstr. 51 (17): B.A.S.I.C. S.72. 1970; Moldenke, Biol. Abstr. 51: 9629. 1970; G. Taylor, Ind. Kew. Suppl. 14: 54. 1970; Anon., Assoc. Étud. Tax. Fl. Afr. Trop. Index 1970: 25. 1971; Moldenke, Biol. Abstr. 18: 445. 1971; Moldenke, Fifth Summ. 1: 217 (1971) and 2: 502 & 943. 1971; Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 540. 1972; Moldenke, Phytologia 24: 464 (1972), 25: 84 (1972), 33: 25 & 26 (1976), and 41: 421 & 424. 1979.

Hutchinson & Dalziel (1931) comment that this species is "Much resembling Eriocaulon; small herb with very short leaves and slender peduncles with basal sheath about 2 cm. long; heads white, depressed globose, 1/4 in. diam.", citing only Pobéguin 1359 from French Guinea. Meikle (1968) characterizes it as a "Slender annual, plants scattered in open colonies; leaves subglabrous, generally less than 1 1/4 in. long; peduncles slender, shining, to about 6 in. high, clothed with spreading hairs; involucre bracts broad, pallid; floral bracts wanting; florets whitish, pilose, receptacle pilose with pallid hairs". He cites the following collections at Kew: SÉNÉGAL: Adam 18370. GUINEA: Adames 363; Chillou 3904; Pobéguin 1153, 1359. SIERRA LEONE: Jordan 588. It has been found in anthesis from August to October.

#### MESANTHEMUM AURATUM H. Lecomte

Synonymy: Mesanthemum rubrum Moldenke, Résumé Suppl. 4: 6, nom. nud. 1962; Phytologia 8: 390--391. 1962.

Additional bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 327 & 328. 1931; Moldenke, Résumé Suppl. 4: 6. 1962; Moldenke, Phytologia 8: 390--391. 1962; Anon., Assoc. Étud. Tax. Fl. Afr. Trop. Index 1962: 29. 1963; Hocking, Excerpt. Bot. A.6: 455. 1963; Moldenke, Biol. Abstr. 42: 1517. 1963; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 65. 1968; Moldenke, Phytologia 20: 285. 1970; G. Taylor, Ind. Kew. Suppl. 14: 86. 1970; Moldenke, Fifth Summ. 1: 217 (1971) and 2: 946. 1971; Moldenke, Phytologia 25: 442 (1973) and 33: 25. 1976.

Hutchinson & Dalziel (1931) describe this species as "A small herb with a few radical leaves and very slender pilose peduncles.. apparently a very distinct species", citing only Pobéguin 30 from French Guinea. Meikle (1968) characterizes it as a "Slender annual, plants often in rather close tufts; leaves thinly pilose or subglabrous, usually less than 3--5 cm. long; peduncles to about 10 in. high, slender, shining, thinly clothed with spreading hairs; involucre bracts narrow, fuscous, pilose; floral bracts filiform, plumose, orange or reddish; florets yellow or red, concealed by the floral bracts and pale receptacular hairs." He cites the fol-

lowing collections from Kew: GUINEA BISSAU: Raimundo & Guerra 931  
 GUINEA: Chillou 675, 676, 679; Jacques-Félix 7451; Schnell 7479.  
 SIERRA LEONE: Jaeger 576. It has been found in anthesis from Oc-  
 tober to January.

#### MESANTHEMUM BENNAE Jacques-Félix

Additional bibliography: Meikle in Hutchins. & Dalz., Fl. W.  
 Trop. Afr., ed. 2, 3: 64. 1968; Moldenke, Phytologia 37: 30. 1977.

Meikle (1968) characterizes this species as a "Tufted perenni-  
 al; leaves pilose or pubescent; peduncles thinly pilose with  
 spreading hairs, 16--18 in. high; capitula 2--2.5 cm. diam.; in-  
 volucral bracts whitish or pale brown; florets pallid, immersed  
 in a cushion of long whitish receptacular hairs". He cites only  
Jacques-Félix 2091 from Guinea. It has been found in flower in  
 October.

#### MESANTHEMUM JAEGERI Jacques-Félix

Additional bibliography: Meikle in Hutchins. & Dalz., Fl. W.  
 Trop. Afr., ed. 2, 3: 64. 1968; Moldenke, Phytologia 35: 17. 1976.

Meikle (1968) calls this species a "Robust perennial with a  
 swollen bulbous base; leaves and peduncles pilose with spreading  
 hairs; scapes to 16 in. high, capitula 1--1.8 cm. diam.; involu-  
 cral bracts dirty whitish; florets whitish, immersed in a cushion  
 of long black receptacular hairs". He cites the following col-  
 lections at Kew: SIERRA LEONE: Cole 155; Jaeger 1625, 7655. NI-  
 GERIA: Southern: Savory & Keay FHI.25079. It has been found in  
 flower in September and December.

#### MESANTHEMUM PRESCOTTIANUM (Bong.) Körn.

Additional & emended bibliography: Hutchins. & Dalz., Fl. W.  
 Trop. Afr., ed. 1, 2: 327--328. 1931; Meikle in Hutchins. & Dalz.,  
 Fl. W. Trop. Afr., ed. 2, 3: 64. 1968; Hepper in Hutchins. & Dalz.,  
 Fl. W. Trop. Afr., ed. 2, 3: 540. 1972; Moldenke, Phytologia 37:  
 30. 1977.

Hutchinson & Dalziel (1931) report "White, star-shaped flower-  
 heads" for this species, citing only Caille s.n. [Herb. Chevalier  
 15038 & 34448], Deighton 1277, Herb. Lindley s.n., and Pobéguin  
2092 from French Guinea and Sierra Leone. Meikle (1968) calls it  
 a "Slender perennial; leaves and peduncles thinly clothed with  
 spreading hairs; scapes up to 18 in. high; leaves narrow, grass-  
 like; capitulum with conspicuous radiating involucral bracts, like  
 a white daisy". He cites the following collections from Kew:  
 GUINEA: Adames 273; Baldwin 9772; Miquel 64; Pobéguin 734; Schnell  
6218, 6789. SIERRA LEONE: Deighton 1277, 5154; Haswell 80; Herb.  
Lindley s.n.; Jaeger 7595; T. S. Jones 231; Melville & Hooker 358.  
 LIBERIA: Baldwin 9516. IVORY COAST: Bouhey GC.18053; Gruys 56;  
Schnell 6363. It has been found in anthesis in June and from Au-  
 gust to November.

MESANTHEMUM RADICANS (Benth.) Körn.

Additional & emended bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 327 & 328, fig. 292. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 64--65, fig. 339. 1968; Moldenke, Phytologia 37: 30 (1977) and 41: 424. 1979.

Emended illustrations: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 327, fig. 292. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 65, fig. 339. 1968.

Meikle (1968) characterizes this species as a "Robust perennial, often forming loose mats in swamps or streams; stems often elongate, leaves and peduncles thinly pilose or glabrescent; scapes up to 2 ft. high; capitula 1--1.3 cm. diam.; involucreal bracts whitish; florets pallid, immersed in a cushion of long, whitish or pale gray receptacular hairs". He cites the following collections at Kew: SENEGAL: Berhaut 5822; Perrottet s.n. SIERRA LEONE: Harley 1958; Harvey 143; Jaeger 2074. LIBERIA: Adam 20332; Adames 461; DeWit 9122; Voorhoeve 1217. IVORY COAST: DeWilde 219; DeWit 7902; Schnell 6542. GHANA: Fishlock 34/1931. DAHOMEY: Adjanohoun 248; Raynal 13543. NIGERIA: Southern: Barter 2201; Kennedy 2798; Onochie FHI. 32099; Onyeagocha FHI.7790; Richards 5086. FERNANDO PO: Milne s.n. He lists it also from "Congo and Angola and eastwards to Uganda and Tanzania". It has been found in anthesis from November to February and in fruit in April, May, August, and September.

Balslev encountered this species in a "Flat area of sandy lake deposits. Vegetation of grass fields with spots of dense forest with trees not more than 6 m. high. The area swampy." The altitude was 1140 m. and he found it in flower in September.

Additional citations: TANZANIA: Tanganyika: Balslev 016 (Ac).

MOLDENKEANTHUS P. Morat

Additional bibliography: Moldenke, Biol. Abstr. 63: 3041. 1977; Moldenke, Phytologia 37: 30 & 508. 1977; H. N. & A. L. Moldenke, Cord. Greet. 1 & 4. 1977.

MOLDENKEANTHUS ITREMENSIS P. Morat

Additional bibliography: Moldenke, Phytologia 35: 17--18. 1976; H. N. & A. L. Moldenke, Cord. Greet. 1 & 4. 1977.

Additional illustrations: H. N. & A. L. Moldenke, Cord. Greet. 1. 1977.

Additional citations: MOUNTED ILLUSTRATIONS: P. Morat, Addisonia, ser. 2, 15: 465, pl. 1. 1976 (Z, Z).

PAEPALANTHUS Mart.

Additional synonymy: Paepacantus Kunth, in herb.

Additional bibliography: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 324 & 328. 1931; Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 57 & 65. 1968; Hocking, Excerpt. Bot. A.25: 378--380 (1975) and A.26: 6, 29, 89, & 90. 1975; Spellman, Dwyer, & Da-

vidse, *Rhodora* 77: 124. 1975; Hocking, *Excerpt. Bot. A.* 28: 170 & 259. 1976; Moldenke, *Biol. Abstr.* 61: 4884. 1976; Moldenke in *Steyerm. & Brewer-Carías, Bol. Soc. Venez. Cienc. Nat.* 132/133: 281—286, fig. 3 & 4. 1976; *Steyerm. & Brewer-Carías, Bol. Soc. Venez. Cienc. Nat.* 132/133: 181, 199, 200, & 227. 1976; Moldenke, *Biol. Abstr.* 63: 2452 & 3041. 1977; "M.P.B.", *Biol. Abstr.* 63: 6594. 1977; Moldenke, *Biol. Abstr.* 63: 6590 (1977) and 64: 686, 1838, & 4787. 1977; Moldenke, *Phytologia* 37: 26—28, 31—58, 69—71, 74—81, 84, 88, 89, 94—96, 258, 259, 263, 264, 269, 271—273, 420, 422, 485, 488, 489, 492, 496, 599. 506, & 509 (1977), 38: 23—25, 28, 29, 32, 33, 35—39, 41, 43, 45—48, 50, 118, 121, 123, 124, 126, 127, 129, 133, & 134 (1977), 38: 180, 183, 185, 186, 188, 190—192, 203, 506, 509, & 510 (1978), and 40: 261 & 509. 1978; Anon., *Roy. Bot. Gard. Kew. Lib. Curr. Aware. List* 7: 29 (1978) and 8: 33. 1978; Satake, *Journ. Jap. Bot.* 53: 107—111, fig. 1 & 2. 1978; Moldenke, *Phytologia* 41: 422. 1979.

The Irwin 775, distributed as *Paepalanthus* sp., actually is *Syngonanthus gracilis* var. *koernickeanus* Ruhl., while Irwin 774 is *S. xeranthemoides* var. *grahamae* Moldenke.

#### **PAEPALANTHUS ACANTHOPHYLLUS** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 31. 1977.

Additional citations: BRAZIL: Distrito Federal: Héringer 12125 [*Herb. Brad.* 64001 & 64008] (Ja, Ja). Minas Gerais: Anderson, Stieber, & Kirkbride 35857 (Ld).

#### **PAEPALANTHUS ALBO-TOMENTOSUS** Herzog

Additional bibliography: Moldenke, *Phytologia* 37: 32. 1977.

Recent collectors have encountered this species in restinga, flowering and fruiting in September.

Additional citations: BRAZIL: Bahia: Davidse, Ramamoorthy, & Vital 11860 (N); Mori, Mattos Silva, & Santos 10484 (Ld).

#### **PAEPALANTHUS ALBO-VAGINATUS** Alv. Silv.

Synonymy: *Paepalanthus albo-vaginatus* Alv. Silv., *Fl. Mont.* 1: pl. 155, sphalm. 1928.

Additional bibliography: Moldenke, *Phytologia* 37: 32. 1977.

Additional citations: BRAZIL: Paraná: Dusén 15586 (Ld); Shepherd & Andrade 6120 (N). MOUNTED CLIPPINGS: Silveira's original description & illustration (N, W, Z).

#### **PAEPALANTHUS ALLEMANTII** C. Diogo

Additional bibliography: Moldenke, *Phytologia* 25: 146. 1973.

Additional citations: BRAZIL: Ceará: Allemão 1551 [*Herb. Mus. Nac. Rio Jan.* 29469; U. S. Nat. Herb. photo 5890] (W—fragment & photo of isotype).

**PAEPALANTHUS ALPINUS** Körn.

Additional bibliography: Moldenke, *Phytologia* 37: 32. 1977.

Additional citations: COLOMBIA: Boyacá: Langenheim 3631 (Ld).

**PAEPALANTHUS ARENICOLA** Alv. Silv.

Additional bibliography: Moldenke, *Phytologia* 26: 468. 1973.

The Irwin, Reis dos Santos, Souza, & Fonsêca 24936, distributed as and previously cited as P. arenicola, is now the type collection of P. urbanianus var. angustifolius Moldenke.

Additional citations: MOUNTED CLIPPINGS: Silveira's original description & illustration (N, W, Z).

**PAEPALANTHUS ARETIOIDES** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 33. 1977.

Hatschbach encountered this species in wet sandy campo, flowering in January.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 40838 (Z).

**PAEPALANTHUS BARBIGER** Alv. Silv.

Additional bibliography: Moldenke, *Phytologia* 37: 33. 1977.

Additional citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 35299 (Ld).

**PAEPALANTHUS BELIZENSIS** Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.*25: 378.

1975; Moldenke, *Phytologia* 35: 20. 1976.

Dwyer found this plant growing on savannas, flowering and fruiting in May.

Additional citations: BELIZE: Dwyer 10719 (N).

**PAEPALANTHUS BIFIDUS** (Schrad.) Kunth

Additional synonymy: Paepacantus bifudos (Schara) Kunth, in herb.

Additional bibliography: Hocking, *Excerpt. Bot. A.*28: 170. 1976; Moldenke, *Phytologia* 37: 33-34, 43, & 47. 1977.

Recent collectors have found this plant growing in restinga, in sandy soil along old roads, and under Pinus caribaea in pine plantations, at 50--125 meters altitude, flowering and fruiting in July and August, and describe it as an herb, 10--15 cm. tall, the "flowers cream"-color. Irwin refers to it as "locally abundant in white quartz sand of forest clearings, a rounded herb in dense stands, early colonizer in recently cleared areas; flowers gray-white. The flowers are described as "cream-color" also on Pinheiro 2247.

The Rosa & Santos 1973, distributed as Paepalanthus bifidus, actually is Philodice hoffmannseggii Mart.

Additional citations: GUYANA: Irwin 5 (Au--173724); Mori, Bolten,

Persaud, Boyan, Roberts, Jugernauth, & Dwarka 8057 (Ld, N); Mori, Persaud, & Boyan 8008 (Ld, N). BRAZIL: Bahia: Mori, Mattos Silva, Kallunki, Santos, & Santos 9756 (Ld); Pinheiro 2247 (Ld, N); Santos & Mattos Silva 3270 (Ld).

**PAEPALANTHUS BIFIDUS** f. **BREVIPIES** Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.28: 170. 1976; Moldenke, Phytologia 35: 20. 1976.

Recent collectors have found this plant in open places in restinga and in wet sandy soil at the base of hills, flowering and fruiting in April and September.

Additional citations: BRAZIL: Bahia: Mori, Mattos Silva, & Santos 10469 (Ld). Minas Gerais: Hatschbach 41294 (Ld); Mexia 5816 (Au--26796).

**PAEPALANTHUS BONGARDI** Kunth

Additional bibliography: Moldenke, Phytologia 37: 34. 1977.

Additional citations: BRAZIL: Minas Gerais: P. Clausen 38 [U. S. Nat. Herb. photo 5899] (W--fragment & photo).

**PAEPALANTHUS BRACHYPUS** f. **BREVIPILOSUS** Moldenke, Phytologia 40: 261. 1978.

Bibliography: Moldenke, Phytologia 40: 261. 1978.

Citations: BRAZIL: Minas Gerais: Hatschbach 40922 (Z--type).

**PAEPALANTHUS BRASILIENSIS** (Mart.) Mart.

Additional bibliography: Moldenke, Phytologia 37: 34. 1977.

Additional citations: BRAZIL: Bahia: Lanna Sobrinho 1437 [Herb. Brad. 60604] (Ja).

**PAEPALANTHUS BROMELIOIDES** Alv. Silv.

Additional bibliography: Moldenke, Phytologia 37: 34--35. 1977.

Irwin refers to this plant as a "rosette herb with inflorescences ca. 0.5 m. tall, the tightly fitting leaf-bases ('tanks') containing a clear mucilaginous fluid, the flowers grayish-white, locally common in grassy fields in gray sandy soil" and found it in flower and fruit in January.

The Tryon & Tryon 6823, distributed as P. bromelioides, actually is P. lanceolatus Körn.

Additional citations: BRAZIL: Minas Gerais: Irwin 2436a (Au--173079).

**PAEPALANTHUS BRYOIDES** (Riedel) Kunth

Additional bibliography: Moldenke, Phytologia 37: 35. 1977.

Additional citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 35232 (Ld).

**PAEPALANTHUS CAPANEMAE** Alv. Silv.

Additional bibliography: Moldenke, Phytologia 37: 36. 1977.



Recent collectors report finding this plant among rocks at 1200 meters altitude.

Additional citations: BRAZIL: Minas Gerais: Windisch & Ghil-lány 129 [Herb. Brad. 61238] (N).

**PAEPALANTHUS CAPAROMENSIS** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 36. 1977.

Additional citations: BRAZIL: Espirito Santo: Irwin 2758 (Mi).

**PAEPALANTHUS CATHARINAE** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 37--38. 1977.

Recent collectors have encountered this plant in wet depressions on campo and in brejo (wet sedge meadows), flowering in October and November, fruiting in November.

Additional citations: BRAZIL: Paraná: Dusén 15783 (Ld); Hatschbach 40240 (Ld), 40448 (Ld). Rio Grande do Sul: Rambo 45408 (Au--26797).

**PAEPALANTHUS CATHARINAE** var. **HATSCHBACHI** (Moldenke) Moldenke & Smith

Additional bibliography: Moldenke, *Phytologia* 37: 38. 1977.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo 45014 (Au--26798, Au--26799).

**PAEPALANTHUS CLAUSSENIANUS** Körn.

Additional bibliography: Moldenke, *Phytologia* 37: 39 & 42. 1977.

Turner describes this taxon as "perennial brittle-stemmed plants to 5 feet tall in wet sandy places in wet areas on ridges" and notes that he took a photograph of the plants in situ.

Additional citations: BRAZIL: Distrito Federal: Héringer 12126 [Herb. Brad. 64002 & 64009] (Ja, Ja); Turner 9144 (Ld).

**PAEPALANTHUS COLOIDES** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 39. 1977.

Hatschbach encountered this plant in sandy soil near corrego, flowering in April.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 41366 (Z); Mexia 5733 (Au--26805).

**PAEPALANTHUS COLUMBIENSIS** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 32 & 39. 1977.

Recent collectors have found this species on wet paramos with Hypochoeris, Espeletia, Gentiana, and orchids, at 3420 m. altitude, flowering and fruiting in December.

Material of this species has been misidentified and distributed in some herbaria as "Compositae".

Additional citations: COLOMBIA: Cundinamarca: Escobar & Uribe 538 (Ld). Valle del Cauca: Cuatrecasas 17841 (W--2816693).

**PAEPALANTHUS COMANS** Alv. Silv.

Additional bibliography: Moldenke, *Phytologia* 37: 39 & 53. 1977.

Recent collectors have encountered this plant on wet sandy campos, flowering in January.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 40862 (Ld); Strang 1071 [Castellanos 26654; Herb. Brad. 60457] (Ja).

MOUNTED CLIPPINGS: Silveira's original description & illustration (N, W, Z).

**PAEPALANTHUS CONVEXUS** Gleason

Additional bibliography: Moldenke, *Biol. Abstr.* 64: 2433. 1977; Moldenke, *Phytologia* 37: 39. 1977.

The Steyermark, Carías, Dunsterville, & Dunsterville 112437, 112439, & 112615, distributed as possibly *P. convexus*, seem better regarded as *P. fraternus* N. E. Br.

**PAEPALANTHUS CRASSICAULIS** Körn.

Additional bibliography: Moldenke, *Phytologia* 37: 40. 1977.

Langenheim found this plant growing "on bedrock in 'badlands area' of shrubby association in shallow soil of eroded Tertiary sandstone" and reports the corollas "white". Other recent collectors have found it in white sand in secondary forests and in "wet sub-jalca", flowering and fruiting in May, the heads described as "white" or "whitish".

Additional citations: COLOMBIA: Boyacá: Langenheim 3570 (Ld). PERU: Amazonas: Boeke 1819 (N), 1845 (N).

**PAEPALANTHUS CUSPIDATUS** Alv. Silv.

Additional bibliography: Moldenke, *Phytologia* 26: 245. 1973.

Recent collectors have encountered this plant in sand under boulders and on "afloramento rochosos comente no solo arenoso", at 1300--1500 m. altitude, flowering and fruiting in December and January.

Additional citations: BRAZIL: Minas Gerais: M. A. Chase 10432 (N, N--photo); Hatschbach 40919 (Z). MOUNTED CLIPPINGS: Silveira's original description & illustration (N, W, Z).

**PAEPALANTHUS DENSIFOLIUS** Alv. Silv.

Additional bibliography: Moldenke, *Phytologia* 37: 40. 1977.

Hatschbach describes this plant as "planta com até 1 m. de altura" and found it growing in "solo arenoso antes rochas", flowering and fruiting in April.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 41299 (Z).

**PAEPALANTHUS DENUDATUS** Körn.

Additional bibliography: Moldenke, *Phytologia* 37: 40. 1977.

Recent collectors describe this plant as a shrub, 80 cm. tall, with white flowers, and found it in "depressões com areia" on rocky cliffs, flowering in December.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 40906 (Ld); Shepherd, Andrade, Kinoshita, & Tamashiro 3907 (N).

**PAEPALANTHUS DISTICHOPHYLLUS** Mart.

Additional bibliography: Moldenke, *Phytologia* 33: 38. 1976.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 27372 (Ld).

**PAEPALANTHUS DIVARICATUS** (Bong.) Kunth

Additional bibliography: Moldenke, *Phytologia* 35: 23. 1976.

Hatschbach describes this species as a branched perennial, 1 meter tall, with white flowers, and found it growing in sandy soil between rocks at the base of a hill, flowering in April.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 41276 (Ld); Shepherd, Andrade, Kinoshita, & Tamashiro 3908 (N). MOUNTED CLIPPINGS: Kunth's original description (N, W, Z).

**PAEPALANTHUS DUIDAE** Gleason

Additional bibliography: Moldenke, *Phytologia* 37: 41. 1977.

Recent collectors describe this plant as "clumping, leaves stiff, brittle, satiny light-green, peduncles medium yellow-tan, phyllaries dark gray-black, the inner tipped white, heads white" and found it in essentially flat areas with small depressions and hills", at 2750 meters altitude, flowering in February.

Additional citations: VENEZUELA: Amazonas: Tillett, Colvés, & al. 752-349 (N).

**PAEPALANTHUS ELONGATUS** (Bong.) Körn.

Additional bibliography: Moldenke, *Phytologia* 37: 41. 1977.

Additional citations: BRAZIL: Goiás: Hatschbach 36826 (N).

**PAEPALANTHUS ELONGATUS** var. **ANGUSTIFOLIUS** Alv. Silv.

Additional bibliography: Moldenke, *Phytologia* 37: 41. 1977.

Additional citations: BRAZIL: Goiás: Hatschbach 36772 (Ld).

MOUNTED CLIPPINGS: Silveira's original description (N, W, Z).

**PAEPALANTHUS ENSIFOLIUS** (H.B.K.) Kunth

Additional bibliography: Moldenke, *Phytologia* 37: 42. 1977.

Recent collectors have encountered this plant in mossy forests and paramos, on humid slopes, in humid herb vegetation between dry scrub vegetation, and dominant in dry scrub which is very wet in the spring, at 2200—3100 m. altitude, flowering in April, May, September, and December, describing it at 1—3 m. tall.

Material of P. ensifolius has been misidentified and distributed in some herbaria as Valeriana sp.

Additional citations: ECUADOR: Azuay: Holm-Nielsen, Jeppesen, Løjtnant, & Øllgaard 4800 (Ut--352577b), 5071 (Ut--352574b). Loja: Hitchcock 21543 (N); Holm-Nielsen, Jeppesen, Løjtnant, & Øllgaard 3664 (Ut--352576b); MacBryde 308 (N, W--2812863); Madison & Coleman 2437 (W--2779594).

**PAEPALANTHUS ERIGERON** Mart.

Additional bibliography: Moldenke, Phytologia 26: 482--483. 1973.

Santos describes this plant as growing to 40 cm. tall, with white flowers, and encountered it on "original campo", flowering in August.

Additional citations: BRAZIL: Bahia: Santos 2364 (Z).

**PAEPALANTHUS FALCIFOLIUS** Körn.

Additional bibliography: Moldenke, Phytologia 37: 42. 1977.

Pinheiro describes this species as growing to about 40 cm. tall, with white flowers, and found it in anthesis in April.

Additional citations: BRAZIL: Bahia: Pinheiro 2105 (Ld, N).

**PAEPALANTHUS FASCICULATUS** (Rottb.) Kunth

Additional bibliography: Moldenke, Phytologia 37: 34, 42--43, & 49 (1977) and 38: 121. 1977.

Recent collectors describe the fruiting-heads of this species as "whitish-brown" and have encountered the plant in dense mats along roadsides in dry exposed soil in secondary forests, fruiting in October.

Additional citations: COLOMBIA: Vaupés: E. W. Davis 88 (G). VENEZUELA: Amazonas: H. C. Clark 6457 (Ld), 6862 (N).

**PAEPALANTHUS FASCICULATUS** f. **SPHAEROCEPHALUS** Herzog

Additional bibliography: Moldenke, Phytologia 37: 34 & 43. 1977.

Mori and his associates describe this plant as having "stems prostrate, inflorescence erect" and found it growing in sandy soil along old roads, at 50--125 m. altitude, flowering and fruiting in August. Other recent collectors have encountered it in sandy and open sandy areas and describe it as a "small herb in secondary growth". They have found it in anthesis from May to July. The flowers are said to have been "white" on Zarucchi 1432 & 1759 and "off-white" on Zarucchi 1680.

Additional citations: COLOMBIA: Vaupés: Zarucchi 1432 (N), 1680 (N), 1759 (N). GUYANA: Mori, Bolten, Persaud, Boyan, Roberts, Jugernauth, & Dwarka 8055 (La, N). BRAZIL: Amazonas: Pabst 9429 (Ja).

**PAEPALANTHUS FASCICULATUS** f. **TENELLUS** Herzog

Additional bibliography: Moldenke, Phytologia 35: 25. 1976.

Mori and his associates have found this plant growing in sandy soil along roadsides, flowering in August.

Additional citations: VENEZUELA: Amazonas: H. C. Clark 6654

(Ld). GUYANA: Mori, Bolten, Persaud, Boyan, Roberts, Jugernauth, & Dwarka 8099 (N, Z).

**PAEPALANTHUS FORMOSUS** Moldenke

Additional bibliography: Moldenke, *Phytologia* 37: 43. 1977.

Tillett and his associates have encountered this species "in vegetation of Brocchinia, Stegolepis pungens, Heliophora, etc.", at 1350 meters altitude, describe it as "common as small rosette plants, adults 1.5 m. tall, leaves satiny medium-green, drying on flowering peduncles [stems] to lustrous medium yellow-green, bracts light, pedicels [peduncles] light satiny yellow-brown, phyllaries sublustrous dark-brown with lighter border, flowers cream, slightly greyed, in some plants the leaves in 2 or more tufts on basal part of the flowering stem", and found it in flower and fruit in February.

Additional citations: VENEZUELA: Amazonas: Tillett, Ferrigni V., & Zorrilla F. 751-59 (N, N).

**PAEPALANTHUS FRATERNUS** N. E. Br.

Additional bibliography: Moldenke, *Phytologia* 37: 43--44. 1977.

Steyermark and his associates have collected what appears to be this species on rocky exposures at 2750--2800 m. altitude, flowering and fruiting in August and September, and describe the plant as having its heads "dull-white" or "sordid-white" and growing in dense or scattered clumps. Irwin found it "locally common rosette herb, inflorescence gray-white, in wet acid muck among rocks" at 9200 feet altitude, flowering in April.

The species is uncomfortably close to P. convexus Gleason and material of it has been so distributed. More intense study of these two taxa is required.

Additional citations: VENEZUELA: Bolívar: Steyermark, Cariás, Dunsterville, & Dunsterville 112437 (N, W--2813994), 112439 (N), 112613 (W--2813995), 112615 (N). GUYANA: Irwin 705 (Au--173717).

**PAEPALANTHUS GENTLEI** Moldenke

Additional bibliography: Spellman, Dwyer, & Davidse 77: 124. 1975; Moldenke, *Phytologia* 35: 26. 1976.

Additional citations: BELIZE: Bartlett 11874 (Ld).

**PAEPALANTHUS GLAUCOPHYLLUS** Alv. Silv.

Additional & emended synonymy: Paepalanthus glaucophyllus Alv. Silv., Fl. Mont. 1: pl. 8, sphalm. 1928. Paepalanthus glaucophyllus Alv. Silv. ex Moldenke, *Phytologia* 29: 481, in syn. 1974.

Additional bibliography: Moldenke, *Phytologia* 29: 481--482. 1974.

Additional citations: MOUNTED CLIPPINGS: Silveira's original description & illustration (N, W, Z).

**PAEPALANTHUS GNEISSICOLA** Alv. Silv.

Synonymy: Paepalanthus geneissicola Alv. Silv., in herb.

Additional bibliography: Moldenke, *Phytologia* 37: 44. 1977.

Irwin describes this plant as a "common rosette herb forming mounded clumps or tufts 5--10 cm. in diameter among mosses and low grasses in meadows, in black muck soil", at 9000 feet altitude, the heads "gray-white", flowering in March.

Additional citations: BRAZIL: Espirito Santo: Irwin 2758 (Au-173580). MOUNTED CLIPPINGS: Silveira's original description & illustration (N, W, Z).

**PAEPALANTHUS GYROTRICHUS** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 33: 42. 1976.

Recent collectors have encountered this plant on "campo rupestre e cerrado", flowering in December.

Additional citations: BRAZIL: Minas Gerais: Hatschbach & Koczicki 35402 (N); Shepherd, Andrade, Kinoshita, & Tamashiro 3918 (N).

**PAEPALANTHUS INCANUS** (Bong.) Körn.

Additional bibliography: Moldenke, *Phytologia* 33: 43. 1976.

Recent collectors have found this species growing on sandy campos, flowering in January.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 40830 (Ld); Mexia 5748 (Au--26800).

**PAEPALANTHUS JAUENSIS** Moldenke

Synonymy: *Paepalanthus jauensis* Moldenke ex Steyerl. & Brewer-Carías, Bol. Soc. Venez. Cienc. Nat. 132/133: 200. 1976.

Additional bibliography: Moldenke in Steyerl. & Brewer-Carías, Bol. Soc. Venez. Cienc. Nat. 132/133: 286. 1976; Steyerl. & Brewer-Carías, Bol. Soc. Venez. Cienc. Nat. 132/133: 200. 1976; Moldenke, *Phytologia* 37: 46. 1977.

**PAEPALANTHUS KANAI** Satake, *Journ. Jap. Bot.* 53: 107--111, fig. 1 & 2. 1978.

Bibliography: Anon., Roy. Bot. Gard. Kew. Lib. Curr. Aware. List 7: 29. 1978; Satake, *Journ. Jap. Bot.* 53: 107--111, fig. 1 & 2. 1978.

Illustrations: Satake, *Journ. Jap. Bot.* 53: 108--110, fig. 1 & 2. 1978.

This amazing find was made in Gunma Prefecture on Honshiu island, Japan, where the taxon is apparently native. In habitat aspect it greatly resembles some of the coriaceous-leaved species of the South American Andes and its presence in Japan is truly amazing.

**PAEPALANTHUS KARSTENII** Ruhl.

Additional bibliography: Hocking, *Excerpt. Bot.* A.25: 380. 1975; Moldenke, *Phytologia* 37: 46. 1977.

The flowers on Kirkbride & Idrobo 363 are said to have been "white" and these collectors have made a photograph of the plant

in situ. Langenheim and her associates found the species growing in Sphagnum.

Additional citations: COLOMBIA: Cundinamarca: Kirkbride & Idrobo 363 (N); Langenheim, Idrobo, Jaramillo, & Mora 3688 (Ld).

**PAEPALANTHUS KARSTENII** var. **COREI** Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.25: 380. 1975; Moldenke, Phytologia 35: 27. 1976.

Recent collectors describe this plant as having "heads tan" and have found it growing on well-drained hillsides of Espeletia páramos, at 3450 meters altitude, flowering and fruiting in October, and comment that the plants are "difficult to separate" for collection.

Additional citations: COLOMBIA: Antioquia: Boeke & McElroy 269 (N).

**PAEPALANTHUS KARSTENII** var. **MINIMUS** Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.28: 170. 1976; Moldenke, Phytologia 33: 45. 1976.

García-Barriga & Jaramilla Mejía describe this plant as a "planta muy pequeñita, que crece formando almohadillas, flores blancas" and have found it growing at 2440—2750 meters altitude.

The Pennell 2256, previously regarded as representing this taxon, seems on closer examination to be a form of P. muscosus Körn.

Additional citations: COLOMBIA: Norte de Santander: García-Barriga & Jaramillo Mejía 19809 (N).

**PAEPALANTHUS KARSTENII** var. **SUBSESSILIS** (Moldenke) Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.28: 171. 1976; Moldenke, Phytologia 37: 46. 1977.

Recent collectors have encountered this plant at 3700—3960 meters altitude.

Additional citations: COLOMBIA: Santander del Norte/Cesar: García-Barriga & Jaramillo Mejía 19759 (N).

**PAEPALANTHUS LAMARCKII** Kunth

Additional bibliography: Meikle in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 3: 57 & 65. 1968; Spellman, Dwyer, & Davidse 77: 124. 1975; Moldenke, Phytologia 37: 46—47, 77, 80, & 81. 1977.

Meikle (1968) describes this species as "Plants usually 3—7 mm. [sic:] high; capitula subglobose, greyish, pilose, 2—3.5 mm. diam.; sepals of female flowers hardening and recurving at maturity and throwing out the ripe seeds". He cites the following collections at Kew: GUINEA: Boismaré 52 [Herb. Chillou 3482]; Chevalier 20307; Chillou 776; Jacques-Félix 7210. SIERRA LEONE: Adames 90, s.n. [Herb. Deighton 4128]; Deighton 1440; Jordan 161. LIBERIA: Bequaert s.n. [Herb. Linder 1451]. He also lists it from Congo, Mafia Island and "S. America". The dimensions he gives for the plant are obviously the result of an error in transcription and should be "cm.", not "mm." The plant has been found in flower in

Africa from October to December.

In Venezuela Davidse & González describe the heads as "grayish-white" and encountered the plant "along a small low-forested stream through Trachypogon-Byrsonima savanna", flowering in May. The Steyermark collection, cited below, collected at 100 meters altitude, flowering and fruiting in September, was previously erroneously cited as P. subtilis Miq., a closely similar species.

Additional citations: BELIZE: Gentle 9631 (Au-238859). VENEZUELA: Amazonas: J. A. Steyermark 58447 (N, S). Apure: Davidse & González 13053 (Id).

**PAEPALANTHUS LANCEOLATUS** Körn.

Additional bibliography: Moldenke, *Phytologia* 37: 47. 1977.

The Tryons encountered this species growing in grass- and sedgeland "with shrubby areas with sandstone and quartzite derived soil and rocks", at 1120 meters altitude, flowering and fruiting in November. Their collection has hitherto been regarded erroneously as P. bromelioides Alv. Silv. and was so distributed and cited.

Additional & emended citations: BRAZIL: Minas Gerais: Hatschbach & Koczicki 35346 (N); Tryon & Tryon 6823 (N, Z).

**PAEPALANTHUS LODICULOIDES** Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.* 28: 171. 1976; Moldenke, *Phytologia* 37: 48. 1977.

**PAEPALANTHUS LODICULOIDES** var. **FLOCCOSUS** Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.* 28: 171. 1976; Moldenke, *Phytologia* 37: 48. 1977.

**PAEPALANTHUS LONGICAULIS** var. **GLABER** Moldenke

Additional bibliography: Moldenke, *Phytologia* 37: 48. 1977.

Santos describes this plant as attaining a height of 80 cm. and found it growing in rocky soil, at 1050 m. altitude, flowering in May, the "flores em botões roxos".

Additional citations: BRAZIL: Bahia: T. S. Santos 3111 (Id, N).

**PAEPALANTHUS MACROCAULON** Alv. Silv.

Additional bibliography: Moldenke in Steyerm. & Brewer-Carías, *Bol. Soc. Venez. Cienc. Nat.* 132/133: 286. 1976; Steyerm. & Brewer-Carías, *Bol. Soc. Venez. Cienc. Nat.* 132/133: 200 & 227. 1976; Moldenke, *Phytologia* 33: 49. 1976.

Additional citations: MOUNTED CLIPPINGS: Silveira's original description & illustration (N, W, Z).

**PAEPALANTHUS MACROCAULON** var. **VENAMENSIS** Moldenke

Additional bibliography: Moldenke, *Phytologia* 33: 49. 1976; Moldenke in Steyerm. & Brewer-Carías, *Bol. Soc. Venez. Cienc. Nat.* 132/133: 286. 1976; Steyerm. & Brewer-Carías, *Bol. Soc. Venez. Cienc. Nat.* 132/133: 200 & 227. 1976.



**PAEPALANTHUS MACROCEPHALUS** var. **MINARUM** (Körn.) Ruhl.

Additional bibliography: Moldenke, *Phytologia* 30: 57--58. 1975.

Hatschbach encountered this plant in wet sandy soil on a plain between a river and mountains, flowering and fruiting in April.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 41342 (Z).

**PAEPALANTHUS MACRORRHIZUS** (Bong.) Kunth

Additional bibliography: Moldenke, *Phytologia* 37: 48. 1977.

Hatschbach found this plant growing on rocky campo cerrado, flowering and fruiting in January.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 40811 (Z).

**PAEPALANTHUS MANICATUS** V. A. Pouls.

Additional bibliography: Moldenke, *Phytologia* 35: 28 (1976) and 37: 48 & 422. 1977.

Hatschbach has found this plant in sandy soil in the shade of rocks, flowering in April.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 41290 (Ld).

**PAEPALANTHUS MESETICOLA** Moldenke & Steyerm. ex Moldenke in Steyerm. & Brewer-Carías, *Bol. Soc. Venez. Cienc. Nat.* 132/133: 281--283, fig. 3. 1976.

Additional bibliography: Moldenke in Steyerm. & Brewer-Carías, *Bol. Soc. Venez. Cienc. Nat.* 132/133: 281--283, fig. 3. 1976; Steyerm. & Brewer-Carías, *Bol. Soc. Venez. Cienc. Nat.* 132/133: 199. 1976; Moldenke, *Phytologia* 37: 48. 1977.

Illustrations: Moldenke in Steyerm. & Brewer-Carías, *Bol. Soc. Venez. Cienc. Nat.* 132/133: [282]. 1976.

**PAEPALANTHUS MICROCAULON** Ruhl.

Additional bibliography: Moldenke, *Phytologia* 37: 48. 1977.

Additional citations: BRAZIL: Goiás: Irwin, Anderson, Stieber, & Lee 34466 (Ld).

**PAEPALANTHUS MOLDENKEANUS** R. E. Schult.

Additional bibliography: Moldenke, *Phytologia* 30: 87--88 (1975) and 33: 191. 1976.

Zarucchi describes this species as a showy plant, terrestrial, growing in well-drained sandy areas on savannas near rapids, where he found a "population of about 40 plants", with "white" flowers, in anthesis in September.

Additional citations: COLOMBIA: Vaupés: Zarucchi 2020 (Z).

**PAEPALANTHUS MUSCOSUS** Körn.

Additional bibliography: Moldenke, *Phytologia* 33: 51 (1976), 34: 257 (1976), and 38: 37. 1977.

[to be continued]

## ADDITIONS TO THE FLORA OF COLORADO – VI

William A. Weber<sup>1</sup>, Barry C. Johnston<sup>1</sup>, and Dieter Wilken<sup>2</sup>

The previous installment of this series appeared in *Southwestern Naturalist* 18(3):317-329. 1973. Entries are presented under the following topics: Novelties and new combinations; New Colorado records, indigenous species, adventive species; Re-evaluations and reinstatements; and Rejections. Unless otherwise specified, herbarium documentation of these reports is in Herbarium COLO.

### Novelties and New Combinations

**ALNUS TENUIFOLIA** Nutt. *forma* **INCISA** W.A. Weber, *f. nov.* *Folia inciso-pinnatifida, planta caeterum speciei similis.* HOLOTYPE: Colorado, Summit Co.: Blue River, Knorr Ranch, wet area along stream, several trees present, 12 Sept. 1977, P.F. Gilbert COLO 310669. Isotype AAH.

**ANEMONASTRUM NARCISSIFLORUM** (L.) Holub *ssp.* **ZEPHYRUM** (A. Nels.) W.A. Weber, *comb. nov.* *Anemone zephyra* A. Nels., Bot. Gaz. 42:52. 1906. I agree with Holub in his segregation of the genera formerly included in *Anemone* but suspect he was not familiar with this taxon which he treated at the species level. Other authors agree in giving it only sub-specific rank.

**ANEMONE MULTIFIDA** Poir. *ssp.* **SAXICOLA** (Boivin) W.A. Weber, *comb. nov.* *A. multifida var. saxicola* Boivin, Canad. Field-Nat. 65:2. 1951. This subspecies is strictly alpine, with ochroleucous flowers, the tepals tinged dorsally with blue. Plants are lower in stature than in the common montane and subalpine race and they occur in only a few of the most mesic and floristically relictual alpine tundra stations. The taxon was originally described from the Canadian Rocky Mountains, and its Colorado distribution fits that of other northern disjuncts in Colorado.

**BOLOPHYTA LIGULATA** (Jones) W.A. Weber, *comb. nov.* *Parthenium alpinum var. ligulatum* Jones, Contr. West. Bot. 13:16. 1910. *Parthenium ligulatum* Barneby, Leafl. West. Bot. 5:20. 1947.

**BOLOPHYTA TETRANEURIS** (Barneby) W.A. Weber, *comb. nov.* *Parthenium tetraneuris* Barneby, Leafl. West. Bot. 5:19. 1947. *Parthenium alpinum var. tetraneuris* Rollins, Contr. Gray Herb. 172:69. 1950. Rollins (1950) took a conservative view of the genus *Parthenium*, placing the three pulvinate desert species in subgenus *Bolophytum*. He demonstrated that floral morphology is surprisingly uniform throughout *Parthenium* and that chromosome numbers are compatible with a single genus concept. Nevertheless, throughout his discussion, the *Bolophytum* group displayed anomalous features. Geographically it is confined to gypsum soils in the Rocky Mountain region, the pulvinate habitus is unique, and the combination of monocephaly, sessile or nearly sessile unusually large capituli, suggest that the group had split

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away from the main line of evolution at a remote period, and by equal logic may be considered a genus in its own right. As a genus, the group takes the name *Bolophyta*, based on *B. alpina* Nutt.

**ERIGERON FLAGELLARIS** Gray *forma* **BREVILIGULATUS** W.A. Weber, *f. nov.* *Flores liguliformi brevissimi 2.5 mm longi 0.5 mm lati, caeterum speciei similis.* HOLOTYPE. Colorado, Boulder Co.: western slope of Davidson Mesa just N of Jefferson Co. line between Marshall and Rocky Flats Atomic Plant, 1800 msm, 10 June 1978, Weber 15375. Additional collections: in neglected lawn, 12th & Baseline, Boulder, 10 June 1978, Weber 15378. Jefferson Co.: meadow above Coal Creek at mouth of Coal Creek Canyon between Rocky Flats and Golden, 10 June 1978, Weber 15378; Rocky Flats Pediment, T2S R70W Sec. 2, 3, 10, 11, 14, 15, 11 June 1973, G. Kunkel & L. Shultz 84.

This distinctive form occupies a large area on the Rocky Flats Pediment. Whether its association with the Rocky Flats Atomic Plant is more than coincidental might be worth cytological investigation. The short ray-flowers, of which the expanded portion is no more than 1.5 mm long, are reflexed over the involucre and practically invisible unless examined at close range. The scapes are stouter and erect, while those of the typical form tend to be weak and sprawling, and the disk is distinctly wider. *F. breviligulatus* produces pure stands and is more conspicuous than the typical form because of the erect habit, larger disks and lack of long white rays to break the color pattern. At the Coal Creek population there were some plants of the long-rayed form and numerous intermediates, but the typical form, at least at this season, was infrequent and inconspicuous. I first noticed the new form in 1964 in Boulder and along Coal Creek. At that time the populations had undergone spray treatment by 2-4-D and I thought the foreshortened rays were a result of this, but the present populations have not been sprayed.

**GEUM ALEPPICUM** Jacq. *ssp.* **STRICTUM** var. **DECURRENS** (Rydb.) W.A. Weber, *comb. nov.* *Geum decurrens* Rydb., N. Amer. Flora 22:404. 1913.

**MIRABILIS GLANDULOSA** (Standl.) W.A. Weber, *comb. nov.* *Quamoclidion multiflorum* (Torr.) Torr. ex Gray *ssp. glandulosum* Standl., Contr. U.S. Nat. Herb. 12:359. 1909. *Mirabilis multiflora* (Torr.) Gray var. *glandulosa* (Standl.) Macbride. *Quamoclidion cordifolium* Osterh. (1928) non *Mirabilis cordifolia* Heimerl (1889). Pilz (1978) includes this taxon under *M. multiflora* as a subspecies but his arguments are not very strong. *M. glandulosa* flowers at a different season, its habit is sprawling, not erect, the blossoms are much larger, the fruits are tuberculate, producing mucilage when wetted, the involucre bracts are obtuse, and the geographic distribution is more northern. Where the two are sympatric in western Colorado (Mesa Co.) they do not intergrade. *M. glandulosa* emits a heavy rose fragrance. By coincidence I happened to be camping in its type locality while doing field work with a zoologist specializing in porcupines. We had to take a porcupine by Caesarean section from the mother on a mesa some ten miles south and were astonished to find that the baby porcupine emitted the identical scent as soon as its fur dried and retained this for several days, a completely unrelated but curious fact.

**NEOPARRYA MEGARRHIZA** (A. Nels.) W.A. Weber, *comb. nov.* *Peucedanum megarrhizum* A. Nels., Bull. Torr. Bot. Club 26:130. 1899; *Lomatium megarrhizum* Mathias, Ann. Mo. Bot. Gard. 25:282. 1937. In all characters this species is more closely related to *Neoparrya lithophila* Mathias than to species of *Lomatium*. The mericarp is little flattened, strongly nerved or winged and the lateral margin is hardly more strongly winged than the dorsal ribs,

just as in *Neoparrya lithophila*. The umbels of both species characteristically have rays of uniform length and spreading in all directions, the lower ones downward and outward to form a spherical array. The leaves of *N. lithophila* are simply pinnate except for the lowermost pinnae which are often pinnatifid, and in *N. megarrhiza* they are somewhat narrower and more uniformly bipinnatifid. The leaf dissection is the chief diagnostic feature separating the two taxa. The scattered oil tubes in *N. lithophila* are not sufficiently different from the arrangement in *N. megarrhiza* to justify the weight placed on this character in the literature.

The more obvious relationships of *Neoparrya* seems to be with *Aletes* rather than with *Lomatium*. In both species the foliage odor, a highly characteristic celery type, contrasts with the anise odor of most *Aletes*. NEW TO COLORADO. Grand Co.: on barren black shale slope derived from a lower member of the Pierre Formation beside Colorado Hwy 9 ca. 3 mi SSE of Kremmling; forming large hemispherical mounds to 50 cm diam with 20-30 stems; branched caudex from a thick vertical storage root up to 5 cm diam with odor of sweet carrots or weak turpentine when fresh, 16 Aug. 1975, Weber & Johnston 15146, 7 July 1978, Johnston & Lucas 1786, 25 June 1947, Penland 3564 (COCO). PLATE 1.

**RHUS AROMATICA** Ait. ssp. **PILOSISSIMA** (Engelm.) W.A. Weber, *comb. nov.* *Rhus aromatica* Ait. var. *pilosissima* (Engelm.) Shinnery, Field & Lab 19:86. 1951. NEW TO COLORADO. Otero Co.: 11 mi S of La Junta on Hwy. 109, 30 April 1963, K. Skelly 8830. Pueblo Co.: abundant along draws in dry sandstone hills, pinyon-juniper area, Greenhorn Valley 3 mi N of Crow, 6000 ft. alt., 2 July 1939, Ewan 11981.

#### New Colorado Records: Indigenous Species

**ASTRAGALUS DUCHESNENSIS** Jones, Contr. West. Bot. 13:6. 1910. Moffat Co.; grassy bench at head of Browns Park just NE of Gates of Lodore above Vermillion Creek drainage, 26 June 1965, Weber & Salamun 12648, !D. Isely.

**ASTRAGALUS GILVIFLORUS** Sheld., Minn. Bot. Stud. 1:21. 1894. Kit Carson Co.: 8 mi N and 3 mi E of Bethune on gravelly prairie knoll with *A. sericoleucus* Gray, 14 June 1972, R. McGregor 24369, !Barneby. A range extension south from the Nebraska Panhandle.

**ATRIPLEX DIOICA** (Nutt.) Macbride, Contr. Gray Herb. n.s. 53:11. 1918 Rio Blanco Co.: S-facing slope of clay butte with white sandstone caprock just N of Rio Blanco Lake, 42 mi E of Rangely, 1770 msm; dominant on clay slopes, 14 June 1978, Weber & Wingate 15372.

**AZOLLA MEXICANA** Presl, Abh. Boehm. Gesell. Wiss. V, 3:150. 1845. Sedgwick Co.: High-line Canal road at Cottonwood Creek, 1.5 mi E of Logan Co. line, 1130 msm, 10 June 1978, Wilken 13314 (CS). Yuma Co.: along Hwy 34 ca. 2 mi W of Wray along Republican River, 1090 msm, 10 June 1978, Wilken (CS).

**BUPLEURUM AMERICANUM** C. & R., Rev. N. Am. Umbel. 115. 1888. La Plata Co.: Needle Mountains, 3900 msm, near Trimble Pass, S edge of Upper Vallecito Basin, 1.2 mi S of Columbine Pass, T38N R7W, on granitic substrate, *Salix arctica* community, 20 July 1978, D. Buckner, COLO 321715. This record represents the southernmost known locality on the North American continent and a range extension southward from Wyoming.

**CAREX EXSICCATA** L.H. Bailey, Mem. Torr. Bot. Club 1:6. 1889. Routt Co.: vicinity Little Snake River at Three Forks Ranch N of Columbine, 26 July 1951, Weber 7040. Grand Co.: Muddy Creek drainage, T4N R81W, between Rabbit Ears Pass and Kremmling, in bottom of old ox-bow, *Carex-Juncus* marsh, 18 July 1973, T. Giese 681.

*CHRYSOETHAMNUS NAUSEOSUS* ssp. *LEIOSPERMUS* (A. Gray) H.M. Hall, Phylogenetic Method in Taxonomy 217. 1923. This race, characterized by its low stature, glabrous phyllaries and glabrous achenes, extends into western Colorado from its main area in Utah and Nevada. Moffat Co.: Morrison Formation S of Blue Hill, Irish Canyon Quadr., T10N R101W, Sec. 11, 6600 ft. alt., 2 Sept. 1970, Weber 14242; Rio Blanco Co.: white shale slopes, gap through Raven Ridge 3 mi W of junction Rangely-Dinosaur road with Bonanza road, 1700 msm, 15 June 1978, Weber & Wingate 15393; Montezuma Co.: between Risley Canyon and Yellow-jacket Canyon ca. 18 mi W of Cortez, 6150 ft. alt., 24 Aug. 1977, J. Ratzloff COLO 316069.

*CRYPTANTHA CAESPITOSA* (A. Nels.) Payson, Ann. Mo. Bot. Gard. 14:281. 1927. NW Moffat Co.: NW face of gypsum hill beside Moffat Co. Hwy 116, T11N R101W Sec. 16, with *Astragalus aretioides*, 2100 msm, 30 May 1972, MacLeod 1109. This range extension from southern Wyoming into northern Colorado was anticipated by Harrington (1954).

*CRYPTANTHA ROLLINSII* I. M. Johnston, J. Arn. Arb. 20:391. 1939. Rio Blanco Co.: white shale slope, gap through Raven Ridge 3 mi W of junction Rangely-Dinosaur road with Bonanza road, 1700 msm, with *Eriogonum ephedroides*, *Phacelia incana*, *Mirabilis alipes*, 15 June 1978, Weber & Wingate 15391.

*CYMOPTERUS PETRAEUS* Jones, Contr. West. Bot. 8:32. 1898. Moffat Co. Dinosaur National Monument; common in drainage lines on rocky bench along trail to the scenic overlook at Gates of Lodore, 10 June 1967, Weber 13063.

*DRABA BOREALIS* DC., Syst. Nat. 2:342. Park Co.: in cold snow—runoff streams on south side of Hoosier Ridge, with *Eutrema penlandii*, 10 July 1959, Hultén & Weber 11042. Summit Co.: valley of Monte Cristo Creek just N of Hoosier Pass, on steep slopes, tundra above Blue Lake dam, 11500 ft. alt., 12 July 1969, Weber COLO 239899, !G. A. Mulligan.

*DRABA JUNIPERINA* Dorn, Madroño 25:101. 1978. Moffat Co.: on steep slope, consolidated talus under *Pinus edulis-Juniperus osteosperma*, Harpers Corner, Dinosaur National Monument, 2 June 1956, Weber & Welsh 9629; Irish Canyon between Greystone and Sparks, T10N R101W, Sec. 34, 6000 ft. alt., 2 Sept. 1970, Weber 14275.

*DRABA PECTINIPIILA* Rollins, Rhodora 55:231. 1951. Gunnison Co.: steep W-facing talus slope of Point 12366 above Virginia Basin, T12S R86W Sec. 26, near Gothic, 12300 ft. alt., with *Senecio werneriaefolius*, *Draba*, *Oxytropis podocarpa*, *Smelowskia calycina*, 30 June 1977, B.C. Johnston 1273. These plants with white flowers and doubly pectinate trichomes on the fruit valves were found in a zone between the slope and tundra forms of *D. oligosperma*, a comparable situation to that at the type locality on Clay Butte, Wyoming.

*DRABA PORSILDII* G.A. Mulligan, Can. J. Bot. 52:1795, fig. 8, 18[map]. 1974. Summit Co.: tundra and loose rock slides, N slope of Hoosier Ridge, 12000-12700 ft. alt., 1-2 mi E of Hwy over Hoosier Pass, 24 July 1948, Weber 4286, !Mulligan.

*DROSERA ROTUNDIFOLIA* L., Sp. Pl. 281. 1753. Gunnison Co.: acid iron bog at base of Mt. Emmons, 2700 msm, 3 mi W of Crested Butte along Kebler Pass road; growing in *Sphagnum fuscum* bog, 23 July 1978, W. & D. Kaemmerer, J. Lanier-Olmsted COLO 318660. This record represents the southernmost occurrence in the western interior of North America and a range extension south from Montana. The collection was made incidental to environmental studies for AMAX, Inc.

*ERIGERON GRANDIFLORUS* Hook., Fl. Bor. Amer. 2:18. 1834. The following specimens were annotated by Stephen Spongberg as belonging to this, which he describes as the southern alpine race of a complex of apomictic triploid biotypes comprising the taxon cited. Clear Creek Co.: Grays Peak, July 1888, Eastwood, Summit Lake, Mt. Evans, 12500 ft., 27 July 1966, L. Snyder 11108; tundra ridge N of summit Loveland Pass, 11 July 1954, Weber COLO 85588. El Paso Co.: Windy Point, Pikes Peak, 12000 ft., 13 July 1940, Alpine Laboratory. Gunnison Co.: Cottonwood Pass, 19 July 1963, C. Loder 1BF. Gilpin Co.: Stewart Lakes near Tolland, 31 July 1918, Ramaley 11467, Yankee Doodle Lake, 26 July 1916, Ramaley 10717. Lake Co.: Independence Pass, 17 July 1952, P.D. Green 359. La Plata Co.: Chicago Basin, E of Mt. Eolus, 13100 ft. alt., 21 Aug. 1961, J. Michener 72.

*ERIGERON KACHINENSIS* Welsh & Moore, Proc. Utah Acad. 45:231-232. 1968. Montrose Co.: San Miguel Resource Area, B.L.M.; secluded tributary of the Dolores River between Slick Rock and Bedrock, 1560 msm, 29 April 1978, J. Ratzloff 107. Four populations have been discovered. The cited collection was intimately associated with a "cave" or "hanging garden". All sites were characterized by moist sandy soil fed by water seeping from the cliffs or overhangs above. Collections of flowering material have been made in April and August. A few plants show some rayless heads. Welsh and Moore did not mention the fact that the ray-flowers characteristically reflex over the involucre upon wilting or maturation and that the plants may be distinctly stoloniferous. PLATE 2.

*ERIOGONUM SCABRELLUM* Reveal, Ann. Mo. Bot. Gard. 55:74. 1968. Montezuma Co.: bluffs above the north bank of San Juan River just NE of Four Corners, 12 June 1949, Weber 4810, !Reveal.

*HERRICKIA HORRIDA* Woot. & Standl., Contrib. U.S. Nat. Herb. 16:186. Pl. 50. 1913. *Aster horridus* Blake, J. Wash. Acad. Sci. 27:379. 1937. Las Animas Co.: Lake Maloya watershed, East Schwachheim Canyon, 0.7 mi NW of upper end of Lake Dorothy, 2450 msm, dry sandy slope, semiclear, no ground cover, E exposure, 31 Aug., 7 Sept., 5 Oct. 1975; Segerstrom Canyon, 1.6 mi ENE from west end of Lake Maloya on SW slope of Gobblers Roost, 2450 msm, 24 Aug. 1975, J.H. Robertson, 1, 2, 3, 4, 6. *Herrickia* seems to be as well separated from *Aster* proper as *Machaeranthera* and *Xylorhiza* and is maintained here as a distinct monotypic genus endemic to northern New Mexico and adjacent Colorado south of the summit of Raton Pass.

*MAHONIA HAEMATOCARPA* (Woot.) Fedde, Bot. Jahrb. 31:100. 1901. The record is a specimen collected by a Miss Archibald, 1902, without locality data written in her hand, but with a pencilled notation on the label in Cockerell's hand, "south of Trinidad, Colo." The species is common in New Mexico from the Sandia Mountains southward and might well occur south of the divide of Raton Pass. This report must be considered tentative but we give it to stimulate collectors to work in this little-collected area of southern Colorado.

*MIMULUS EASTWOODIAE* Rydb., Bull. Torr. Bot. Club 40:483. 1913. Delta Co.: Escalante Canyon, in "hanging garden" on roof of large cave of Wingate Sandstone at Cottonwood Spring, 7 Sept. 1975, Weber & Steward 15244. Montrose Co.: tributary of Dolores River near junction of Little Gypsum Creek and Dolores River, 5150 ft. alt., on vertical sandstone walls, 30 Aug. 1977, J. Ratzloff 220/95.

*MIRABILIS ALIPES* (S. Wats.) Pilz, Madrono 25:120. 1978. *Hermidium alipes* S. Wats., Bot. Kings Exped. 286, f. 32. 1871. Rio Blanco Co.: white shale slope, gap through Raven Ridge

3 mi W of junction Rangely-Dinosaur road with Bonanza road, 1700 msm, with *Eriogonum ephedroides* and *Phacelia incana*, 15 June 1978, Weber & Wingate 15388.

*PELLAEA TERNIFOLIA* (Cav.) Link var. *WRIGHTIANA* (Hook.) A.F. Tryon, Ann. Mo. Bot. Gard. 44:153. 1957. Baca Co.: Holt Canyon, 10 mi W and 7 mi S of Campo, 8 Sept. 1972, M.L. Howard COLO 275242, Picture Canyon, 9 mi W and 4 mi S of Campo, 9 Sept. 1972, M.L. Howard COLO 275230. A range extension northward from Texas.

*PENSTEMON UTAHENSE* Eastwood, Zoë 4:124. 1893. Mesa Co.: 1 mi NW of Gateway, 5000 ft. alt., 7 May 1966, Rohrbach 8 (CS), along Hwy 141, 11.5 mi S of Gateway, 1450 msm, 27 May 1976, Wilken et al 12637 (CS). Montezuma Co.: slopes of Cannonball Mesa above McElmo Creek 10 mi E of Utah State line, 8 May 1974, G. Kelly COLO 277638.

*PHACELIA INCANA* Brand, Beitr. z. Kenntn. d. Hydrophyll. 8. 1911. Rio Blanco Co.: white shale slope, gap through Raven Ridge 3 mi W of junction Rangely-Dinosaur road with Bonanza road, 1700 msm, with *Eriogonum ephedroides* and *Hermidium alipes*, 15 June 1978, Weber & Wingate 15387, !Barneby. An ephemeral spring annual to be compared with *P. ivesiana* but with entire or slightly toothed oval leaves and reticulate, deeply pitted seeds. The corollas are minute and deciduous. Previously known from Utah and Wyoming.

*PHACELIA INTEGRIFOLIA* Torr. Montezuma Co.: Four Corners, above the San Juan River, 5000 ft. alt., 16 May 1964, J. Erdman & J. Watson, !D. Atwood.

*POTENTILLA OVINA* Macoun, Can. Rec. Sci. 6:464. 1896. Boulder Co.: E slope Buchanan Pass, 11200-11600 ft., 11 July 1972, Komarkova COLO 262618, Niwot Ridge, 11000-12600 ft., 28 Aug. 1971, Komarkova COLO 262794. Gilpin Co.: slope of cirque in NE side of James Peak, 12000 ft., alt., 4 July 1972, Komarkova COLO 262381. Summit Co.: Ten Mile Range, NE slope of Peak Ten, 3900-3990 msm, 31 July 1973, Komarkova COLO 274445. Larimer Co.: Flattop Trail between Emerald View and Glacier View, 11700 ft. alt. in dry fellfield, 11 July 1961, Willard 61140, !B. C. Johnston.

*RIBES ODORATUM* Wendland f. in Bartling & Wendland, Beitr. z. Bot. 2: 15. 1825. Boulder Co.: 17th Street bridge, Boulder, 14 May 1915, A.J. Evans 16, 23, common on N-facing slope above Boulder Creek along trail, 19th Street on N edge of University campus, 12 May 1974, Weber 15090.

*RUBUS IDAEUS* L. ssp. *SACHALINENSIS* var. *PERAMOENUS* (Greene) Fern., Rhodora 21:98. 1919. Routt Co.: just S of Steamboat Springs on Howelson Hill in mixed coniferous forest on N-facing slope, T6N R84W Sec. 17, 19 July 1972, J. Bunin COLO 275893.

*SELAGINELLA SELAGINOIDES* (L.) Link, Fil. Sp. Hort. Berol. 158. 1841. Jackson Co.: moist streambank along Bear Creek, 9500 ft. alt., 106° 36'W, 43° 0'N, Routt National Forest along trail from Ute Pass-Grizzly Creek trail, 2 Sept. 1978, D. Wilken. Unfortunately the plants were transferred to the greenhouse and later lost before a voucher collection was made. However, this range extension is important and the identification correct so we are reporting it here. Vouchers will be deposited in CS and COLO during the 1979 field season without fail.

*SPIRAEA DOUGLASII* Hook. var. *MENZIESII* (Hook.) Presl, Epimel. Bot., p. 195. 1849. Routt Co.: Clark Sawmill, N of Steamboat Springs on road to Hahns Peak; in the sawmill

yard, not definitely known as to whether or not an escape from cultivation, 15 July 1966, W. Stevenson COLO 208938.

*TRIFOLIUM KINGII* S. Wats., Bot. Kings Exped. 5:59. 1871. Montrose Co.: Uncompahgre Nat. For., Love Mesa road, T49N R15W Sec. 20, 9400 ft. alt., in aspen type, 10 Aug. 1949, H.F. Harlan 30, !D. Isely.

New Colorado Records: Adventives

*AGROSTEMMA GRACILIS* Boiss., Diagn. Pl. Orient. Nov. 3(1):80. 1853. Boulder Co.: a spontaneous waif in a garden between 5th and 6th Street and Concord, Boulder, 16 June 1975, Weber 15118. This had persisted for a number of years at the site. Petals large, pink, whitish toward the base, with lines of black spot-streaks on the limb. Native in Asia Minor and Greece.

*AILANTHUS ALTISSIMA* (Mill.) Swingle, J. Wash. Acad. Sci. 6:495. 1916. Thoroughly naturalized in Colorado cities and towns as a consequence of urbanization. Following are only the earliest of our collections Boulder Co.: various localities in City of Boulder, 25 June 1938, Ewan 11401, 19 Aug. 1941, Ewan 13848, Sept. 1943, Ewan 15521.

*ARCTIUM LAPPA* L., Sp. Pl. 816. 1753. Ouray Co.: plentiful weed in abandoned lots, Main Street, Ouray, 9 Sept. 1972, F.J. Hermann 24971.

*ASTRAGALUS CICER* L., Sp. Pl. 757. 1753. Boulder Co.: in grass parking along 17th Street and Canyon Blvd.; surviving remnant of a legume garden maintained by S.B. Detwiler some 20 years ago, source unknown, 14 June 1978, R. Wittmann COLO 322941. Rio Blanco Co.: 7 mi from Piceance Basin road, near CSU Piceance Basin Intensive Study Site, 12 Aug. 1978, M. Wertheimer COLO 318673.

*ASTRAGALUS FALCATUS* Lam., Encycl. 1:310. 1783. BOULDER CO.: in grass parking along 17th Street and Canyon Blvd.: surviving remnant of a legume garden maintained by S.B. Detwiler some 20 years ago, source unknown, 10 June 1978, Weber 25359.

*BROMUS HORDEACEUS* L. *ssp. HORDEACEUS*, Sp. Pl. 77. 1753 (incl. *B. mollis* L.). Moffat Co.: 6 mi SW of Greystone on NE-facing slope of Douglas Mountain, in shade of aspen with sagebrush, 7500 ft. alt., 28 June 1967, M. MacLeod 721. We follow Hylander (1953) for the nomenclature, and Scholz (1970) for the taxonomy of this group.

*BROMUS SQUARROSUS* L., Sp. Pl. 76. 1753. Boulder Co.: roadside ditch ca. 4 mi N of Boulder on foothills highway, 5000 ft. alt., 9 July 1962, R. Watkins 18.

*CENTAUREA JACEA* L., Sp. Pl. 914. 1753. Garfield Co.: Glenwood Canyon at Grizzly Creek, 2.8 mi E of No Name, 6000 ft. alt., 26 May 1977, D. Wilken 12928 (CS).

*CENTAUREA MACULOSA* Lam., Encycl. 1:669. 1783. Jefferson Co.: Pine Park Estates SE of Evergreen, T5S R70W Sec. 20; stand covered more than a square mile and is abundant along road for several miles east and west; forms with white and purple rays occur intermixed, 26 July 1976, R. White COLO 310286.

*CIRSIIUM INCANUM* (S.G. Gmel.) Fisch. ex MB, Fl. Taur.-Cauc. 3:561. 1819. *C. arvense beta incanum* Ledeb., Fl. Ross. 2:735. 1846. This taxon has been passing for a form of



*C. arvensis* with shallowly toothed or pinnatifid leaves strongly tomentose beneath. It differs from the shallowly-toothed and -lobed *var. mite* Wimm. & Graebn. in its tomentose leaf undersurface. *C. incanum* is native in SE Europe and SW Asia (cf. Fl. USSR 28:211-215. 1963).

*CORONILLA VARIA* L., Sp. Pl. 743. 1753. Boulder Co.: along Table Mesa Drive on ditch bank. locally abundant, 2000 msm, 17 June 1974, U. Lanham COLO 278103. Ouray Co.: gravelly embankment of Box Canyon road in open woods, 2375 msm, 9 Sept. 1972, F.J. Hermann 24970.

*ELEAGNUS PARVIFOLIA* Royle, Illustr. Bot. Himal. 323, t. 61, f. 1. 1836. Boulder Co.: escaped from cultivation and locally established along diagonal hwy. NE of Boulder at Gunbarrel crossing, 27 Oct. 1975, Weber COLO 288680. Some authors make this a variety of *E. umbellata* L. Here we follow Bailey's Standard Cyclopedia of Horticulture.

*ELEAGNUS ORIENTALIS* L., Mantissa Pl. 41. 1767. *E. angustifolia* L. *var. orientalis* Dipp. Boulder Co.: thoroughly naturalized, N slopes at base of talus slides, bottom of Gregory Gulch (probably spread by jays from the adjacent urban area), 2000 msm, 19 June 1973, Weber 15004. Mesa Co.: along cliff base, entrance highway, Colorado National Monument, Fruita entrance, 16 May 1954, Weber COLO 83443, !F. G. Meyer. Whether this is really distinct is questionable. Sucker shoots from *E. angustifolia* have very broad large rounded bicolored leaves similar to those of *E. orientalis*. For the time being we follow Flora USSR 15:390-392. 1974 where the taxon is treated as a species.

*EUPHORBIA MYRSINITES* L., Sp. Pl. 461. 1753. Boulder Co.: 1 mi ENE of Eldorado Springs, 5700 ft. alt., locally abundant as an established escape from cultivation on 1.5 acres of sandy soil along South Boulder Creek, 3 April 1972, U. Lanham COLO 257044. Jefferson Co.: 26th and Queen Streets, Lakewood, May 1977, W. Eisenlohr COLO 306980.

*FALLOPIA AUBERTII* (L. Henry) Holub, Folia Geobot. Phytotax. 6:176. 1971 (*Polygonum baldshuanicum* auctt. non Regel), *Polygonum aubertii* L. Henry, Rev. Hort. 82-83. 1907. Boulder Co.: Euclid at 15th St., Boulder, 25 June 1938, Ewan 11408 (then a cultivar) but now established in several places in the Boulder Valley and in Denver. City of Denver. Along Cherry Creek between Arapahoe and University Ave., 19 June 1975, D. Buckner COLO 287963. Boulder Co.: escaped from cultivation, Boulder, climbing over old fences, vines massive and with much old wood hidden by the young growth; fls. white, polygamo-monoecious, 11 July 1975, Weber 15125.

*GERANIUM COLUMBINUM* L., Sp. Pl. 682. 1753. Boulder Co.: Lafayette, a weed in fields, 29 June 1973, I. Siegrist COLO 269696.

*IBERIS AMARA* L., Sp. Pl. 649. 1753. Douglas Co.: flat on road to Roxbury[ough] Park, Wolhurst, 19 Sept. 1919, R.P. Duthie 561.

*ISATIS TINCTORIA* L., Sp. Pl. 670. 1753. Grand Co.: roadside, N end of Middle Park 5 mi

S of Muddy Pass, 25 June 1975, Weber 15120. Shortly after this collection was made, the small population was eradicated by county weed control crews.

*KNAUTIA ARVENSIS* (L.) T. Coulter, Mem. Dipsac. 41. 1823. Routt Co.: disturbed roadside ditch and prairie 0.3 mi W of junction roads 16 and 18A, Stagecoach, 2250 msm, T3N R84W Sec. 6, 10 Aug. 1972, B. Smith et al 8722.

*LATHYRUS LATIFOLIUS* L., Sp. Pl. 733. 1753. Boulder Co.: Boulder, escaped from gardens, 16 June 1953, Weber COLO 73705. Widely established along canyon roads throughout the Boulder area and elsewhere along the Front Range.

*LYTHRUM SALICARIA* L., Sp. Pl. 446. 1753. Jefferson Co.: around a pond at high water line between cattail zone and grassy meadow, W of Hampden and Quincy, South Denver, July 1978, R.F. Harner COLO 318898.

*NYMPHAEA ODORATA* Solander in Ait., Hort. Kew. ed. I, 2:227. 1789. Larimer Co.: Shields Ponds, Poudre R. between Fort Collins and La Porte, 15 Sept. 1973, R. Budzinski CS 7535. Otero Co.: Ryans Ponds along Arkansas River NE of Rocky Ford, 3 Oct. 1975, D. Hess CS 7534. Both of these colonies are evidently of very long standing.

*PANICUM GYMNOCARPON* Ell., Bot. S.C. and Ga. 1:117. 1816. Bent Co.: near McClave, 3700 ft. alt., 13 July 1961, G. Zonitch CS 42841.

*PAPAVER CROCEUM* Ledeb., Fl. Altaica 2:271. 1830. *P. nudicaule* Hort. non L. fide Hanelt, Kulturpfl. 18:73-88. 1970. Park Co.: Mosquito Pass, 3350 msm; roadside above timberline just beyond London Mine, probably escaped and persisting from old mine gardens or from cultivation in nearby Fairplay, 14 July 1967, Weber 13351.

*POLYGONUM ARGYROCOLEON* Steud. ex Kunze, Linnaea 20:17. 1847. Moffat Co.: Irish Lakes, 2000 msm, at upper end of Irish Canyon, T10R 101W Sec. 10, in drying mud of lake bottom, 2 Sept. 1970, Weber 14236.

*SILENE DICHOTOMA* Ehrh., Beitr. z Naturkunde 7:143. 1792. Gunnison Co.: Robinson Basin, 30 mi N of Gunnison, 8 mi W of Crested Butte, 2 mi N of Kebler Pass; dry meadow, 10800 ft. alt., 2 July 1967, D. Bathke 265.

*SOLANUM CAROLINENSE* L., Sp. Pl. 187. 1753. Boulder Co.: a weed in discarded planter boxes behind apartments at Walnut and 19th Streets, Boulder, locally abundant, 4 Aug. 1975, Weber 15135.

*SOLANUM DULCAMARA* L., Sp. Pl. 185. 1753. Delta Co.: 2.3 mi E of Delta city center, 5000 ft. alt., 6 July 1968, B.A. Howard 54, Cedaredge, 30 June 1952, Walker (all in herb. Western State College).

*TAMARIX PARVIFLORA* DC., Prodr. 3:97. 1828. Baca Co.: depleted pasture, Sand Arroyo 2 mi S of Walsh, T31S R43W Sec. 16, 5 May 1949, Weber 4564. Flowers 4-merous, the spikes on wood of previous season, stamens from the ends of the disk lobes.

*VERBASCUM PHLOMOIDES* L., Sp. Pl. 1194. 1753. Jefferson Co.: outer foothills between Golden and Morrison at Heritage Square, along roadside, 24 July 1974, Weber, Kunkel & Munger 15095. Harrington (1954) stated that the species was reported for Colorado but gave no source for the record.

## Re-evaluations and Reinstatements

*ARTEMISIA MICHAUXIANA* Besser in Hook., Fl. Bor. Amer. 1:324. 1833. Harrington (1954) noted that the species was reported for Colorado. Weber (1966) located the specimen and suggested that it represented *L. ludoviciana* ssp. *incompta* (Nutt.) Keck, a view also held by Keck. However, recent collections are more convincing in favor of *A. michauxiana*. Hinsdale Co.: 1 mi below summit Engineer Pass just S of jeep road from Lake City, 3596 msm, 17 Aug. 1976, J. Ratzloff 46/153; Mesa Seco, 12000 ft. alt., 15 July 1967, K. Johnson J67-51. Custer Co.: Sangre de Cristo Mts., talus slope above ponds below Horseshoe Lake, Aug. 1976, G. Schooley COLO 288835. Conejos Co.: steep SE-facing grassy slopes above waterfall, below conglomerate cliffs, N Fork Rio Chama, 3250 msm, 12 July 1976, B.C. Johnston 391. While Keck (1946) doubted that the disjunct southern populations could belong to this species, this material shows no morphological deviation from typical material from Montana and northward. The capituli are almost glabrous with extremely broad erose often purplish phyllaries and the flowers are usually purplish as well. Keck's key considered only leaf form, which is variable in the direction of narrow-lobed races of *A. ludoviciana*. Chromosome studies suggested by Keck to be of value in the ultimate disposition of the problem have not been made.

*ATRIPLEX VIRGATA* Osterhout, Bull. Torr. Bot. Club 53:35. 1926. This taxon was described from Colorado but was not evaluated by Harrington (1954). It should be placed in synonymy under *A. rosea* L. Osterhout's basis for the species was the lack of facial appendages on the bracts, the type otherwise agreeing with *A. rosea*. Actually the type collection displays many ripe fruits and several of them have one or two sharp tubercles. Descriptions indicate that considerable variability must be allowed in this character.

*CLEMATIS SCOTTII* Porter in Porter & Coulter, Syn. Fl. Colorado, 1. 1874. This taxon is a good species and did not deserve to be summarily reduced to varietal status under *C. hirsutissima* Pursh by Erickson (1943). *Clematis hirsutissima* is erect, with fascicled stems and ascending leaves with straight rachises. The leaves, with very few exceptions (cf. Payson & Armstrong 3365, from Lincoln Co., Wyo., a mixed collection with narrow or very broad leaflets) are narrow and usually strongly pubescent. The flowers are short-cylindric, slightly broadened at the base with prominent apical lobes not strongly bordered by white tomentum. *Clematis scottii* is a sprawling decumbent herb with widely divergent stems and divaricately spreading leaves with a sigmoid-arcuate leaf-rachis. The leaves have broadly elliptic-ovate, glaucous and sparsely long-pilose leaflets. The flowers are short-turbinate with a very broad base and very small recurved tepal apices with a very prominent border of white tomentum. Erickson did not consider the differences in floral shape although many species of *Clematis* have distinctive floral shapes. Two color plates in Rickett (1973) illustrate the differences between *C. hirsutissima* (Plate 54, lower right-hand figure by Blecher) and *C. scottii* (Upper right-hand figure by Schooley).

*DICORIA BRANDEGEI* Gray, Proc. Amer. Acad. 11:76. 1876. The record of this species is the Brandegee collection at NY, No. 1170 from "sands of R. San Juan near Utah line, SW Colorado, 1875". The species becomes common along the river in Utah, but has not been taken again in Colorado. The specimen cited is one branchlet six inches long.

*FESTUCA SCABRELLA* Torr. in Hook., Fl. Bor. Amer. 2: 252. 1840. I erred (Weber 1961) in suggesting that *F. hallii* (Vasey) Piper [*F. scabrella* ssp. *hallii* (Piper) W.A. Weber] is the only member of the *F. scabrella* group occurring in Colorado. Harrington's report (1954) of *F. scabrella* from Huerfano County at 11,250 ft. and from Custer County at 8500 ft. was correct, and his description certainly applies to the species proper and not to the rhizomatous

*F. hallii*. I recently had the opportunity of seeing the species in the field (Huerfano Co.: Apishapa Pass, 3340 msm, 6 July 1978, Weber & Wingate 15442). It occurs sparsely on a grassy saddle along the trail from the pass toward West Spanish Peak. The saddle is dominated by *Trifolium attenuatum* Greene and *Festuca arizonica*, various species of *Carex* and sub-alpine perennials and appears to have had a history of overgrazing and recovery. The few large bunches of *F. scabrella* are best developed in deep loose soils churned up by gophers. The dense bunches lacking any rhizome development, the very high reddish leaf sheaths, long and tightly involute blades and large heavy spikelets easily distinguish *F. scabrella* from *F. hallii*. It is not impossible that *F. scabrella* might have been introduced for range restoration.

*KOCHIA SIEVERSIANA* (Pall.) C.A. Mey. in Ledeb., Fl. Altaica 1:415. 1829. This is the common *Kochia* in Colorado and probably the most abundant late summer weed along the base of the Front Range. Weber (1966) reported this as *K. iranica*, but the treatment of *Kochia* in Fl. USSR VI clearly shows that this was incorrect. The flowers of *K. iranica* are permanently tomentose while our plants have flowers which are glabrous at maturity except for a marginal fringe of trichomes. *K. sieversiana* differs from *K. scoparia* (L.) Schrad. in having the inflorescence dense rather than remotely-flowered and the flowers are enveloped in tufts of long trichomes giving the whole inflorescence a woolly-tomentose appearance. The species occurs naturally in southern Siberia, Mongolia and western China.

*LAPPULA DIPLOLOMA* (Schrenk ex Fisch. & Mey.) Guerke in Engler, Nat. Pflanzenfam. IV, 3a:107. 1893. *Echinosperrum diplomoma* Schrenk ex F. & M., Enum. Pl. nov. a cl. Schrenk lect. 1:36. 1841. This is suggested as an earlier name for an American and Siberian taxon that has had an extraordinary nomenclatural history and synonymy in American treatments. *Lappula texana* Britt., based on *Echinosperrum texanum* Scheele (1852) and a long list of Greene names were enumerated most recently by Cronquist (1959) who considers all of them synonymous within a highly polymorphic concept of *Lappula redowskii* (Hornem.) Greene. *L. diplomoma* is treated and figured in Flora USSR 19:313-315, Plate XX:3. We have not examined authentic material. In the event that we are not correct in assigning this name to the American plant, the name it should take would be *L. texana* (Scheele) Britt.

Over many seasons of observing this complex in the field the senior author has become convinced that, regardless of the difficulty of determining some herbarium specimens, there are two distinct entities in the field that are clearly separable. The first, *L. diplomoma* (or *L. texana*) is a vernal species of steppe-desert, flowering very early in the spring on sites that become very arid. This plant is characterized by having its primary stem suppressed and replaced by several elongate stems from near ground level that are essentially unbranched and bear flowers in almost every leaf-axil. The mature nutlets are provided with inflated margins resembling old-fashioned horse-collars. The second, *Lappula redowskii*, is an aestival species of more mesic sites and higher altitudes, blossoming through the summer. This plant characteristically has a main stem which produces radiating branches from the upper portion, the flowers being limited to these branches. The mature nutlets are not provided with highly inflated margins. Interspecific hybridization may be responsible for some of the confusion in herbaria, but extensive intergradation has not been observed in the field.

The Russian *L. diplomoma* is said to have nutlets that separate with difficulty, while the American plants have normally separating mature nutlets. In other respects the description of the Russian species seems to match ours.

*RANUNCULUS OROGENES* Greene, Plantae Bakerianae 3:2. 1901. The type of this taxon was collected by C.F. Baker in 1901 from Cerro Summit above Cimarron. Benson (1948) discussed its obvious close relationship with *R. glaberrimus* Hook. var. *ellipticus* Greene but

surprisingly placed the species in different sections of the genus! It is difficult to find a valid distinction between them. In Benson's comparison table, the characters overlap or the measurements of one are encompassed by the range of the other. He gives the receptacle of *glaberrimus* in the table as glabrous, but in the description on page 167 he says "usually finely pubescent". The only character that remains to separate the two after comparing the table point by point is the allegation that the cauline leaves are parted in *glaberrimus* and entire in *oreogenes*. The senior author visited the type locality to observe *R. oreogenes* and found the area dominated by nothing but *R. glaberrimus* var. *ellipticus*. I conclude that the two taxa are synonymous.

Benson gives what he has called *R. oreogenes* a geographical range replacing that of *R. glaberrimus ellipticus* southward in southern Utah, Arizona and New Mexico. If the southern populations are distinct from *glaberrimus* the name that they should take is *R. collomae* Benson.

#### Rejections

*CAREX BIGELOWII* Torr. & Schwein. Hermann (1970) continues to list this species as being present in Colorado as well as Utah, Idaho and Wyoming. All the specimens we have been able to examine belong either to *C. scopulorum* or some related species. *C. bigelowii* has an Amphiatlantic distribution. According to Raymond (1951) discussed by Hultén (1958), it "occurs in Eurasia from Spitzbergen, Iceland and Scotland eastward to Jana River and also in the Alps, and in America from Greenland to the west coast of Hudson Bay." It would be very unlikely for a species with this characteristic distribution to be found in the southern Rocky Mountains.

*CAREX ROSTRATA* Stokes in Withering, Bot. Arr. British Plants ed. 2: 1059. 1787. This name has been erroneously applied to *C. utriculata* Boott, a common Rocky Mountain and western North American species, by Mackenzie, Fernald and subsequently almost every author dealing with western plants. *Carex rostrata* is a plant of oligotrophic bogs (pH between 4.5 and 6.5 according to Jermy and Tutin [1968] p. 90). The leaves are typically revolute and glaucous. It has a distinctly Amphiatlantic distribution. *C. utriculata* is a plant of eutrophic wetlands with pH neutral or nearly so abundant along streams, ponds and beaver-dams in the mountain west. Its leaves are typically broad, green, and plicate.

The confusion may have begun with Mackenzie's treatment of *Carex* (1935) in which he lumped all North American material in the group under *C. rostrata*, saying, "This is one of the most widely distributed and most frequently collected of our sedges. Variations in vegetative characters in individual specimens are often marked, but are of no systematic value." Fernald (1942) added to the confusion when he concurred although he admitted that "very little North American material is satisfactorily identified with true *C. rostrata* Stokes, (*C. ampullacea* Gooden.), the 30 fat covers of North American material (fully 750 sheets) in the Gray Herbarium yielding only 29 numbers which can be forced into the typical European form of the species, these all from high-northern, alpine, subalpine or bleak habitats in Labrador, Newfoundland, eastern Quebec, northern Nova Scotia, northern New Brunswick, northern Vermont, northern Michigan, Lake Athabaska, Mackenzie and Alaska, with a slightly thicker spiked series, often with broader leaves, at high altitudes to Colorado and California . . ."

Fernald was familiar in the field with *Carex rostrata* in the east, but neither he nor Mackenzie had field experience with it in Europe, nor with the western species *C. utriculata*. European botanists visiting the Rocky Mountains are astounded that the western plant has been passing as *Carex rostrata*. The senior author's field experience in northern Europe confirms their opinion.

*MELAMPODIUM STRIGOSUM* Stuessy, Rhodora 74:51. 1972. Stuessy reports this species

from Chaffee County, Colorado. The species is Mexican, barely getting into southeastern Arizona. An extralimital report such as this should have been more closely investigated. The specimen in question is said to have been collected in Chaffee County, Buena Vista, Jones s.n. (POM). The *Pomona* specimen has no further data, and no date of collection. In view of the highly dubious character of the record coupled with the discordant distribution pattern it poses, we feel that this record should be ignored.

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Plate 1. A. *Neoparrya megarrhiza*  
 B. *N. lithophila*



Plate 2. *Erigeron kachinensis* Welsh & Moore



## BOOK REVIEWS

Alma L. Moldenke

**"ALGAL PHYSIOLOGY AND BIOCHEMISTRY"** edited by W. D. P. Stewart, xi & 987 pp., 92 b/w fig. & 75 tab. University of California Press, New York, N. Y., Los Angeles & Berkeley, California 94720. 1974 [1975]. \$45.00.

This is Volume 10 in the Botanical Monographs and, like its predecessors, is a carefully planned valuable contribution to botanical literature. There are 32 papers by 35 authors mostly from the British Isles and the United States but also from Canada and Germany. The cell wall, intracellular structures, chemical elements, cell processes, ion uptake, movements and synchronous culturing are presented with their experimental data, bibliographies, and evaluations. Lewin's paper on Biochemical Taxonomy chides careless generalizing about large groups when authors may have examined only one strain of one species of a genus grown under only one set of known conditions; or, worse, they may have analyzed only a single tuft of seaweed, grown under unspecified and probably unknown conditions and identified merely to genus by whichever passing botanist was rash enough to do so." Lewin then checks through text and comparative charts of different algal groups the presence of the various chlorophylls, carotenoids, biliproteins, carbohydrates, alginates, cellulose, lipids, enzymes, etc.

**"SOLUTE MOVEMENT IN THE SOIL-ROOT SYSTEM"** by P. H. Nye & P. B. Tinker, xiv & 342 pp., 118 b/w fig. & 45 tab. University of California Press, New York, N. Y., Los Angeles & Berkeley, California 94720. 1977 [1978]. \$23.00.

This carefully presented work is Volume 4 in "Studies in Ecology" suitable for advanced soil science and related crop or plant physiology courses and for advanced technicians in such fields. The chapters deal with movement of water through soils into plants especially using the "continuity equation which underlies most quantitative treatments", solute interchange in the soil and its modelling for gas, liquid and solid phases, diffusion, uptake rates of solutes and the complicated changes occurring in the soil around single roots with extrapolation for a crop or plant community. Clear expository text, much use of plotted data on graphs and wise analyses of the limitations of such newly evaluated information are the strong points of this study.

**"EDIBLE AND USEFUL PLANTS OF CALIFORNIA"** by Charlotte Bringle Clarke, 283 pp. & 77 b/w line draw. & 8 plates of color photos. University of California Press, Los Angeles & Berkeley, California 94720. 1978. \$5.95 paperbound.

The author's attractive lectures, fine courses and effective field trips are in response to the demand created by the recent "back-to-nature" movement. This useful book "tells about aboriginal and modern uses of more than 220 different species of plants found in California.....Recipes are given where applicable.... It is meant to be useful to the average student, city dweller, backpacker, camper, vegetarian, and survival instructor." It groups and describes the plants according to their habitats. The illustrations really help in identification. The "Suggested Reference List" is well planned as is the "Index of Plant Uses".

**"ENDANGERED PLANT SPECIES OF THE WORLD AND THEIR ENDANGERED HABITATS: A Compilation of the Literature"**, 2nd Revised Edition compiled by Meryl A. Miasek & Charles R. Long, i & 47 pp., Library of the New York Botanical Garden, Bronx Park, N. Y. 10458. 1978. \$3.50 paperbound.

How convenient to have this carefully compiled bibliography of 629 listings available "for researchers and all individuals interested in the preservation of the world's flora, and [for] informing the public about those rare and endangered plants".

**"VEGETATION MITTELEUROPAS MIT DEN ALPEN in Ökologischer Sicht"** by Heinz Ellenberg, 982 pp., 499 illus. & 130 tab. Verlag Eugen Ulmer, P.O. 1032, 7000 Stuttgart 1, Germany. 1978. DM. 120.

This is an exceedingly well prepared, thoroughly detailed, ecologically oriented (the kind that grew out of the Tüxen and the Braun-Blanquet school) synthesis and analysis of the vegetation (and vegetational changes over different time periods) of Central Europe including the Alps. The 25 detailed and well outlined chapters are developed under the following topics: "A Einführender Überblick, B Naturnahe Wälder und Gebütsche, C Andere vorwiegend naturnahe Formationen, und D Grossenteils von Menschen mitgeschaffene und erhaltene Formationen". The photographic illustrations are printed very clearly and consequently small details are readily visible. Likewise, the tables and figures have many details incorporated into them and they yield a great deal of information.

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## Publication dates

Volume 40, No. 5 --- September 24, 1978

Volume 40, No. 6 --- October 20, 1978

Volume 41, No. 1 --- December 4, 1978

Volume 41, No. 2 --- December 15, 1978

Volume 41, No. 3 --- January 1, 1979

Volume 41, No. 4 --- January 17, 1979

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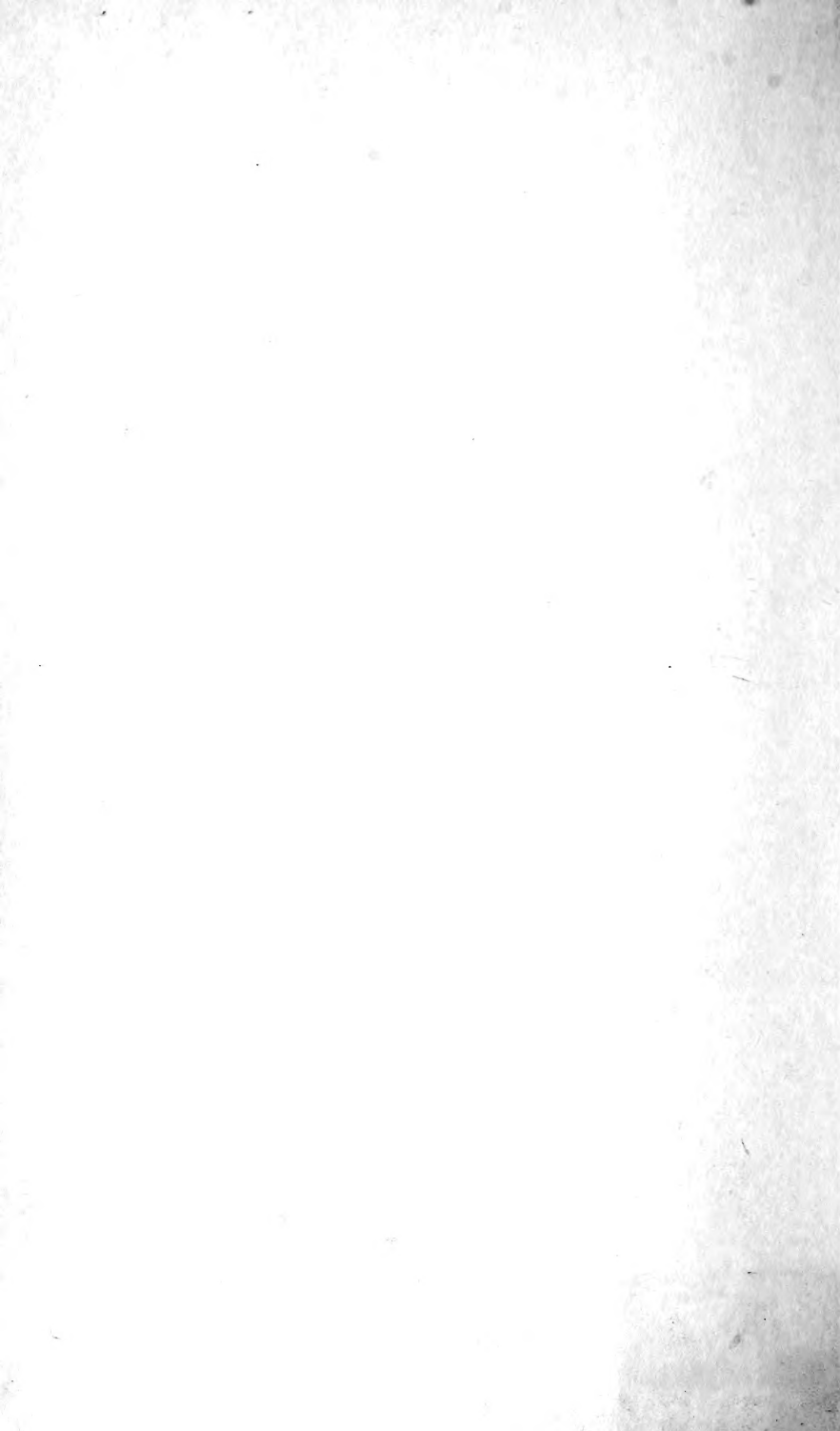
## Addenda and errata

- (1) On page 105 of Volume 41, No. 2, "Sri Lanka" was inadvertently omitted from the type locality description of Premna tomentosa f. jejuna Moldenke.
- (2) On the title-page/front cover of Volume 41, No. 5, the authorship of the fifth paper should read: "SCHMIDT, D. J., EICHMAN, J. K., and CHRISTENSEN, C. L., Diatoms as water quality indicators: Part II"











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