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CERTAMEN MELASTOMATACEIS XXV.

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Under the aegis of the Smithsonian Research Foundation, several months during the fall of 1975 were spent in European herbaria, with investigations centered on Ecuadorian Melastomataceae. The present miscellany is mostly based on the notes accumulated on this trip, plus subsequent loans of critical materials. The hospitality at the botanical institutions visited (BM, BR, GB, K, P, S) augmented the research results much beyond normal visitant expectance.

TIBOUCHINA ANDERSSONII Wurdack, sp. nov.

Sect. Diotanthera. T. eriocladae (Triana) Cogn. affinis ramulorum pilis ad nodos non elongatis staminum maiorum connectivis magis prolongatis stylo basim versus sparse setuloso differt.

Ramuli teretes sicut foliorum venae primariae subtus petiolique dense appresso-setulosi pilis gracilibus basim versus sparse inconspicueque barbellatis 0.5-1 mm longis. Petioli 0.4-1.8 cm longi; lamina (2-)3-5.5 X (1-)1.5-3.2 cm, ovata apice acuto basi obtusa vel rotundato-truncata, firme membranacea, supra sparse vel modice strigosa (pilis gracilibus ad basim adnatis) et modice appresso-setulosa (pilis gracillimis omnino liberis), subtus modice appresso-setulosa, (5-)7-nervata (pari intermedio ad basim 2-3 mm coalito). Flores terni vel in paniculam paucifloram usque ad 3 cm longam coaliti, pedicellis 4-5 mm longis, bracteolis 2-3 mm longis plus minusve persistentibus extus strigulosis. Hypanthium (ad torum) 7 mm longum extus sicut sepala modice pilis subappressis gracilibus 1-1.5(-2) mm longis indutum; calycis tubus 0.5 mm altus, lobis (4-)6-7 X 1.7-2 mm lanceatis persistentibus intus in dimidio superiore sparse strigulosis. Petala (15-)19-24 X 10-12 mm oblongo-obovata ciliis marginalibus 0.1-0.2(-0.5) mm longis exceptis glabra. Stamina in dimensionibus dimorphica glabra; filamenta 12.5 vel 9.5 mm longa; antherarum thecae 10-10.5 vel 9 X 0.8 mm subulatae poro 0.2 mm diam. ventraliter inclinato; connectivum 3 vel 1.3-1.5 mm prolongatum, lobis ventralibus inflatis 1-1.3 X 0.8-1 mm. Stigma punctiforme; stylus 22 X 0.6 mm basaliter saepius sparse appresso-setulosus (usque ad 0.5 mm); ovarium apicem versus dense strigulosum, lobis apicalibus ca. 1.8 mm longis.

Type Collection: G. Harling & L. Andersson 14363 (holotype US 2727453; isotype GB), collected between Piñas and El Placer along the Zaruma-Santa Rosa road, Prov. El Oro, Ecuador, elev. 1100-1200 m, 6 May 1974. "Shrub 1.5-2 m. Corolla bluish violet."

Paratypes (all El Oro, Ecuador): R. Espinosa 1734 (NY), from Cerro Gordo (Zaruma), elev. 1250 m, 13 Aug. 1947 ("Corola

violeta"); J. A. Steyermark 53825 (F, NY), from between Pampa de los Cedros northeast of San Pablo and Curtincapa, elev. 2285-2430 m, 12 Aug. 1943 ("Shrub 5-8 feet tall; petals purple"); Harling & Andersson 14174 (GB, US), from between Huertas and Palto on road to Paccha, elev. 1300-1400 m, 2 May 1974 ("Shrub ca. 1 m. Corolla violet").

The suggested relative, known only from southern Colombia and northern Ecuador, has the branchlet nodes densely setose with fine hairs 3-4 mm long and young internodes densely villose, large stamen connectives prolonged only 1 mm, and a glabrous style, but similar dimorphic hairs on the upper leaf surfaces. In stamens (but not the foliar pubescence nor glabrous hypanthia), T. oroensis Gleason is like T. anderssonii. The general aspect of T. anderssonii is like that of T. geitneriana (Schl.) Cogn. and T. longisepala Cogn., both of which have all the upper leaf surface hairs with adnate bases, completely smooth hairs on the branchlets and hypanthia, and glabrous styles; T. arthrostemmoides Cogn. (André 3339 and André s. n., K) has sparsely strigulose upper and lower leaf surfaces (the upper surface hairs all adnate), cauline pubescence more obviously barbellate, and a glabrous style. Two collections from near Zaruma (Espinosa E-1887 and E-2083) generally resemble material of T. anderssonii (apparently similar stamens) but with much sparser cauline, foliar, and hypanthial pubescence, and glabrous styles; the material is inadequate for further evaluation at present.

ACIOTIS ASPLUNDII Wurdack, sp. nov.

A. levyanae Cogn. affinis, foliis 7-nervatis calycis dentibus longioribus petalis extus sparse glanduloso-setulosis differt.

Ramuli alato-tetragoni (alis ca. 0.7-1.2 mm latis) sicut folia modice setosi pilis gracilibus laxis saepissime eglandulosis 1-2(-2.5) mm longis persistentibus. Petioli (1-)1.5-2.5 (-3.5) cm longi bialati 0.5-1 mm; lamina 5-9 X 3-5 cm ovata apice paulo (ca. 0.5 cm) gradatimque acuminato basi 0.2-0.5 cm cordulata, membranacea et densiuscule ciliolato-serrulata, 7-nervata. Panicula 10-20 cm longa multiflora vel submultiflora, ramis ramulis bracteolis hypanthiis sepalisque sparsiuscule vel modice setulosis pilis gracillimis plerumque glanduliferis 0.4-1 mm longis; bracteolae ca. 1 X 0.3-0.5 mm lanceatae persistentes, pedicellis 0.3-0.4 mm longis. Hypanthium (ad torum) 2.3-2.8 mm longum obscure alatum; calycis tubus 0.2-0.3 mm longus, lobis 1.1-1.5 mm longis. Petala 4-5 X 1.6-1.9 mm lanceato-oblonga acuminata setula glandulifera 0.7-1 mm longa terminata extus sparse glanduloso-setulosa intus glabra. Stamina in dimensionibus paulo dimorphica glabra; filamenta 2.3-2.5 vel 2-2.3 mm longa; antherarum thecae 1.9-2 vel 1.5-1.6 X 0.2-0.25 X 0.25-0.35 mm oblongae poro 0.1-0.15 mm diam.; connectivum 0.2-0.3 mm prolongatum. Stigma non vel paullulo expansum; stylus 3.5-4.5 X 0.1-0.15 mm glaber; ovarium biloculare glabrum.

Type Collection: E. Asplund 20105 (holotype S), collected at Shell Mera, Prov. Pastaza, Ecuador, elev. ca. 900 m,

3 April 1956. "Herb to 1 m, petals white, anthers reddish violet."

Paratypes (all Ecuador): Pastaza: Asplund 8546 (S), Río Zuñag-Chashurco, elev. 1250 m, 25 Aug. 1939; Fagerlind & Wibom 1113 (S) and 1143 (S), both from 8 km north of Puyo, 6 Nov. 1952; Skutch 4510 p.p. (US p. p.), near Puyo, elev. 750-1000 m, Sep. 1939; Asplund 18316 (S), Mera, elev. ca. 1100 m, 10 Nov. 1955; G. W. Prescott 451 (NY) and 903 (NY), both from near Puyo. Morona-Santiago: Sparre 19045 (S), Gualaquiza, elev. 700-800 m, 27 Sep. 1967.

Aciotis levyana, known in Ecuador from the western lowlands, has 3-5-nerved leaf blades, deltoid calyx lobes only ca. 0.4 mm long, and petals glabrous except for the terminal setula. Other relatives include A. aristellata Mgf. (with eglandular hypanthial hairs, 3-5-nerved leaf blades merely obtuse at the base, and shorter anthers with longer connective prolongation, but similar long calyx lobes), A. rubricaulis (DC.) Triana (with leaf blades obtuse to truncate at the base, calyx lobes only ca. 0.5 mm long, and anther connectives prolonged ca. 1 mm), and A. aristata Ule (with leaf blades broadly acute to truncate at the base, branchlets only narrowly winged 0.3-0.4 mm and rather sparsely setulose, broadly ovate calyx lobes 0.5-0.6 mm long, petals glabrous except for the terminal setula, and stamen connectives prolonged 0.7-1 mm). I am dubious as to the correct application of the name A. caulialata (R. & P.) Triana, not having studied the type; notes on the Gay specimen (P) cited by Cogniaux indicate gland-tipped foliar hairs, corolla glabrous except for the terminal glandular setula, and anther connective (dry) prolonged 0.5 mm. If Cogniaux' delimitation is correct, many (or most) of the recent Peruvian collections referred to A. caulialata should be placed rather in A. aristata; none of these recent specimens are conspecific with A. asplundii.

MERIANIA AMPLA Wurdack, sp. nov.

M. rigidae (Benth.) Triana affinis, foliis subtus secus venas primarias puberulis floribus maioribus differt.

Ramuli teretes sicut petioli foliorum superficies inflorescentia hypanthiaque primum modice furfuracei pilis granuloso-pinoideis ca. 0.1 mm longis mox deciduis; linea interpetiolaris non vel vix evoluta. Petioli 1-2(-2.5) cm longi; lamina 7.5-12(-20) X 4-6(-13) cm elliptica apice plerumque rotundato basi late acuta vel anguste obtusa, coriacea et integra, subtus secus venas primarias persistenter pilis pinoideis 0.2-0.3 mm longis induta, 7-nervata (pari inframarginali paulo tenui incluso) vel paulo (usque ad 0.5 cm) pseudoplinervata nervis secundariis principalibus plerumque 1.5-2 mm inter se distantibus nervulis ubique paulo elevatis reticulatis (areolis 0.2-0.3 mm latis). Panicula 12-17 cm longa pauciflora; flores 5-meri, pedicellis 6-11 mm longis crassis, bracteolis non visis. Hypanthium (ad torum) 9.5 mm longum; calyx 4.5-4.8 mm longum paullulo (0.3 mm) 5-undulatum, dentibus exterioribus essentialiter obsoletis. Petala 26-40 X 26-28 mm asymmetrice obovata glabra. Stamina in

dimensionibus paulo dimorphica glabra; filamenta 14.5-15.5 mm longa; antherarum thecae 10-11 vel 9 X 2 mm subulatae declinatae poro 0.4 mm diam. dorsaliter inclinato, cornu basali 5 mm longa acuto, connectivo dorsaliter ad thecae basim paulo elevato sed dente ascendenti obscuro. Stigma non expansum; stylus 15.5 X 1 mm glaber in ovarii cono ca. 1 mm immersus; ovarium 5-loculare, apice dentibus hebetibus ca. 0.4 mm lobulato.

Type Collection: J. A. Steyermark 53507 (holotype F 1263825; isotypes F, NY), collected on densely forested moist slopes above and bordering Río Tintas southeast of El Pan, Prov. Morona-Santiago, Ecuador, elev. 2860-2985 m, 11 July 1943. "Tree 50-60 feet tall; trunk up to 2 feet diam.; petals deep rose; filaments lavender or pink; anthers creamy white with lavender appendages; style and ovary rose-red."

Paratype: M. Acosta Solís 5014 (F), from "selva humeda de Campanas al E. de El Pan, Cordillera Oriental," Morona-Santiago, Ecuador, elev. 2500-2800 m, 16 July 1943. "Arbol de hermosas flores púrpureas o rojo cardenal, tronco de 30 a 50 cm diam.; produce buena madera. Nomb. común: cebolleta."

Meriania rigida has glabrous (and usually relatively broader, length/width ratio 1.2-1.5 rather than 2-2.1) leaf blades and calyx (above torus) only 2-2.5 mm long, but a similar ovary apex. Another close relative, M. pastazana Wurdack, has glabrous 5-nerved leaf blades and ovary apex barely (0.3-0.4 mm) prolonged around the style base. More distantly related is M. maxima Markgraf, with leaf venules beneath laxly reticulate, somewhat larger flowers, an obvious ascending dorsal tooth on the anther connective, and the ovary apex barely prolonged around the style base.

MERIANIA TOMENTOSA (Cogn.) Wurdack, comb. nov.

Centronia tomentosa Cogn., Bull. Acad. Belg. ser. 3, 14: 943. 1887.

Taxonomic synonyms of M. tomentosa include Centronia excelsa (Bonpl.) Triana (the epithet not available in Meriania) and C. tungurahuae Blake. The anther pore in M. tomentosa is on the same side as the connective appendage, the thecae showing the pseudo-inversion noted by Triana (Trans. Linn. Soc. Bot. 28: 165. 1871). The petal color and stamen structure are like that of several other species now placed in Meriania. From the stamen structure, several other species currently placed in Centronia are not congeneric with C. laurifolia D. Don, C. reticulata Triana, C. vaupesana Wurdack, and C. neblinae Wurdack, but the adjustments are the province of a tribal monographer.

MERIANIA ACOSTAE Wurdack, sp. nov.

In systemate Cogniauxii M. arboreae (Naud.) Triana affinis, foliis maioribus 7-9-nervatis subtus in superficie glabratis, calycis dentibus exterioribus minus eminentibus differt.

Ramuli robusti obtuse sulcato-quadrangulares sicut petioli indumento appresso subpinoideo (interdum apicibus attenuatis ca.

0.2 mm longis) dense induti; linea interpetiolaris ca. 0.5 mm alta evoluta. Petioli 7-11 cm longi adaxialiter apicem versus sicut laminarum subtus venae primariae strigosi pilis gracillimis 0.5-1(-3) mm longis; lamina ca. 30 X 23-30 cm ovata apice paulo hebeti-acuminato basi 1-2 cm cordata, firme membranacea et serrulata (dentibus irregularibus 1-3 mm altis), supra ut videtur paulo reticulato-rugosa glabra, subtus in superficie primum pinoideo-puberula pilis ca. 0.2 mm longis deciduis in venis venulisque pilis crispulis subpinoideis 0.2-0.5 mm longis modice induta, (7-)9-nervata nervis secundariis principalibus 5-8 mm inter se distantibus nervis tertiariis subtus paulo elevatis nervulis planis areolis 1-2 mm latis. Panicula ca. 27 X 16 cm submultiflora; flores 5-meri, pedicellis 15-21 mm longis sicut hypanthiis dense strigulosis pilis gracillimis 0.5-1 mm longis ad basim granuloso-expansis. Hypanthium (ad torum) 7 mm longum obscure 10-costatum; calyx ca. 8 mm longus ad anthesim usque ad ca. 4 mm supra torum 5-divisus, dentibus exterioribus crassis 1-1.5 mm eminentibus. Petala glabra 21-30 X 18-23 mm late obovata apice truncato-rotundato. Stamina dimorphica glabra; filamenta 11 mm longa; antherarum thecae 10 X 1.5 mm vel 9 X 1.1 mm subulatae, poro 0.3 mm diam. dorsaliter inclinato; connectiva ad basim paullulo (0.1-0.3 mm) prolongata, dorsaliter in staminibus maioribus dente hebeti (apice lobulato) 2.5 X 1 mm et appendice ascendenti hebeti ca. 1 mm libera in staminibus minoribus dente hebeti (apice paullulo emarginato-lobulato) ca. 2 X 1.8 mm et appendice ascendenti ca. 0.3 mm libera ornata. Stigma non expansum; stylus 17 X 0.7-1 mm glaber in ovarii apicem ca. 0.7 mm immersus; ovarium 5-loculare glabrum apice hebeti-lobulato.

Type Collection: M. Acosta Solís 5809 (holotype F 1240482), collected at Saloya on the western descent of the Cordillera Occidental, Prov. Pichincha, Ecuador, elev. 1800 m, 9 Sep 1943. "Melastomacea de grandes arboles; hojas grandes; flores grandes y de un hermoso color lila, caliz cafe pardo."

Paratype: Sodiro Add. 3 (BR; sterile), from near Nanegal, Pichincha, Ecuador, August 1902.

Meriania arborea has 5-nerved leaf blades 9-14 X 5-8 cm with a dense persistent indument beneath, as well as external calyx teeth projecting 4-10 mm; a recent collection of this Colombian species is Cuatrecasas 23313, from above Peñas Blancas, Caldas, elev. 3000 m. The branchlet details for M. acostae are taken from the Sodiro collection (whose identity seems certain).

MERIANIA DENTICULATA (Gleason) Wurdack, comb. nov.

Calyptrella denticulata Gleason, Phytologia 2: 300. 1947.

Graffenrieda denticulata (Gleason) L. Wms., Fieldiana Bot. 29: 563. 1963.

MERIANIA ACIDA (Markgraf) Wurdack, comb. nov.

Graffenrieda acida Markgraf, Notizbl. Bot. Gart. Berl. 13: 462. 1938.

As previously indicated (Phytologia 9: 413. 1964), these two species are very closely related, M. denticulata being the

most reduced in floral features of the species-group treated by Gleason (Phytologia 2: 295-298. 1947), with the addition of M. arborea (Naud.) Triana, M. costata Wurdack, M. dimorphanthera Wurdack, M. stellata (Gleason) Wurdack (vide infra), M. tuberculata Triana (probably), M. vargasii Wurdack, M. versicolor Uribe (perhaps synonymous with M. dimorphanthera), and M. vilcabambensis Wurdack. Possibly Graffenrieda phoenicea Markgraf belongs in this alliance; however, no recent collections agreeing with the described feature combination (basally subcordate and apically acuminate leaf blades, petals only 6 X 4 mm, anther calcar acute and 2 mm long, ovary pubescent) have been seen; the only Oriente (Ecuador) material approaching these features (Grubb, Lloyd, Pennington, & Whitmore 1093, Borja near Antisana, Puyo) but with larger petals (9.5-9.7 X 7-8 mm), very short anther connective spurs, and a glabrous ovary, seems better placed as a variant of M. denticulata with less attenuate bases of the leaf blades.

MERIANIA FURVANTHERA Wurdack, sp. nov.

M. acidae (Markgraf) Wurdack affinis, foliis minoribus floribus maioribus differt.

Ramuli primum obtuse sulcato-quadrangulati demum teretes sicut petioli foliorum venae primariae subtus inflorescentia hypanthiaque dense pilis pinoideo-stellulatis appressis interdum (in ramulis foliorum venis primariis subtus petiolisque) ad apicem ca. 0.3-0.5 mm setuloso-protractis induti. Petioli 1-1.7 cm longi; lamina 4-7 X 2-3 cm elliptica apice hebeti-acuto basi acuta, coriacea et distincte undulato-serrulata, supra glabra et plana, subtus in superficie sparsiuscule pilis stellulato-pinoideis appressis 0.1-0.15 mm diam. induta, breviter (0.3-0.4 cm) 5-plinervata nervis secundariis ca. 2 mm inter se distantibus supra obscuris nervulis subtus non vel paullulo evolutis laxis. Inflorescentia ca. 6-flora pedunculo ca. 0.5 cm longo; flores 5-meri, pedicellis 9-10 mm longis. Hypanthium (ad torum) 6-6.5 mm longum teres; calyx ut videtur in alabastris clausus ca. 3.5 mm longus ad anthesim in lobis ovatis obtusis ca. 2.5 mm longis dehiscens, dentibus exterioribus paulo evolutis ca. 0.5 mm longis crassis non eminentibus. Petala glabra 21-22.5 X 16-19 mm obovata apice asymmetrice rotundato-truncato. Stamina paulo dimorphica glabra; filamenta 7.5-9 mm longa; antherarum thecae 8.2-9 X 1.2 X 1.5 mm vel 7 X 1 X 1.2 mm oblongo-subulatae, poro 0.2 mm diam. dorsaliter inclinato; connectivum 1.2-1.7 mm prolongatum, appendice dorsali 1.5 vel 1 mm longa hebeti ad apicem minute lobulata. Stigma non expansum; stylus 21.5 X 1.5-0.8 mm glaber; ovarium 5-loculare glabrum apice paullulo (0.3-0.4 mm) hebeti-lobulato.

Type Collection: G. Harling & L. Andersson 13506 (holotype GB; isotype US), collected in low mountain rain forest on Loja-Zamora road near the Zamora-Chinchipe boundary, Prov. Loja, Ecuador, elev. 2600-2800 m, 13 April 1974. "Shrub 1.5 m. Corolla rose-red. Anthers blackish violet."

Meriania acida has leaf blades mostly 10-18 X 5-9 cm,

petals 11.5-14 X 11-16 mm, and the blunt dorsal tooth on the connective only 0.3-0.4 mm long. Meriania denticulata (Gleason) Wurdack also has larger leaves and smaller flowers, while both M. stellata (Gleason) Wurdack and M. loxensis Gleason have prominently emergent external calyx teeth as well as vegetative differences. Sympatric with M. furvanthera on the Loja-Zamora road near the cordillera crest are at least M. costata Wurdack, M. maguirei Wurdack, and M. rigida (Benth.) Triana, as well as perhaps other species collected in less well-defined areas east of Loja.

MERIANIA STELLATA (Gleason) Wurdack, comb. nov.

Calyptrella stellata Gleason, Phytologia 2: 428. 1948.

Graffenrieda stellata (Gleason) L. Wms., Fieldiana Bot. 29: 564. 1963.

This Ecuadorian species diverges in a somewhat different direction than M. denticulata (Gleason) Wurdack from M. acida (Markgraf) Wurdack, having much denser pubescence completely covering the lower leaf surfaces, more abundant hairs with protracted apices on the hypanthium, external calyx teeth projecting ca. 2.5 mm (rather than less than 1 mm), and longer large anthers (ca. 10 mm, rather than 6-6.5 mm). Meriania stellata has been compared with type material of M. acida, as well as two recent Cajamarca collections (Rauh P2202 and Hutchison 6393, both from near Hacienda Taulis) of the Peruvian species.

MERIANIA CUNEIFOLIA Gleason subsp. SUBANDINA Wurdack, subsp. nov.

Foliis maioribus (laminis 15-23 X 5-10 cm) subtus minus pubescentibus staminibus paullulo inaequalibus differt.

Type Collection: H. Lugo 143 (holotype GB; isotype US), collected at Mera, Prov. Pastaza, Ecuador, 27 Aug. 1968. "Tree 8-9 m high. Corolla tomato red, stamens black."

The typical subspecies, known from 2000-2500 m in Morona-Santiago and Loja, has thicker leaf blades 10-13 X 2.5-4.5 cm with lower surface hairs ca. 0.2 mm (rather than 0.5 mm or more) apart (the surface thus nearly completely obscured) and the anthers of the large stamens about twice as long as those of the small ones (rather than ca. 1/3 longer).

GRAFFENRIEDA HARLINGII Wurdack, sp. nov.

G. fantasticae Schultes & Smith affinis, foliis subtus in venarum primariarum axillis non barbatis inflorescentiarum capitulis prominenter bracteatis differt.

Ramuli teretes paulo robusti primum sicut folia novella inflorescentia bracteae hypanthiaque obscure granulosi mox glabrati; linea interpetiolaris gracilis paulo evoluta. Petioli 1-1.5 cm longi; lamina (5-)6-10 X 3.5-6 cm elliptica vel ovato-elliptica apice rotundato-obtuso basi obtusa et paullulo (ca. 0.3 cm) decurrenti, rigida et integra, 5-nervata (pari exteriore tenui incluso) nervis secundariis ca. 4-5 mm inter se distantibus nervulis obsoletis. Panicula 12-13 cm longa multiflora; flores 4-meri subsessiles (pedicellis crassis 0.2-0.4 mm longis)

ad ramulorum apices glomerati (floribus ca. 6-10 in quoque glomerulo), bracteis orbiculari-ovatis ca. 4.5 X 4 mm subpersistentibus. Hypanthium 3 mm longum teres; calyx in alabastris clausus ca. 1.6-1.8 mm longus ad anthesim in lobis ovatis 1.3-1.4 mm longis fissus. Petala glabra 4.8-5 X 3-3.4 mm elliptico-obovata apice late obtuso vel rotundato. Stamina isomorphica glabra; filamenta 3.3-3.5 mm longa; antherarum thecae 3.5-3.6 X 0.7 X 0.9 mm oblongo-subulatae poro 0.2 mm diam. paulo ventraliter inclinato; connectivum vix (0.2-0.3 mm) prolongatum, dente dorsali 0.7 mm longo acuto. Stigma punctiforme; stylus 8.2-9 X 0.4-0.1 mm glaber; ovarium 3-4-loculare apice paullulo (0.3 mm) emarginato glabro vel obscure resinoso-granuloso.

Type Collection: G. Harling & L. Andersson 13534 (holotype GB; isotype US), collected in low mountain rain forest on the Loja-Zamora road near the Zamora-Chinchipe border, Prov. Loja, Ecuador, elev. 2600-2800 m, 13 April 1974. "Shrub ca. 3 m high. Corolla white."

Graffenrieda fantastica has the inner leaf vein axils barbellate with fine hairs and the interrupted-verticillate flower clusters without prominent bracts. Other relatives perhaps include G. trichanthera Gleason (with relatively much narrower leaf blades, flowers interrupted-verticillate on the branches, thinner calyx lobes, smaller petals, and somewhat larger anthers with a setulose connective tooth), and G. emarginata (R. & P.) Triana (with larger 7-nerved cordate leaf blades and smaller flowers). Of seven dissected ovaries in G. harlingii, 4 were 4-celled and 3 were 3-celled.

AXINAEA SODIROI Wurdack, sp. nov.

A. tomentosae Cogn. affinis, foliorum laminis ad basim rotundatis vel paulo cordatis subtus minus pubescentibus hypanthiis glabris antheris maioribus differt.

Ramuli primum obtuse quadrangulati demum teretes sicut petioli foliorum venae primariae subtus inflorescentiaque modice caduceque pilis pinoideis 0.2-0.5 mm longis setulosi; linea interpetiolaris obscure evoluta ca. 0.1-0.2 mm elevata. Petioli 2-3(-11) cm longi; scutum crassum 1.5-3 mm elevatum evolutum; lamina 11-18(-28) X (6-)9-14(-25) cm elliptico-ovata apice rotundato vel hebeti-obtuso basi 0.5-1(-2.5) cm cordata, coriacea et distanter undulato-serrulata, supra glabra, subtus in superficie sparsiuscule setulosa pilis pinoideis ca. 0.3 mm longis, 5(-7)-nervata nervis secundariis ca. 5 mm inter se distantibus nervulis supra obscure elevatis subtus paulo elevato-reticulatis areolis 0.7-1 mm latis. Panicula 15-24 cm longa multiflora ut videtur nutans; flores 5-meri, pedicellis 7-10 mm longis. Hypanthium (ad torum) 5 mm longum basim versus paulo pinoideo-puberulum alioqui glabrum; calyx 1.5 mm longum truncatum, dentibus exterioribus obscuris. Petala glabra 15-17 X 9-10 mm obovato-oblonga apice asymmetrice rotundato. Stamina paulo dimorphica glabra; filamenta 10.5 vel 7-7.3 mm longa; antherarum thecae 13 vel 10 X 1 mm subulatae, poro 0.2 mm diam. dorsaliter

inclinato; connectivum non prolongatum, appendice inflata 3.8-4 X 2.5 X 3.2 mm vel 3.5 X 2.5 X 2.8 mm. Stigma non expansum; stylus 15 X 1.2-0.7 mm glaber in ovarii collo ca. 1 mm immersus; ovarium 5-loculare, apice hebeti-lobulato.

Type Collection: A. Sodiro s. n. (holotype BR, 2 sheets; isotype P), collected "in silv. occ. suband. m. Pich.", Prov. Pichincha, Ecuador, August 1905. "Arbor 6-8 metr. Coma patula floribunda spectabilis."

Paratype: Sodiro Add. 1 (BR), from "silv. subtrop. v. Gualea," Pichincha, Ecuador. "Arbusc.-flor. ignoti."

Axinaea tomentosa has leaf blades broadly acute to obtuse and beneath persistently dense-setulose, hypanthia densely setulose, and anther thecae only 8 or 6 mm long. Cogniaux had suggested on the type collection of A. sodiroi that A. crassinoda Triana might be the closest relative; however, that species has well-developed branchlet node flaps as well as 4-merous flowers. Axinaea weberbaueri Cogn. and A. tovarii Wurdack, both with relatively narrower leaves and small anther thecae, are more distant relatives of A. sodiroi. The Gualea specimen, while sterile and with large markedly cordate leaves, has the same pubescence as the type collection.

TRIOLENA PILEOIDES (Triana) Wurdack, comb. nov.

Diolena pileoides Triana, Trans. Linn. Soc. Bot. 28: 81. 1871.

The species has been twice collected in Prov. Napo, Ecuador (Jameson 772, Holm-Nielsen & Jeppesen 775).

TRIOLENA PILEOIDES (Triana) Wurdack subsp. PANAMENSIS Wurdack, subsp. nov.

Inflorescentia evoluta fructifera usque ad 4 cm longa, floribus 3-5(-8).

Type Collection: R. L. Dressler 5035 (holotype US 2776819), collected along the first branch of the Río Santa Maria about 8 km west of Santa Fé, Prov. Veraguas, Panamá, elev. ca. 650 m, 18 May 1975. "On mossy wet rocks and tree trunks near stream; buds white and pink; leaves pink when in sun."

Paratype: S. Mori & J. Kallunki 5340 (MO, US), from northwest of Santa Fé 2.7 km from Escuela Agricola Alto de Piedra on road to Calovebora, Veraguas, Panamá, 30 Mar. 1975. "Abundant on rocks along stream. Petals white, tinged with pink."

The typical subspecies, well represented from Colombia (Valle, Nariño) and Ecuador (vide supra) consistently shows solitary flowers, although Triana's description cited them as "subsolitary." Both subspecies have two types of gland-tipped hairs, the more abundant trichomes with glands only ca. 0.03 mm long, the other with glandular heads ca. 0.1 mm long; in the Panamanian population, the larger hairs are developed on the pedicels as well as the toral region while the South American subspecies does not have the larger glands on the pedicel pubescence.

TRIOLENA ASPLUNDII Wurdack, sp. nov.

T. dressleri Wurdack et T. pustulatae Triana in foliis supra pustulato-setulosis similis, foliis in quoque pari valde dimorphicis differt.

Caulis sublignosus 12-30 cm longus ad basim radicans sicut laminarum venae primariae subtus petiolique dense pilis subappressis gracilibus 1-2(-2.5) mm longis inconspicue caduceque glanduliferis armatus. Folia in quoque pari valde inaequalia (3.5-7:1) membranacea irregulariter serrulata (dentibus 0.5-1.5 mm profundis), anguste ovata, supra modice pustulato-setulosa (setulis gracilibus ca. 1 mm longis p. p. glanduliferis glandulis mox deciduis), subtus paulo foveolata et in venis secundariis tertiariisque sparsiuscule appresso-setulosa. Folia maiora: petioli 0.7-1.6 cm longi; lamina 6-10.5 X 2.5-4.5 cm apice gradatim hebeti-acuminato basi obtusa et valde (0.5-1.5 cm) asymmetrica, breviter 5-7-plinervata. Folia minora: petioli 0.1-0.2 cm longi; lamina 1-2.4 X 0.5-1.3 cm apice hebeti-acuto basi rotundata vel subcordata 3(-5)-nervata. Flores ignoti. Inflorescentia 3-5 cm longa plerumque 3-5-fructifera, axe sicut pedicellis hypanthiisque sparsiuscule graciliterque setuloso, pedicellis ca. 2-3 mm longis; fructus unilateraliter dispositi ca. 4 X 5-6 mm triquetri; capsula 3-locularis, seminibus 0.5 X 0.3 mm obscure tuberculatis.

Type Collection: E. Asplund 19308 (holotype S), collected in forest about 2 km east of Puyo, Prov. Pastaza, Ecuador, elev. ca. 900 m, 9 Feb. 1956.

Paratypes (both Pastaza, Ecuador): Asplund 20104 (S), from Shell Mera, elev. ca. 900 m, 3 April 1956 ("Leaves red beneath"); G. W. Prescott 402 (NY), from Puyo, 16 Feb. 1953.

None of the other known species of Triolena with strongly dimorphic foliage has the leaves pustulate above. Until flowers are known, speculation on the exact species relationship is futile, at least for me.

MICONIA HETEROMERA Naud.

Clidemia simulans Macbride, Field Mus. Publ. Bot. 13(4): 494. 1941.

Stork & Horton 9516 (K) conforms in all ways, including predominantly 6-merous flowers, to recent near-topotypical (Tocache Nuevo, J. Schunke 3659 and 7430) and Huánuco (Croat 21188, Schunke 5159) collections of M. heteromera.

MICONIA SCLEROPHYLLA Triana

The holotype (K) quite conforms with many recent collections from the Brazilian Planalto (Minas Gerais: Anderson et al 8477, 8661, 35365; Heringer 7304; Irwin et al 20156, 21844, 22490, 28182, 28974; Maguire et al 44610, 44766; Mexia 5769. Distrito Federal: Irwin et al 26633. Mato Grosso: Hatschbach et al 36515). The country of origin of the type collection sent to Kew was suspected by Bentham to be Peru, the collector Pavón; however, it seems certain (possibly confirmable by searching at Oxford) that the collector was Luschnath, Claussen, Pohl, Riedel,

or another of the Brazilian collectors represented in the Fielding Herbarium. The flowers are 4-merous, although Cogniaux (who did not see, or at least did not annotate, the Kew specimen) keyed M. sclerophylla with the 5-merous species of Sect. Glossocentrum. A very close relative is M. corallina Spring, which has quite flexuous (rather than rigid) arms on the pinoid-stellate hairs of the lower leaf surfaces (thus a cobwebby aspect under low magnification), calyx lobes strigillose within (rather than glabrous), torus within setulose with barbellate hairs (rather than glabrous), and inflorescence branches with longer pubescence (the hypanthia thus appearing partly immersed).

MICONIA WARMINGIANA Cogn.

The species was described as with 5-merous flowers, but this feature is contradicted in the Flora Brasiliensis plate. The Paris isotype of M. warmingiana, as well as Glaziou 21393 and Irwin, Harley, & Onishi 30284 (base of Serra de Piedade on road to Caete, Minas Gerais), all show 4-merous flowers. Perhaps the closest relative is M. corallina (vide supra), both species having similar calyx and torus pubescence within. Miconia corallina differs from M. warmingiana in the much thicker and relatively broader entire leaf blades which have cordate bases and rufous (rather than cinereous) pubescence beneath, as well as the thicker inflorescence branchlets.

CLIDEMIA BARBATA Triana

Clidemia rigida Cogn. & Gleason ex Gleason, Am. Journ. Bot. 19: 750. 1932.

The holotypes (Triana 4108, Quindio, BM; Lehmann 6132, above Cali, US) have been compared and certainly represent the same Colombian taxon. A recent collection is Huertas & Camargo 5331 (COL, US), from along the road to Buenaventura 15 km from Cali, Valle, elev. 1500 m. A few of the cauline, petiolar, and hypanthial hairs are gland-tipped.

CLIDEMIA VERRUCULOSA Wurdack, sp. nov.

Sect. Sagraea. In systemate Cogniauxii C. francavillanae Cogn. et C. attenuatae (Naud.) Cogn. affinis, foliis basaliter nervatis corollis subapicaliter dente setuloso armatis differt.

Ramuli teretes sicut foliorum venae primariae subtus petiolique dense incurvo-setosi (pilis 2-3 mm longis laevibus gracilibus) pilis pinoideis ca. 0.1-0.2 mm longis sparse et glandulis minutis 0.05 mm longis modice intermixtis. Petioli 1-2 cm longi; lamina (6-)11-21 X (2.5-)4-8.5 cm, elliptica apice breviter gradatimque hebeti-acuminato basi acuta, firme membranacea et crenulato-denticulata, supra dense bullato-setulosa, subtus foveolata et in venis secundariis tertiariisque modice longo-setulosa in venulis superficieque glabra, 5-nervata (pari inframarginali debili neglecto) nervulis subtus planis obscuris areolis 0.2-0.3 mm latis. Flores 4-meri in foliorum superiorum axillis multiglomerati subsessiles (pedicellis obscuris 0.1-

0.2 mm longis), bracteolis ca. 1 X 1 mm oblongis persistentibus ob pilos occultis. Hypanthium (ad torum) 2.2-2.7 mm longum modice appresso-setosum pilis ca. 1(-2) mm longis laevibus eglandulosis; calycis tubus 0.1-0.2 mm longus, lobis interioribus 0.3-0.4 mm longis ovatis, dentibus exterioribus setulosis 0.1-0.3 mm eminentibus; torus intus glaber. Petala 3 X 0.9-1.1 mm oblonga extus subapicaliter dente 1-3-setuloso armata alioqui glabra. Stamina glabra; filamenta 3.5-4.5 mm longa; antherarum thecae 2.3-2.6 X 0.25 mm anguste oblongae, poro terminali 0.15-0.2 mm diam.; connectivum ad basim non vel paullulo (0.1-0.2 mm) prolongatum non appendiculatum. Stigma vix expansum 0.3 mm diam.; stylus 8 X 0.25 mm glaber in ovarii collo 0.3 mm immersus; ovarium 3(-4)-loculare omnino inferum collo sparse setuloso.

Type Collection: José Schunke Vigo 6786 (holotype US 2751859; isotype MO), collected in high forest on right bank of Río Mishollo along road to Santa Rosa, Dto. Tocache Nuevo, Prov. Mariscal Cáceres, Depto. San Martín, Peru, elev. 350-370 m, 9 Aug. 1973. "Arbusto 2-3 m. Lo tallo jóvenes tienen pelos de color pardo. Hojas rugosas de color verde intenso. Flores pale orange yellow; estambres blancos."

Both C. francavillana and C. attenuata have 5-7-plinerved leaf blades with relatively longer petioles and essentially plane upper surfaces, as well as glabrous petals. Clidemia heteronervis (Naud.) Wurdack and its allies do not seem as closely related to C. verruculosa as perhaps C. debilis Crueg. and C. rubra (Aubl.) Mart., having shorter pubescence and markedly plinerved leaf blades. Descriptions of the critical features of all these species except C. francavillana have been earlier published by me.

CLIDEMIA DISCOLOR (Triana) Cogn., DC. Mon. Phan. 7: 1025. 1891.

Sagraea discolor Triana, Trans. Linn. Soc. Bot. 28: 139. 1871.

Clidemia purpureoviolacea Cogn., Bull. Acad. Soc. Belg. 30(1): 263. 1891.

The Triana holotype (BM) agrees in salient features with recent collections from Central America (Costa Rica, Panama), Colombia (Santander, Antioquia, Chocó, Valle, Nariño), and Ecuador (Esmeraldas, Pichincha); the original description of leaf blades attenuate at the base is misleading, the type showing young leaves basally obtuse but mature ones rounded. Synonymy of C. crotonifolia Pilger and C. cordata Cogn. is probable; types have not been studied and certainly recent Peruvian collections in San Martín and Amazonas are referable to C. discolor, but material from southeastern Peru and Bolivia differs in the sparsely ciliolate external calyx teeth (with other floral features not now discernible). Throughout most of the range of the complex, occasional collections show capitate-agglomerate inflorescences with variable "peduncle" length; I believe these inflorescences are diseased or resulting from arthropod injury and that (ex char. and photo) C. urticoides

Pilger will prove synonymous with C. discolor.

CLIDEMIA OSTRINA Gleason, Phytologia 1: 46. 1933.
Clidemia ramiflora Gleason, Brittonia 2: 323. 1937.
The affinity mentioned by Gleason is certainly true; however, all the collections show similar petals (sporadically with 1-2 setulae ca. 0.1 mm long) and 4-celled anthers with essentially glabrous connectives. Clidemia ostrina is closely related to C. discolor (without reliable vegetative distinctions), but differs in the not or barely emergent calyx teeth (rather than 0.7-2 mm protruding) and 2-celled (rather than 4-celled) ovaries. The species is known from Costa Rica (a recent collection being Davidse & Pohl 1193, from Maravia de Churipó, Cartago, 1125 m), Venezuela, Colombia (Boyaca, Antioquia), and Ecuador (Morona-Santiago). I am uncertain as to the correct disposition of C. ramiflora var. colombiana Gleason (described without sepals, petals, and stamens known), but phytogeographically believe it to be referable to C. discolor; certainly Haught 4945, placed by Gleason in C. ramiflora var. colombiana is better accomodated in C. discolor. In both C. ostrina and C. discolor, the size of the inflorescences is too variable for taxonomic utility.

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NOTES ON NEW AND NOTEWORTHY PLANTS. XCIV

Harold N. Moldenke

AVICENNIA SCHAUERIANA f. CANDICANS Moldenke, f. nov.

Haec forma a forma typica speciei recedit laminis foliorum subtus plusminusve densissime canescenti-puberulis.

This form differs from the typical form of the species in having the lower surface of its leaf-blades more or less very densely canescent-puberulent or farinaceous.

The type of the form was collected by Alma L. Moldenke and Harold N. Moldenke (no. 19606) in the mangrove formation at Manguinhos, Rio de Janeiro, Guanabara, Brazil, on September 16, 1948, and is deposited in the Britton Herbarium at the New York Botanical Garden.

ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXV

Harold N. Moldenke

LACHNOCAULON Kunth

It should be noted here that Stapf (1930) regards "1906" as the proper date of publication for the Pilger (1908) work cited in the bibliography of this genus, although the United States Library of Congress catalogue card for the work retains the 1908 title-page date.

Macbride (1931) feels that Lachnocaulon, along with Syngonanthus, Blastocaulon, and Philodice, should be united with Paepalanthus as a single genus. In my opinion, Paepalanthus is large and cumbersome enough already, with its many disparate elements, without adding more!

LACHNOCAULON ANCEPS (Walt.) Morong

Additional bibliography: Holm, Bot. Gaz. 31: 18 & 33. 1901; Gleason, New Britt. & Br. Illustr. Fl., imp. 1, 1: 372, 374, & 480 (1952), imp. 1, 3: 568, 574, & 582 (1952), imp. 2, 1: 372, 374, & 480 (1958), imp. 2, 3: 568, 574, & 582 (1958), imp. 3, 1: 372, 374, & 480 (1963), and imp. 3, 3: 568, 574, & 582. 1963; G. W. Thomas, Tex. Pl. Ecolog. Summ. 32. 1969; Hocking, Excerpt. Bot. A.26: 89 & 90. 1975; Moldenke, Phytologia 33: 20—21. 1976.

Additional illustrations: Gleason, New Britt. & Br. Illustr. Fl., imp. 1, 1: 373 (1952), imp. 2, 1: 373 (1958), and imp. 3, 1: 373. 1963.

D'Arcy describes the flower-heads of this species as "chalky gray-white" and found the species to be "frequent" in Alachua County, Florida. Correll found it growing "in clumps" on savannas, flowering in May. Thomas (1969) calls it the "whitehead bogbutton".

Additional citations: FLORIDA: Alachua Co.: D'Arcy 1602 (Sd—86665). TEXAS: Tyler Co.: D. S. Correll 37248 (Sd—73934).

LACHNOCAULON FLORIDANUM Small

Additional bibliography: Moldenke, Phytologia 29: 286. 1974.

The Schallert 26274, distributed as L. floridanum, actually is L. minus (Chapm.) Small.

LACHNOCAULON MINUS (Chapm.) Small

Additional bibliography: Hocking, Excerpt. Bot. A.26: 89 & 90. 1975; Moldenke, Phytologia 33: 21. 1976.

This species quite generally inhabits wet places throughout its range. Material has been misidentified and distributed in some herbaria as L. floridanum Small.

Additional citations: FLORIDA: Seminole Co.: Schallert 26274 (Sd—72822).

LEIOTHRIX Ruhl.

Additional bibliography: Pilger in Engl. & Prantl, Nat. Pflanzenfam. Ergänz. 2, Nachtr. 3 zu 2: 37, 39, & 40. 1908; Hocking, Excerpt. Bot. A.26: 89 & 90. 1975; Moldenke, Phytologia 33: 21--24, 36, 186, 198, 202, 374, & 509 (1976) and 34: 256, 258, 275, 276, & 505. 1976; P. Morat, Adansonia, ser. 2, 15: 464 & 468. 1976.

It should be noted here that Stapf (1930) regards "1906" as the correct date of publication for the Pilger work (1908) cited above.

LEIOTHRIX AFFINIS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 29: 288. 1974; Hocking, Excerpt. Bot. A.26: 90. 1975.

LEIOTHRIX ARECHAVALETAE (Körn.) Ruhl.

Additional bibliography: Moldenke, Phytologia 33: 22. 1976; P. Morat, Adansonia, ser. 2, 15: 464. 1976.

LEIOTHRIX ARGYRODERMA Ruhl.

Additional bibliography: Moldenke, Phytologia 25: 96 (1972), 28: 439 (1974), and 29: 288. 1974.

Lindeman and Haas encountered this plant "in low vegetation on saddle of planalto", flowering and fruiting in April.

Additional citations: BRAZIL: Rio de Janeiro: Lindeman & Haas 5193 (Ld).

LEIOTHRIX CURVIFOLIA (Bong.) Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 89. 1975; Moldenke, Phytologia 33: 22. 1976.

LEIOTHRIX CURVIFOLIA var. GLABRESCENS Ruhl.

Additional bibliography: Moldenke, Phytologia 26: 44. 1973; Hocking, Excerpt. Bot. A.26: 89. 1975.

Occhioni affirms that the scapes of this plant are to 10 cm. long and the flower-heads white. He encountered the plant "in loco encharcado", flowering and fruiting in June.

Additional citations: BRAZIL: Minas Gerais: Occhioni 5095 [Herb. Fac. Nac. Farmac. 13197] (Z).

LEIOTHRIX CURVIFOLIA var. MICROPHYLLA Alv. Silv.

Additional bibliography: Moldenke, Phytologia 29: 288. 1974; Hocking, Excerpt. Bot. A.26: 89. 1975.

LEIOTHRIX DIELSII Ruhl.

Additional bibliography: Moldenke, Phytologia 29: 289 (1974), 33: 374 (1976), and 34: 258. 1976.

LEIOTHRIX DIELSII var. VILAVELHENSIS Moldenke, Phytologia 33: 374. 1976.

Bibliography: Moldenke, Phytologia 33: 374 (1976) and 34: 258. 1976.

Citations: BRAZIL: Espirito Santo: Araujo 377 [A. L. Peixoto 247; Herb. Jard. Bot. Rio Jan. 164991] (N—type).

LEIOTHRIX FULGIDA Ruhl.

Additional bibliography: Moldenke, Phytologia 26: 45. 1973; Hocking, Excerpt. Bot. A.26: 89. 1975.

LEIOTHRIX HIRSUTA (Wikstr.) Ruhl.

Additional bibliography: Moldenke, Phytologia 33: 23 (1976) and 34: 258. 1976; P. Morat, Adansonia, ser. 2, 15: 464. 1976.

Luna Peixoto describes this plant as "heliofila, crescendo em areia mais seca, capitula branco" and found it in flower and fruit in January. Occhioni found it in "local alagado", the flowers white, in June.

Additional citations: BRAZIL: Espirito Santo: Luna Peixoto 366 [Araujo & Peixoto 615; Herb. Jard. Bot. Rio Jan. 169708] (Ld). Rio de Janeiro: Occhioni 2289 [Herb. Fac. Nac. Farmac. 7990] (Ld).

LEIOTHRIX HIRSUTA var. BLANCHETIANA (Körn.) Ruhl.

Additional bibliography: Moldenke, Phytologia 33: 23. 1976; P. Morat, Adansonia, ser. 2, 15: 464. 1976.

LEIOTHRIX LUXURIANS (Körn.) Ruhl.

Additional synonymy: Syngonanthus luxurians (Körn.) Ruhl. ex Mendes Magalhães, Anais V Reun. Anual Soc. Bot. Bras. 236—237, 266—267, & 276—277. 1956.

Additional bibliography: Mendes Magalhães, Anais V Reun. Anual Soc. Bot. Bras. 236—237, 266—267, & 276—277. 1956; Moldenke, Phytologia 29: 291 (1974) and 34: 278. 1976.

Mendes Magalhães asserts (1956) that this species flowers from August to January.

LEIOTHRIX VIVIPARA (Bong.) Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 89 & 90. 1975; Moldenke, Phytologia 33: 24. 1976.

LEIOTHRIX VIVIPARA var. ANGUSTA Ruhl.

Additional bibliography: Moldenke, Phytologia 29: 291. 1974; Hocking, Excerpt. Bot. A.26: 90. 1975.

LEIOTHRIX VIVIPARA var. LONGIPILOSA Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.26: 89. 1975; Moldenke, Phytologia 33: 24. 1976.

MESANTHEMUM Körn.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 89 & 90. 1975; Jaeger, Boissiera 24: 474. 1976; Moldenke, Phytologia 33: 24—26, 191, & 510 (1976) and 34: 395. 1976; P. Morat, Adansonia, ser. 2, 15: [463] & 468. 1976.

MESANTHEMUM AFRICANUM Moldenke

Additional bibliography: Moldenke, Phytologia 25: 140. 1973; Hocking, Excerpt. Bot. A.26: 89. 1975.

MESANTHEMUM JAEGERI Jacques-Félix

Additional bibliography: Moldenke, Phytologia 25: 139 & 140. 1973; Jaeger, Boissiera 24: 474. 1976.

MESANTHEMUM PRESCOTTIANUM (Bong.) Körn.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 90. 1975; Moldenke, Phytologia 33: 25 & 26. 1976.

A photographic copy of the illustration of this species by Meikle & Baldwin (1952) is included on the United States National Herbarium sheet of Baldwin 9516.

Additional citations: LIBERIA: J. T. Baldwin 9516 (W--2070103). REPUBLIC OF GUINEA: J. T. Baldwin 9772 (W--2070105).

MESANTHEMUM RADICANS (Benth.) Körn.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 89. 1975; Moldenke, Phytologia 33: 26, 189, & 191 (1976) and 34: 395. 1976.

Recent collectors refer to this species as 30--60 cm. tall.

Additional citations: LIBERIA: J. T. Baldwin 10052 (W--2070116), 12056 (W--2070218). ZAIRE: Devred 1465 (W--2319128).

MESANTHEMUM RUTENBERGIANUM Körn.

Additional bibliography: Moldenke, Phytologia 29: 293. 1974; Hocking, Excerpt. Bot. A.26: 89. 1975.

MOLDENKEANTHUS P. Morat, Adansonia, ser. 2, 15: [463]--469, pl. 1 & 2. 1976.

Bibliography: Moldenke, Phytologia 34: 262 & 506. 1976; P. Morat, Adansonia, ser. 2, 15: [463]--469, pl. 1 & 2. 1976.

A genus of two known species in Madagascar.

MOLDENKEANTHUS BOSSERI P. Morat, Adansonia, ser. 2, 15: 467--469, pl. 2. 1976.

Bibliography: Moldenke, Phytologia 34: 262. 1976; P. Morat, Adansonia, ser. 2, 15: 467--469, pl. 2. 1976.

Illustrations: P. Morat, Adansonia, ser. 2, 15: 467, pl. 2. 1976.

This species is based on Bosser 19567 from the Massif de l'Itremo, 1600 m. altitude, Central District, Madagascar, where it appears to be endemic.

MOLDENKEANTHUS ITREMENSIS P. Morat, Adansonia, ser. 2, 15: 465--467, pl. 1. 1976.

Bibliography: Moldenke, Phytologia 34: 262. 1976; P. Morat, Adansonia, ser. 2, 15: 465--467, pl. 1. 1976.

Illustrations: P. Morat, Adansonia, ser. 2, 15: 465, pl. 1. 1976.

This species is based on Morat 4263 from the Massif de l'Itremo, altitude 1600 m., Central District, Madagascar, where it appears to be endemic.

PAEPALANTHUS Mart.

Additional synonymy: Dupotya Kuntze ex Moldenke, Résumé 282, in syn. 1959. Dupataya Kuntze ex Moldenke, Résumé Suppl. 2: 31, in syn. 1962. Duptaya Kuntze ex Moldenke, Fifth Summ. 1: 487, in syn. 1971.

Additional bibliography: C. Müll. in Just, Bot. Jahresber. 16 (1): 769 & 770. 1888; Holm, Bot. Gaz. 31: 18. 1901; Lutz & Machado, Mem. Inst. Oswaldo Cruz 7: 15. 1915; Thorne in Meggers, Ayensu, & Duckworth, Trop. Forest Ecosyst. Afr. & S. Am. 29. 1973; Hocking, Excerpt. Bot. A.26: 6, 89, & 90. 1975; Liogier, Bol. Jard. Bot. Raf. Moscoso 3 (2): 2. 1976; Moldenke, Phytologia 33: 26--58, 130--153, fig. 1 & 2, 183--202, 271--275, 374, 508, & 510 (1976) and 34: 254, 256, 258, 259, 275--276, 281, 390, 391, 395, 502, & 507. 1976; P. Morat, Adansonia, ser. 2, 15: [463], 464, & 468. 1976; L. B. Sm., Phytologia 33: 430 & 431. 1976.

Thorne (1973) asserts that Paepalanthus is a genus of 485 species, of which 484 live in America, 2 in Africa, and 1 in Madagascar.

The Murça Pires & Cavalcante 52405, distributed as Paepalanthus sp., is actually Syngonanthus gracilis var. glabriusculus Ruhl.

PAEPALANTHUS ACANTHOLIMON Ruhl.

Additional bibliography: Moldenke, Phytologia 25: 143 (1973) and 29: 485. 1974; Hocking, Excerpt. Bot. A.26: 89. 1975; Moldenke, Phytologia 33: 150. 1976.

PAEPALANTHUS ACANTHOPHYLLUS Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 90. 1975; Moldenke, Phytologia 33: 27, 190--192, 195, & 196. 1976.

The Haases encountered this species "in graminosis humidis", describe the involucre as black, and found the plant in flower and fruit in September.

Additional citations: BRAZIL: Goiás: Haas & Haas 444 [Herb. Brad. 50554] (Ut--320407).

PAEPALANTHUS ACTINOCEPHALOIDES Alv. Silv.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 89. 1975; Moldenke, Phytologia 33: 27. 1976.

PAEPALANTHUS ALBO-VAGINATUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 33: 28. 1976.

Lindeman and Haas found this plant growing in a rocky campo and call attention to the "main peduncle [being] strongly flattened". Occhioni comments on the "capitulo branco acinzentado", and found the plant on sandy campos, flowering in November.

Additional citations: BRAZIL: Paraná: Lindeman & Haas 3033 (Ac), 3036 (Ld); Occhioni 4741 [Herb. Nac. Fac. Farmac. 11287] (Ld).

PAEPALANTHUS ALSINOIDES C. Wright

Additional synonymy: Dupatya alsinoides (Wright & Sauv.) Britton ex Moldenke, Phytologia 1: 332, in syn. 1939. Dupatya alsinoides Wr. & Sauv., in herb. Paepalanthus alsinoides Wright & Sauvalle, in herb.

Additional bibliography: Moldenke, Phytologia 33: 28 & 184. 1976.

Collectors have encountered this plant in white sand of pinelands, flowering and fruiting in June and August. C. Wright 710 is a mixture with var. minimus Jennings, while C. Wright 3743 is a mixture with P. lamarckii Kunth, doubtless due to the notoriously poor assembling and distributing of Wright's collections by Asa Gray.

Additional citations: CUBA: Pinar del Río: Britton, Britton, & Gager 7090 (W—696893), 7130 (W—696902); Ekman 16781 (W—1302672), 17284 (W—1301995); C. Wright 710, in part (W—936251), 3742 (W—936264), s.n. [1865] (W—287261).

PAEPALANTHUS ALSINOIDES var. MINIMUS Jennings

Additional bibliography: Moldenke, Phytologia 33: 28. 1976.

Killip found this plant growing on white sand savannas, flowering and fruiting in January. C. Wright 710 is a mixture of this variety with the typical form of the species.

Additional citations: CUBA: Pinar del Río: C. Wright 710, in part (W—936241). ISLA DE PINOS: Britton, Britton, & Wilson 14144 (W—793020, W—1049604); Ekman 11965 (W—1301980); Killip 44547 (W—2112712), 45388 (W—2226225); Shafer 10682 (W—699074).

PAEPALANTHUS AMOENUS (Bong.) Körn.

Additional bibliography: Moldenke, Phytologia 33: 28—29, 189, 191, 192, 194, & 196. 1976.

Haas and his associates encountered this plant on "stony slopes at the foot of a hill".

Additional citations: BRAZIL: Goiás: Haas, Haas, & Belém 364 (Ac).

PAEPALANTHUS ANDICOLA Körn.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 90. 1975; Moldenke, Phytologia 33: 29 & 40 (1976) and 34: 256. 1976.

PAEPALANTHUS ANDICOLA var. VILLOSUS Moldenke

Additional bibliography: Moldenke, Phytologia 33: 29—30, fig. 1. 1976.

Illustrations: Moldenke, Phytologia 33: 29, fig. 1. 1976.

PAEPALANTHUS ARGILLICOLA Alv. Silv.

Additional bibliography: Moldenke, Phytologia 29: 296--297. 1974.

Recent collectors have encountered this plant in small groups in wet places on campos and in "local encharcado" associated with mosses, flowering and fruiting in March and July.

Additional citations: BRAZIL: Minas Gerais: Mendes Magalhães s.n. [Herb. Fac. Nac. Farmac. 5746] (Ld). Rio de Janeiro: P. Occhioni 7621 [Herb. Fac. Nac. Farmac. 16795] (Z); E. Pereira 3853 [Herb. Fac. Nac. Farmac 8967] (Ld).

PAEPALANTHUS ARGYROPUS Alv. Silv.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 89. 1975; Moldenke, Phytologia 33: 30. 1976.

PAEPALANTHUS BATOCEPHALUS Ruhl.

Additional bibliography: Moldenke, Phytologia 29: 297—298 (1974) and 30: 21 & 112. 1975.

Krapovickas encountered this plant at 2000 m. altitude, flowering and fruiting in January.

Additional citations: BRAZIL: Rio de Janeiro: Krapovickas 27240 (Z).

PAEPALANTHUS BELIZENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 33: 31. 1976.

Dwyer found this plant growing on savannas, flowering and fruiting in May. Material has been misidentified and distributed in some herbaria as "Cyperaceae".

Additional citations: BELIZE: Dwyer 10719 (Z); McKee 11373 (P--isotype).

PAEPALANTHUS BIFIDUS (Schrad.) Kunth

Additional bibliography: Moldenke, Phytologia 33: 31—32. 1976.

Lindeman & Haas encountered this plant in a "burned but wet old dune valley with low savanna-like vegetation". Lasseign found it on a "campina....near old borrow pit", in white sand, flowering and fruiting in July. He refers to the flower-heads as "buttons" and describes them as brownish-white.

Additional citations: BRAZIL: Amazônas: Lasseigne P.21169 (Ld). Pernambuco: Lindeman & Haas 6157 (Ut—320406).

PAEPALANTHUS BIFIDUS f. BREVIPES Moldenke

Additional bibliography: Moldenke, Phytologia 33: 31 & 32. 1976.

Prance found this plant growing in a swamp on dunes, flowering and fruiting in July. His label asserts that it was growing among plants 8 cm. tall (probable the typical form of the species).

Additional citations: BRAZIL: Pará: Prance 21155 (Z).

PAEPALANTHUS BIFRONS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 29: 300 (1974), 30: 274 (1975), and 33: 191. 1976.

Recent collectors found this plant in flower in May.

Additional citations: BRAZIL: Minas Gerais: Elena, Carmem, & Occhioni s.n. [Herb. Fac. Nac. Farmac. 11404] (Z).

PAEPALANTHUS BOMBACINUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 33: 32. 1976.

Occhioni and Carmem describe this plant as 20 cm. tall, with white flowers, and found it in flower in May.

Additional citations: BRAZIL: Minas Gerais: Occhioni & Carmem s.n. [Herb. Fac. Nac. Farmac. 11425] (Ld).

PAEPALANTHUS BRITTONI Moldenke

Additional bibliography: Moldenke, Phytologia 33: 32. 1976.

Recent collectors have found this plant in pinelands, flowering and fruiting in February and April. Material has been misidentified and distributed in some herbaria as P. pungens Griseb.

Additional citations: CUBA: Oriente: Alain, Acuña, & López Figueiras 5881 (W—2288325); León, Clémente, & Howard 20149 (W—2286854); López Figueiras 2483 (W—2284300).

PAEPALANTHUS BRYOIDES (Riedel) Kunth

Additional bibliography: Moldenke, Phytologia 33: 33. 1976.

Additional citations: BRAZIL: Minas Gerais: Duarte 15031 (Ld).

PAEPALANTHUS CALDENSIS Malme

Additional bibliography: Moldenke, Phytologia 33: 33. 1976.

Hatschbach encountered this plant on a "campo pequeño brejo", while Lindeman and his associates found it in a "banhado no planalto", on a "campo úmido na beira dura sanga", and as a rare clustered herb in open vegetation on a planalto, at 2350 m. altitude, the corollas "white".

Additional citations: BRAZIL: Paraná: Hatschbach 37921 (Ld). Rio de Janeiro: Lindeman & Haas 4135 (Ld). Rio Grande do Sul: Lindeman & al. ICN.20866 (Ut—320393); Lindeman, Lindeman, Porto, & "A. M. C." 9357 (Ut—320394).

PAEPALANTHUS CALLOCEPHALUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 139. 1973; Hocking, Excerpt. Bot. A.26: 89. 1975.

PAEPALANTHUS CALLOCEPHALUS var. CILIATUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 139. 1973; Hocking, Excerpt. Bot. A.26: 89. 1975.

PAEPALANTHUS CALLOCEPHALUS var. VILLOSUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 139—140.

1973.

Occhioni describes this plant as 50 cm. tall, with white flower-heads, and found it growing on sandy campos, flowering in June.

Additional citations: BRAZIL: Minas Gerais: Occhioni 5681 [Herb. Fac. Nac. Farmac. 14284] (Z).

PAEPALANTHUS CANESCENS (Bong.) Körn.

Additional bibliography: Moldenke, Phytologia 29: 302 (1974), 30: 18 (1975), and 31: 385. 1975; Hocking, Excerpt. Bot. A.26: 6. 1975.

PAEPALANTHUS CANESCENS var. ATRATUS Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Phytologia 33: 33. 1976.

PAEPALANTHUS CAPANEMAE Alv. Silv.

Additional bibliography: Fedde in Just, Bot. Jahresber. 46 (2): 651. 1929; Moldenke, Phytologia 33: 33—34. 1976.

Additional citations: BRAZIL: Goiás: Hatschbach 36867 (Ld).

PAEPALANTHUS CATHARINAE Ruhl.

Additional bibliography: Moldenke, Phytologia 33: 34. 1976.

Irgang & Fereira encountered this plant in "turfeira".

Additional citations: BRAZIL: Rio Grande do Sul: Irgang & Ferreira ICN.7398 (Ut—320398).

PAEPALANTHUS CLAUSSENIANUS Körn.

Additional bibliography: Moldenke, Phytologia 33: 35—36, 191, & 196. 1976.

Lasseigne found this plant growing in dry red soil. Mendes Magalhães refers to it as a frequent subshrub, 0.5—1 m. tall, in dry grassy campos.

Additional citations: BRAZIL: Distrito Federal: Lasseigne 4334 (Ld, N); Mendes Magalhães 18127 [Herb. Fac. Nac. Farmac. 5817] (Ld).

PAEPALANTHUS COLUMBIENSIS Ruhl.

Additional bibliography: Moldenke, Phytologia 33: 30, 36, & 44 (1976) and 34: 276 & 281. 1976.

In addition to months previously reported, this plant has been found in fruit in August. Schulz and Rodríguez found it in "praderas ± húmedas (al margen de un río), pastoreado; sitio rodeado por montañas", at 3700 m. altitude, and describe it as a "Hierba arosetada, frecuente sitios resguardados, muy húmedos, con musgos, entre Espeletia no. 539 y 538".

Additional citations: COLOMBIA: Boyacá: Schulz & Rodríguez Poveda 541 (Ld). Cauca: López-Palacios & Idrobo 3748 (Ld).

PAEPALANTHUS COMOSUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 29: 306 (1974)

and 30: 43. 1975.

Hatschbach encountered this plant "da base dos paredões de arenito, local sombrio", flowering and fruiting in February.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 36485 (Ld).

PAEPALANTHUS COMPLANATUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 233—235. 1973.

Occhioni and his associates describe this plant as 20 cm. tall, with white flowers, and encountered it on "afloramenta de quartzito", flowering in May.

Additional citations: BRAZIL: Minas Gerais: Occhioni, Elena, & Carmem s.n. [Herb. Fac. Nac. Farmac. 11423] (Ld).

PAEPALANTHUS COSTARICENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 33: 37. 1976.

Recent collectors have found this plant in flower and fruit in September and December. Material has been misidentified and distributed in some herbaria as P. ensifolius (H.B.K.) Kunth

Additional citations: COSTA RICA: Alajuela: J. León 1274 (W—2134413). San José: P. C. Standley 42135 (W—1251387, W—1251388). Province undetermined: O. Jiménez 38 [El Cañon] (W—2217521).

PAEPALANTHUS COUTOËNSIS Moldenke

Additional bibliography: Moldenke, Phytologia 33: 37, 57, & 191 (1976) and 34: 258. 1976.

Kummrow encountered this plant on a "campo solo úmido e arenoso" and implies that his collection, at least, is only an immature example of P. polyanthus (Bong.) Kunth, which is very possible. Lindeman and Haas encountered it in a belt of outcropping rocks of Vila Velha arenite, flowering in October.

Additional citations: BRAZIL: Paraná: Kummrow 953 (Ld); Lindeman & Haas 2694 (Ld).

PAEPALANTHUS DIVARICATUS (Bong.) Kunth

Additional bibliography: Moldenke, Phytologia 29: 308 (1974), 30: 99 & 332 (1975), and 33: 191. 1976.

Occhioni describes this plant as 30 cm. tall and encountered it on dry sandy campos, flowering and fruiting in June.

Additional citations: BRAZIL: Minas Gerais: Occhioni 5515 [Herb. Fac. Nac. Farmac. 11477] (Ld).

PAEPALANTHUS ELONGATUS (Bong.) Körn.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 6. 1976; Moldenke, Phytologia 33: 39. 1976.

The Haases describe this plant as 30—80 cm. tall, the flowerheads cinereous, and found it growing in "pascuis ad basin montis, locis humidis", flowering and fruiting in September.

Additional citations: BRAZIL: Goiás: Haas & Haas 442 [Herb. Brad. 50551] (Ut—320409), 443 [Herb. Brad. 50552] (Ut—320408).

PAEPALANTHUS ELONGATUS f. GRAMINIFOLIUS Herzog

Additional bibliography: Moldenke, Phytologia 33: 39. 1976.

The Irwin & al. 13298 collection cited below is a mixture with Syngonanthus euschemus Ruhl.

Additional citations: BRAZIL: Goiás: Irwin, Grear, Souza, & Reis dos Santos 13298, in part (N).

PAEPALANTHUS ELONGATUS var. LONGIBRACTEATUS Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Phytologia 33: 39. 1976.

PAEPALANTHUS ENSIFOLIUS (H.B.K.) Kunth

Additional bibliography: Moldenke, Phytologia 33: 40. 1976

The P. C. Standley 42135, distributed as P. ensifolius, actually is P. costaricensis Moldenke

PAEPALANTHUS ERECTIFOLIUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 26: 481—482 (1973) and 34: 258. 1976.

Recent collectors describe this plant as an erect herb, 75 cm. to 1.5 m. tall, the stem simple, the flowering heads white or gray, and have found it growing in cerrado and "in wet campo and gallery margin", at altitudes of 300—550 m., flowering and fruiting in March, May, and October. Irwin and Soderstrom assert that it is "occasional" in distribution.

Material has been misidentified and distributed in some herbaria, and cited by me in previous installments of these notes, as P. speciosus (Bong.) Körn.

Additional citations: BRAZIL: Goiás: Hatschbach 38569 (Z). Mato Grosso: Irwin, Grear, Souza, & Reis dos Santos 16017 (Ld, N, W—2759036); Irwin & Soderstrom 6552 (N).

PAEPALANTHUS FASCICULATUS (Rottb.) Kunth

Additional bibliography: Moldenke, Phytologia 33: 40 (1976) and 34: 258. 1976.

Prance and his associates found this plant growing on a "campina on white sand (regosol)", especially in "damp seepage patches", flowering in July and both flowering and fruiting in September, describing it as to 10 cm. tall. Ongley and Ramos found it on "terra firme on open campina", describing it as an herb, 8—12 cm. tall, green, the fertile stems white at the tip and slightly browning, in flower in April and June.

Additional citations: BRAZIL: Amazônas: Maas & Maas 462 (Ld); Ongley & Ramos P.21770 (Ld); Prance 23527 (Ld); Prance, Anderson, & Schubert 23501 (Ac); Prance, Berg, Bisby, Steward, Monteiro, & Ramos 17921 (Ld).

PAEPALANTHUS FASCICULATUS f. SPHAEROCEPHALUS Herzog

Additional bibliography: Moldenke, Phytologia 33: 40 (1976) and 34: 258. 1976.

Bunting and his associates describe this plant as an herb growing in set sand and in standing water, the flower-heads with a buff involucre and the flowers white.

Additional citations: VENEZUELA: Amazonas: Bunting, Akkermans, & Van Rooden 3765 (Ld). BRAZIL: Goiás: Hatschbach & Kummrow 38512 (Ld).

PAEPALANTHUS FASCICULATUS f. TENELLUS Herzog

Additional bibliography: Moldenke, Phytologia 29: 318 & 324. 1974.

Prance describes this plant as having "some stems prostrate and producing inflorescences along the stem, others upright and with terminal inflorescences only" and encountered it in secondary forests, flowering and fruiting in April. He misspells the authority surname "Hertzog". Campbell and his associates refer to it as herbaceous, 5--10 cm. tall, with white flower-heads, and found it growing on the ground in shade in the transition zone "between campina and terra firme", flowering in June.

Additional citations: BRAZIL: Amazônas: Prance 23710 (Ld, N). Pará: Campbell, Ongley, Ramos, Monteiro, & Nelson P.22538 (Ld).

PAEPALANTHUS FASCICULIFER var. CAPILLIFOLIUS Moldenke

Synonymy: Paepalanthus filifolius Moldenke, Phytologia 34: 258. nom. nud. 1976.

Additional bibliography: Moldenke, Phytologia 33: 41 (1976) and 34: 258. 1976.

PAEPALANTHUS FLACCIDUS (Bong.) Kunth

Additional bibliography: Moldenke, Phytologia 33: 32, 35, & 41 (1976) and 34: 258 & 276. 1976.

Hatschbach encountered this plant on "brejo, zona de cerrado".

Additional citations: BRAZIL: Mato Grosso: Hatschbach 37607 (Ld).

PAEPALANTHUS FOLIOSUS Körn.

Additional bibliography: Moldenke, Phytologia 29: 330 & 386--387. 1974; Hocking, Excerpt. Bot. A.26: 90. 1975; Moldenke, Phytologia 30: 97 & 103 (1975) and 33: 191. 1976.

PAEPALANTHUS FORMOSUS Moldenke

Additional bibliography: Moldenke, Phytologia 29: 387 (1974) and 33: 191 & 192. 1976.

Prance and his associates refer to this plant as producing flowering stems to 1.6 m. tall and found it growing on cerrado at 720 m. altitude, in flower and fruit in October.

Additional citations: BRAZIL: Mato Grosso: Prance, Lleras, & Coêlho 19206 (Z).

PAEPALANTHUS GARIMPENSIS Alv. Silv.
Additional bibliography: Hocking, Excerpt. Bot. A.26: 90. 1975; Moldenke, Phytologia 33: 42. 1976.

PAEPALANTHUS GENTLEI Moldenke
Additional bibliography: Moldenke, Phytologia 29: 478—479 (1974) and 30: 35. 1975.
Bartlett found this species growing on sandy uplands.
Additional citations: BELIZE: H. H. Bartlett 11874 (W—1493409).

PAEPALANTHUS GLAREOSUS (Bong.) Kunth
Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 878 (1893), imp. 2, 1: 878 (1946), imp. 2: 2: 402 (1946), imp. 3, 1: 878 (1960), and imp. 3, 2: 402. 1960; Moldenke, Phytologia 29: 478 & 480—481. 1974.

PAEPALANTHUS GONÇALENSIS Alv. Silv.
Additional bibliography: Moldenke, Phytologia 29: 484—485. 1974.
Mendes Magalhães found this plant in wet sandy places "con tapete de herbáceas", frequent in distribution, and with white flowers in April.
Additional citations: BRAZIL: Minas Gerais: Mendes Magalhães 6157 [Herb. Fac. Nac. Farmac. 6738] (Z).

PAEPALANTHUS HYDRA Ruhl.
Additional bibliography: Hocking, Excerpt. Bot. A.26: 90. 1975; Moldenke, Phytologia 33: 43. 1976.

PAEPALANTHUS HYMENOLEPIS Alv. Silv.
Additional bibliography: Hocking, Excerpt. Bot. A.26: 90. 1975; Moldenke, Phytologia 33: 43. 1976.

PAEPALANTHUS ITATIAIENSIS Ruhl.
Additional bibliography: Moldenke, Phytologia 33: 43. 1976.
The Eitens describe this as a plant with white inflorescence-heads and found it growing in "black humusy soil" among outcropping rocks, at 2350 m. altitude, on a plateau of "steep hilly terrain, many hills topped with mountainous outcrops of bare sienite quartz, the hillsides with frequent rounded outcroppings of quartz rocks and boulders and a thin, black, almost pure humus soil supporting a periodically burned natural tussock sedge grassland with scattered low Chusquea bamboo and occasionally other shrubs, the lower valley sides often with dense Chusquea brakes or brooks lined with a marsh of Cladium in tussocks or with trunks of massed rhizomes".
Additional citations: BRAZIL: Rio de Janeiro: Eiten & Eiten 6549 (N).

PAEPALANTHUS JAUENSIS Moldenke

Additional bibliography: Anon., Ind. Bot. Guay. Highl. 16. 1972; Moldenke, Phytologia 30: 24. 1975.

PAEPALANTHUS KARSTENII Ruhl.

Additional bibliography: Moldenke, Phytologia 33: 43--46 (1976) and 34: 256 & 276. 1976.

The Schulz & Rodríguez Poveda 672, distributed as P. karstenii, seems better placed as var. corei Moldenke

PAEPALANTHUS KARSTENII var. COREI Moldenke

Additional bibliography: Moldenke, Phytologia 33: 44--45 (1976) and 34: 256. 1976.

Schulz and his associates describe this plant and where they found it as follows: "formando colonias pequeñas (en forma ± de almohadilla) en la estrata herbácea de páramo....vertiente hacia el N de una colina; buen drenaja; expuesto al influencia (viento, neblina) del valle de Sto. Domingo, veget. páramo abierto con estrato superior discontínuo de Espeletia schultzii y Hypericum (± 1 m), estra. infer. herbáceo-gramíneo, ± contínuo; pastoreado ocacionalmente. En resguarda de Espeletia schultzii; formando una almohadilla de numerosas plantas unidas subterráneamento; capítulos de color crema oscura."

Additional citations: VENEZUELA: Mérida: Schulz & Rodríguez Poveda 672 (Ut--320388); Schulz, Rodríguez Poveda, & Sánchez 121 (Ut--320390).

PAEPALANTHUS KARSTENII var. SUBSESSILIS (Moldenke) Moldenke

Additional bibliography: Moldenke, Phytologia 33: 45--46 (1976) and 34: 256, 257, & 276. 1976.

Wessels Boer found this plant in flower and fruit in December.

Additional citations: VENEZUELA: Mérida: Wessels Boer 2186 (Ut--320387).

PAEPALANTHUS KUPPERI Suesseng.

Additional bibliography: Moldenke, Phytologia 33: 47. 1976.

Seidenschnur encountered this plant at 3300 meters, flowering in August.

Additional citations: COSTA RICA: San José: Seidenschnur 303 (N).

PAEPALANTHUS LAMARCKII Kunth

Additional bibliography: Moldenke, Phytologia 33: 47, 51, & 184. 1976.

Davidse found this plant growing in mud with herbaceous vegetation in and around a "morichal" with standing water dominated by Mauritia flexuosa. McKee refers to it as having light-green leaves and "white" inflorescences and found it growing on very sandy soil with impeded drainage. Describing the inflorescences as "white" must certainly be an error -- they are almost black.

The J. A. Steyermark 57804 collection, cited by me in a previ-

ous installment of these notes, is a mixture with Syngonanthus gracilis (Bong.) Ruhl., while C. Wright 3742 is a mixture with P. alsinoides C. Wright.

Additional citations: BELIZE: Gentle 3780 (W—2087557); McKee 11378 (P). CUBA: Pinar del Río: Ekman 18121 (W--1301999). Province undetermined: C. Wright 3742, in part (W--936264), 3772 (W--46428). ISLA DE PINOS: Ekman 12015(W--1301981). VENEZUELA: Guárico: G. Davidse 3808 (Ld).

PAEPALANTHUS LANCEOLATUS Körn.

Additional bibliography: Moldenke, Phytologia 33: 47--48 & 130. 1976.

The Eitens describe this plant as having flower-heads "light-gray around [the] edge, white in [the] center" and found it to be "common in clumps" on rocky knolls with very fine sand, light-gray because of a small humus content, at 1200 m. altitude.

Additional citations: BRAZIL: Minas Gerais: Eiten & Eiten 6784 (N).

PAEPALANTHUS LODICULOIDES var. FLOCCOSUS Moldenke

Additional bibliography: Moldenke, Phytologia 33: 49 & 50, fig. 2 (1976) and 34: 256. 1976.

Illustrations: Moldenke, Phytologia 33: 50, fig. 2. 1976.

Additional citations: COLOMBIA: Boyacá: Cleef, Cuatrecasas, & Jaramillo Mejia 9214 (Z--isotype, Z--photo of type).

PAEPALANTHUS MANICATUS V. A. Pouls.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 90. 1975; Moldenke, Phytologia 33: 35 & 51. 1976.

PAEPALANTHUS MERIDENSIS Klotzsch

Additional bibliography: Moldenke, Phytologia 30: 79--80. 1975.

Wessels Boer and his associates came upon this plant in a disturbed cloud forest and report that it was growing "in a cespitose manner" along a swampy creeklet, flowering in March.

Additional citations: VENEZUELA: Táchira: Wessels Boer, Teunissen, & Wildschut 2431 (Ld).

PAEPALANTHUS MESETICOLA Moldenke & Steyerm. (in press)

Citations: VENEZUELA: Bolívar: Steyermark, Espinoza, & Brewer-Carias 109389 (Z--type).

PAEPALANTHUS OVATUS Körn.

Additional bibliography: Moldenke, Phytologia 33: 52, 53, 55, & 144. 1976.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 36547 (N).

PAEPALANTHUS PILOSUS (H.B.K.) Kunth

Additional bibliography: Hocking, Excerpt. Bot. A.26: 90. 1975; Moldenke, Phytologia 33: 54--55 & 144. 1976.

PAEPALANTHUS PLANIFOLIUS (Bong.) Körn.

Additional bibliography: Moldenke, Phytologia 33: 55. 1976

The Eitens refer to the flowers of this species as white and found it growing "in open saturated marshy soil in wet open rolling terrain with scattered shrubs and small trees and groves of these, the original vegetation here was continuous submontane rainforest". Lindeman and Haas encountered it on rocky campos.

Additional citations: BRAZIL: Paraná: Lindeman & Haas 2450 (Ld), 3034 (Ld). São Paulo: Eiten & Eiten 5042 (W--2729346).

PAEPALANTHUS PLANIFOLIUS var. CONDUPLICATUS Ruhl.

Additional bibliography: Moldenke, Phytologia 30: 256--258 & 260. 1975.

Hatschbach encountered this plant on a "campo junta a filete de agua", flowering and fruiting in September.

Additional citations: BRAZIL: Paraná: Hatschbach 37105 (Ld).

PAEPALANTHUS PLANIFOLIUS var. CONSANGUINEUS (Körn.) Ruhl.

Additional bibliography: C. Müll. in Just, Bot. Jahresber. 16 (1): 770. 1888; Moldenke, Phytologia 33: 55. 1976.

PAEPALANTHUS PLANTAGINEUS (Bong.) Körn.

Additional bibliography: C. Müll. in Just, Bot. Jahresber. 16 (1): 770. 1888; Moldenke, Phytologia 33: 53, 55, & 144. 1976.

PAEPALANTHUS POLYANTHUS (Bong.) Kunth

Additional bibliography: C. Müll. in Just, Bot. Jahresber. 16 (1): 770. 1888; Moldenke, Phytologia 33: 56, 131, 188, & 191 (1976) and 34: 276. 1976.

Rambo (1950) comments: "Esta bela espécie, frequente no litoral catarinense, parece ter o seu limite meridional nos aredores de Torres, onde foi colhida por Reitz; pessoalmente nunea a encontrei no RGS [Rio Grande do Sul]. Segundo Ruhland.....teria sido encontrado 'em lugares húmidos no RGS' por Sellow, levando o número 1,934. Como os números Sellowianos 1293--1503 são duma excursão ao Rio Pardo no centro do Rio Grande; e como esta espécie posteriormente jamais foi vista por outro botânico em tal região, tenho as minhas dúvidas a respeito desta indicação." Other recent collectors have encountered it in open vegetation on plateaus and on burned slopes with many herbs and low shrubs and describe it as having a dense basal rosette [of leaves], stems 2 cm. in diameter, and about 10 lateral branches. Lindeman says "ervas com roseta e racemo curto de umbelas".

In addition to the months previously reported by me, this plant has been found in fruit in April.

Additional citations: BRAZIL: Rio de Janeiro: Lindeman & Haas 4169 (Ac), 5170 (Ut--320403). Rio Grande do Sul: Lindeman ICN.

20912 (Ut--320391).

PAEPALANTHUS POLYANTHUS var. TOMENTOSUS Alv. Silv.
Synonymy: Paepalanthus speciosus var. tomentosus Alv. Silv. ex Moldenke, Phytologia 33: 191, sphalm. 1976.
Additional bibliography: Moldenke, Phytologia 30: 274 & 276--277 (1975), 33: 191 (1976), and 34: 276. 1976.

PAEPALANTHUS POLYTRICHOIDES Kunth
Additional bibliography: Hocking, Excerpt. Bot. A.26: 90. 1975; Moldenke, Phytologia 33: 56--57. 1976.
Additional citations: BRAZIL: Minas Gerais: E. Pereira 5007 [Herb. Fac. Nac. Farmac. 7155] (Ld).

PAEPALANTHUS PSEUDOTORTILIS Ruhl.
Additional bibliography: Moldenke, Phytologia 30: 322. 1975.
Lindeman and Haas came upon this plant in low vegetation in a moist mountain saddle, at 2400 m. altitude, flowering and fruiting in April.
Additional citations: BRAZIL: Rio de Janeiro: Lindeman & Haas 5188 (Ut--320404).

PAEPALANTHUS PULLUS Körn.
Additional bibliography: Moldenke, Phytologia 30: 325--327 (1975) and 34: 259. 1976.
Luna Peixoto describes this plant as "heliofila, frecuente, capítulo branco".
Additional citations: BRAZIL: Espirito Santo: Luna Peixoto 367 [Araujo & Peixoto 616; Herb. Jard. Bot. Rio Jan. 169709] (Z).

PAEPALANTHUS PUNGENS Griseb.
Additional bibliography: Moldenke, Phytologia 33: 57 (1976) and 34: 254. 1976.
Ekman asserts that this species is very rare in Oriente. The López Figueiras 2843, distributed as P. pungens, is actually P. brittoni Moldenke.
Additional citations: CUBA: Oriente: Ekman 2187 (W--1302384), 2341 (W--1302387), 9121 (W--1302490).

PAEPALANTHUS RAMOSUS (Wikstr.) Kunth
Additional bibliography: Moldenke, Phytologia 33: 37, 57, 188, & 191. 1976.
Saddin describes this plant as a subshrub, about 70 cm. tall, with white flowers. He found it in "restinga baixa", sandy soil, flowering in August.
Additional citations: BRAZIL: Guanabara: Saddin 1165 [Herb. Fac. Nac. Farmac. 8904] (Ld); Strang 1006 [Castellanos 26308; Herb. Brad. 45560] (N).

PAEPALANTHUS RAMOSUS var. AFFINIS (Bong.) Ruhl.

Additional bibliography: Moldenke, Phytologia 30: 331-334 (1975) and 31: 392, 397, & 403. 1975.

Recent collectors have found this plant in flower and fruit in May.

Additional citations: BRAZIL: Bahia: Lanna Sobrinha 1437 [Herb. Brad. 60604] (Ld).

PAEPALANTHUS REPENS (Lam.) Körn.

Additional bibliography: Moldenke, Phytologia 30: 337—339. 1975; Liogier, Bol. Jard. Bot. Raf. Moscoso 3 (2): 2. 1976

PAEPALANTHUS RETUSUS C. Wright

Additional bibliography: Moldenke, Phytologia 33: 58. 1976

Additional citations: CUBA: Pinar del Río: Ekman 11064 (W—1302529).

PAEPALANTHUS SAXICOLA var. CONICUS Moldenke

Additional bibliography: Moldenke, Phytologia 33: 137—139. 1976.

Bunting and his associates describe this perplexing plant as a "delicate herb in wet sand and standing water", the peduncles "nearly white-puff", the heads white, and speak of it as common at 125—140 m. altitude, apparently growing in association with Syngonanthus comosus Alv. Silv., and fruiting in July. Schultes and Cabrera found it growing as "tufts in water", flowering and fruiting in September. The plant has much the aspect of the genus Carptotepala.

Additional citations: COLOMBIA: Vaupés: Schultes, Baker, & Cabrera 17987 (Z); Schultes & Cabrera 17564 (N), 17586 (Ss). VENEZUELA: Amazonas: Bunting, Akkermans, & Van Rooden 3738a (Ld).

PAEPALANTHUS SCHENCKII V. A. Pouls.

Additional synonymy: Paepalanthus schenkii Pouls. apud C. Müll. in Just, Bot. Jahresber. 16 (1): 769 & 770. 1888.

Additional bibliography: C. Müll. in Just, Bot. Jahresber. 16 (1): 769 & 770. 1888; Moldenke, Phytologia 33: 141 (1976) and 34: 276. 1976.

PAEPALANTHUS SCHUECHIANUS Körn.

Additional bibliography: Moldenke, Phytologia 33: 143—144 (1976) and 34: 259. 1976.

Lindeman found this plant growing in a restinga, flowering and fruiting in July.

Additional citations: BRAZIL: Rio de Janeiro: Lindeman 6345 (Z).

PAEPALANTHUS SCIRPEUS Mart.

Additional bibliography: Moldenke, Phytologia 33: 146—147 (1976); P. Morat, Adansonia, ser. 2, 15: 464. 1976.

PAEPALANTHUS SENAEANUS Ruhl.

Additional bibliography: Moldenke, Phytologia 33: 151--152. 1976.

Recent collectors describe this plant as an herb, 20--30 cm. tall, with white flowers, and have found it growing on quartzite and on "afloramento de cascalho e quartzo ou arenoso", flowering in May.

Additional citations: BRAZIL: Minas Gerais: Occhioni, Elena, & Carmem s.n. [Herb. Fac. Nac. Farmac. 11401] (Ld); Occhioni & Occhioni s.n. [Herb. Fac. Nac. Farmac. 11405] (Ld); Occhioni, Carmem, & Elena s.n. [Herb. Fac. Nac. Farmac. 11406] (Ld).

PAEPALANTHUS SESLERIOIDES Griseb.

Additional synonymy: Dupatya seslerioides Griseb., in herb.

Additional bibliography: Moldenke, Phytologia 33: 183--185. 1976.

Recent collectors have encountered this plant in dry sandy pinelands, on dry sand, on savannas, and in grayish-white sand of pinelands, flowering and fruiting in September, October, December, and January.

The Bartsch s.n. [April 1, 1937] and Killip 43683, 44544, & 44638, distributed as the typical form of P. seslerioides, represent var. carabiae Moldenke instead, while Ekman 11031, Killip 45363, and Morton 10074 are var. wilsonii Moldenke.

Additional citations: CUBA: Pinar del Río: Alain 2587 (W--2284319); Britton, Britton, & Gager 7251 (W--696938); Ekman 17803 (W--1302713); León 17433 (W--1784918); Shafer 10882 (W--699168), 10956 (W--699199). ISLA DE PINOS: Britton, Britton, & Wilson 14225 (W--793071), 14319 (W--793092); Killip 45610 (W--2226403).

PAEPALANTHUS SESLERIOIDES var. CARABIAE Moldenke, Phytologia 34: 485. 1976.

Bibliography: Moldenke, Phytologia 34: 485. 1976.

Collectors have found this plant growing on white sand savannas and in white quartz sand of pine barrens, forming clumps or cushions, flowering and fruiting from January to May. Killip 44054 is smaller and resembles var. wilsonii.

Most of the material cited below was originally distributed and even previously cited by me as typical P. seslerioides Griseb.

Citations: ISLA DE PINOS: Bartsch s.n. [April 11, 1937] (W--1559729); Carabia 1083 (Cr, N), 3930 (Cr, N), 3941 (Cr, N), 3995 (Cr, N); O. E. Jennings 338 (Cm, N); Killip 43683 (W--2175763), 44054 (W--2176129), 44544 (W--2112708), 44638 (W--2112780), 45610 (W--2226403); León & Seifriz 17520 (Ha, N); León & Victorin 18856 (Ha, W--1784925).

PAEPALANTHUS SESLERIOIDES var. WILSONII Moldenke, Phytologia 34: 485. 1976.

Bibliography: Moldenke, Phytologia 34: 485. 1976.

Collectors have encountered this plant on savannas, in "shady places", in white or white siliceous sand, in pinelands, on sandy savannas, and on white-sand savannas, flowering and fruiting from January to March and in May.

Most of the material cited below was originally distributed as and even previously cited by me as typical P. seslerioides Griseb. Killip, with his keen eye to spot morphological differences in plant populations, was the first to point out the existence of definite varieties or forms in this species and labeled his no. 43819 as "Paepalanthus seslerioides Griseb. sens. lat."

Citations: CUBA: Oriente: C. Wright 748 (N). Pinar del Río: Ekman 11031 (S, S, W--1301976). ISLA DE PINOS: Britton, Britton, & Gager 7131 (N, W--696903); Britton, Britton, & Wilson 14225 (Cm--isotype, N--type, W--793071--isotype, S--isotype), 14319 (Cm, S, W--793082); Britton & Wilson 14319 (N), 15689 (Cm, N, W--793590); Carabia 999 (Cr, N), 3949 (Cr, N); Killip 43819 (N, W--2175955), 43881 (W--2175994), 45363 (B, Mu, W--2226208); León 17520 (Ha, N); C. V. Morton 10074 (W--2351391).

PAEPALANTHUS SPECIOSUS var. ATTENUATUS Moldenke

Additional bibliography: Moldenke, Phytologia 33: 192 & 194. 1976.

Additional citations: BRAZIL: Distrito Federal: Duarte 10164 [Herb. Fac. Nac. Farmac. 14090] (Ld).

PAEPALANTHUS STEYERMARKII Moldenke

Additional bibliography: Moldenke, Phytologia 33: 272--273. 1976.

Davidse encountered this species "on open savanna with Trachypogon, Echinolaena, and Paspalum dominat and with a narrow zone of gallery forest along river, soil with top 20 cm. sand and organic material mixture, 1 m. of white sand below which is yellow sand", at 1300 m. altitude, flowering and fruiting in December.

Additional citations: VENEZUELA: Bolívar: G. Davidse 4681 (Ld).

PAEPALANTHUS SUBCAULESCENS N. E. Br.

Additional bibliography: N. E. Br., Trans. Linn. Soc. Lond. Bot., ser. 2, 6: 71. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30: 124, 134, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 126. 1908; Herzog in Fedde, Repert. Spec. Nov. 29: 207. 1931; Moldenke, Known Geogr. Distrib. Erioc. 6, 54, & 60. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 64, 66, & 211. 1949; Moldenke, Résumé 72, 75, 328, & 490. 1959; Moldenke, Phytologia 20: 297. 1970; Moldenke, Fifth Summ. 1: 126 & 130 (1971) and 2: 591 & 958.

1971; Moldenke, Phytologia 29: 483 (1974), 30: 106 (1975), and 33: 275. 1976.

This species is based on McConnell & Quelch 153 & 300 from the Kotinga Valley and "savannas generally" in the Roraima Mountains of Guyana, deposited in the herbarium of the Royal Botanic Gardens at Kew. Brown (1901) comments that this is "A very distinct species, bearing a resemblance to P. uncinatus, Gardn., in stem and foliage, but with very different flower-heads. It might be placed near P. plantagineus, Koern." Ruhland (1903) says "Speciem non vidi, ex cl. Brown P. uncinato Gardn. foliis et caule similis, sed capitulis longe diversa et proxime ad P. plantagineum ducenda". Gleason, in his unpublished Flora of British Guiana, cites from the "Roraima region, Schomburgk 713, 1026 B, Appun 1405, Quelch & McConnell 153, 300" and affirms the species as "Endemic" to that region. Presumably the Appun and Schomburgk specimens cited by Gleason are deposited in the Kew herbarium.

Ruhland (1903) cites the original publication of this binomial as "N. E. Br. in Trans. Linn. Soc. VI. 1. (1901) 71", but the description is actually in series 2, volume 6, of this periodical.

The species apparently bears great superficial similarity in habit and habitat to P. densifolius Alv. Silv. and P. oyapockensis Herzog.

Citations: GUYANA: Quelch & McConnell 153 [N. Y. Bot. Gard. type photo neg. 5005, in part] (K--cotype, N--photo of cotype, W--photo of cotype), 300 [N. Y. Bot. Gard. type photo neg. 5005, in part] (K--cotype, N--photo of cotype, W--photo of cotype).

PAEPALANTHUS SUBFALCATUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 151. 1903.

Synonymy: Paepalanthus subfulcatus Ruhl. ex Moldenke, Phytologia 31: 405, in syn. 1975.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 128, 151, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 126. 1908; Alv. Silv., Fl. Mont. 1: 414. 1928; Moldenke, Known Geogr. Distrib. Erioc. 16 & 54. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 211. 1949; Moldenke, Résumé 102 & 490. 1959; Moldenke, Fifth Summ. 1: 167 (1971) and 2: 958. 1971; Moldenke, Phytologia 31: 405. 1975.

This species is based on Glaziou 19958 from near Diamantina, in the Serra dos Cristaes, Minas Gerais, Brazil, flowering in April, and deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10652. Ruhland (1903) cites only this one collection, but comments that the "Species a P. falcato Koern. proxima. Differt autem ab illo praesertim bracteis involucrantibus dorso non persistenter pilosis, habitu robustiore, foliis etc." Silveira (1928) cites A. Silveira 601 from Muticas, Minas Gerais, collected in 1912.

Irwin and his associates describe P. subfalcatus as a cespitose rosette herb, 20--50 cm. tall, the heads white or "pale yel-

low-brown", and found it growing on wet campos in regions of cerrado interspersed with wet rocky campo, at altitudes of 950--1200 meters, flowering in February.

Citations: BRAZIL: Minas Gerais: Glaziou 19958 [Macbride photos 10652] (B--type, N--photo of type, N--photo of type, Z--isotype); Irwin, Maxwell, & Wasshausen 21003 (N); Irwin, Reis dos Santos, Souza, & Fonsêca 23355 (N, Z).

PAEPALANTHUS SUBFALCATUS var. VILLOSUS Moldenke, Phytologia 21: 418. 1971.

Bibliography: Moldenke, Phytologia 21: 418. 1971; Moldenke, Fifth Summ. 2: 958 & 968. 1971.

Citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28201 (N--isotype, Z--type).

PAEPALANTHUS SUBTILIS Miq., Stirp. Surin. 221, pl. 65b. 1850.

Synonymy: Paepalanthus subulatus Klotzsch in Schomb., Faun. & Fl. [Reise] Brit. Guian. 3: 1116. 1848. Eriocaulon subtile (Miq.) Steud., Syn. Pl. Glum. 2: [Cyp.] 281. 1855. Eriocaulon subtile Benth. ex Steud., Syn. Pl. Glum. 2: [Cyp.] 334. 1855. Eriocaulon subtile Miq. ex Steud., Syn. Pl. Glum. 2: [Cyp.] 281. 1855. Eriocaulon arenarium Salzm. ex Körn. in Mart., Fl. Bras. 3 (1): 358, in syn. 1863 [not E. arenarium G. Gardn., 1842, nor Hardn. & Hook., 1855, nor Hook., 1855, nor Mart., 1903]. Eriocaulon aciphyllum Reichenb. ex Körn. in Mart., Fl. Bras. 3 (1): 358, in syn. 1863 [not E. aciphyllum Bong., 1831]. Paepalanthus subtilis var. γ Körn. in Mart., Fl. Bras. 3 (1): 358--359. 1863. Dupatya subtilis (Miq.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Eriocaulon subtile Steud. ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879. 1893. Dupatya subtilis Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Adelopus humilis Hoffmgg. ex Moldenke, Résumé 227, in syn. 1959.

Bibliography: Schomb., Faun. & Fl. [Reise] Brit.-Guian. 3: 1116. 1848; Miq., Stirp. Surin. 221, pl. 65b. 1850; Miq., Naturk. Verh. Holl. Maatsch. Wet. Haarl., ser. 2, 7: 65. 1851; Walp., Ann. Bot. Syst. 3: 662 (1852) and 3: 1093. 1853; Steud., Syn. Pl. Glum. 2: [Cyp.] 281 & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 281, 358--359, 464, 505, & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877 & 879 (1893) and imp. 1, 2: 402. 1894; N. E. Br., Trans. Linn. Soc. Lond. Bot., ser. 2, 6: 72. 1901; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 12, 152, 157, 284, 287, & 292. 1903; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 41. 1930; Stapf, Ind. Lond. 4: 519. 1930; Uittien & Heyn in Pulle, Fl. Surin. 1 [Meded. Konink. Ver. Ind. Inst. 30, Afd. Handelmus. 11]: 216 & 219. 1938; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877 & 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 6, 7, 16, 31, 32, 40, 52, &

54, & 60. 1946; Moldenke in Maguire & al., Bull. Torrey Bot. Club 75: 199. 1948; Moldenke, Alph. List Cit. 3: 701, 744, 956, & 975. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 64, 66, 67, 88, & 212. 1949; Moldenke, Phytologia 4: 205. 1953; Moldenke in Steyerm., Fieldiana Bot. 28: 824 & 825. 1957; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 72, 75, 77, 102, 227, 282, 285, 293, 327, 328, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877 & 879 (1960) and imp. 3, 2: 402. 1960; Moldenke, Résumé Suppl. 7: 4. 1963; Van Donselaar, Wentia 14: 70. 1965; Huinink, Wentia 17: 138--139. 1966; J. A. Steyerm., Act. Bot. Venez. 1: 223. 1966; Moldenke, Phytologia 20: 297. 1970; Teunissen & Wildschut, Verh. Konink. Nederl. Akad. Wet. Natuurk. 59 (2): 23, 33, & table 1. 1970; Moldenke, Fifth Summ. 1: 126, 130, 132, 167, 377, & 486 (1971) and 2: 492, 514, 589, 591, & 958. 1971; Teunissen & Wildschut, Meded. Bot. Mus. Utr. 341: 23, 33, & table 1. 1971; Moldenke, Phytologia 28: 439 (1974), 30: 107, 109, 110, 113, 279, 280, 317, & 318 (1975), and 31: 405. 1975.

Illustrations: Miq., Stirp. Surin. pl. 65b. 1850; Miq., Naturk. Verh. Holl. Maatsch. Wet. Haarl., ser. 2, 7: pl. 65. 1851.

Recent collectors describe this plant as a delicate annual herb or small forb, to 10 cm. tall, the leaves wiry and green, and the inflorescence capitate, the heads white or gray. They have found it growing on open or wet sand, damp white sand, dry sandy places, and white sand of clearings, on savannas, sandy savannas, large sand savannas, and sandy beaches, dry sandy uplands, dry campos, and "campos cerrados", in open xeromorphic scrub on white sand, in rock crevices in shade on rocky hillsides, among rock outcrops, and frequent in sandy soil of open places on islands in river rapids, at altitudes of 100--1400 meters, flowering from November to September, and fruiting in March, August, November, and December. A vernacular name recorded for it is "aribá-panárukusí". It is said to be a member of the Polycarpaeo-Trachypogonetum cyperetosum and Mesoseto-Trachypogonetum ecologic associations.

As of now, the species is known from southern Venezuela, Guyana, and Surinam south to northern Brazil.

The Eriocaulon arenarium credited to Gardner, to Gardner & Hooker, or to Hooker in the synonymy cited above belongs in the synonymy of Syngonanthus arenarius (G. Gardn.) Ruhl., E. arenarium Mart. is a synonym of Paepalanthus parvus Ruhl., and E. aciphyllum Bong. is now known as Syngonanthus aciphyllus (Bong.) Ruhl.

Paepalanthus subulatus Klotzsch is based on R. Schomburgk 236 from Guyana in the Berlin herbarium; Adelopus humilis is based on Sieber s.n. from Pará in the Brussels herbarium.

Uittien & Heyn (1938) cite Huber 1616 from Guyana and Focke 1319, Pulle 539, and Went 367 from Surinam. Gleason, in his unpublished Flora of British Guiana, says that the species is found on "Sandy soil and savannas, probably throughout [Guyana]" and cites from the Kew herbarium Appun 1551, Clarke s.n., Jenman 5170 & 7277, Loyed s.n., Quelch & McConnell 312, and Schomburgk 236 & s.n.

[to be continued]

STUDIES IN THE LIABEAE (ASTERACEAE). VIII.

ADDITIONS TO *LIABUM* AND *MUNNOZIA*.

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Continuing studies in the Liabeae have revealed two additional undescribed species and one species in need of transfer.

Liabum nudicaule H.Robinson, sp. nov.

Plantae suffrutescentes terrestres 1-2 m altae? laxe ramosae. Caules subtiliter hexagonales glabri vel subglabri, nodis interdum disciferis, discis ca. 10 mm diam e petiolis discretis. Folia opposita, petiolis 2-6 cm longis superne anguste alatis; laminae ovatae vel late ovatae 5-16 cm longae et 3-13 cm latae base cuneatae vel subtruncatae ad medio distincte anguste acuminatae margine argute serrulatae apice anguste breviter acuminatae supra distincte sparse pilosae subtus canescentiter tomentellae in nervis glabrescentes fere ad basem trinervatae, nervis lateralibus valde ascendentibus inferne e marginis remotis superne tenuibus 4/5 laminarum attingentibus. Inflorescentiae terminales dense cymosae, pedicellis 0-8 mm longis dense tomentosis, pilis rubescentibus et pilis arachoideis albidis inmixtis. Capitula 6-7 mm alta et 7-9 mm lata. Squamae involucri 50-60 ca. 5-seriatae 1-5 mm longae anguste ovatae vel linearilanceolatae apice anguste acutae vel vix acuminatae plerumque virides extus glabris vel glabrescentes; cristae receptaculorum laciniatae ad 0.5 mm altae. Flores radii 25-30; corollae flavae, tubis 3 mm longis superne minute parce puberulis, limbis anguste ellipticis 5-6 mm longis et ca. 1 mm latis base minute puberulis. Flores disci 25-32; corollae flavae, tubis 1.5-2.5 mm longis subglabris, faucis 1.5 mm longis base indistinctis sparse puberulis, lobis 1.5 mm longis et 0.3 mm latis apice sublaevibus; thecae antherarum 2 mm longae; appendices antherarum oblongo-ovatae ca. 0.3 mm longae et 0.15 mm latae. Achaenia ca. 0.8 mm longis dense setifera; setae pappi longiores ca. 30 plerumque 4 mm longae apice non vel vix latiores, setae breviores pauce angustae ca. 0.5 mm longae. Grana pollinis ca. 25μ diam.

TYPE: PERU: Junin: Prov. Tarma, Chanchamayo Valley above La Merced at Cumbre Yacumay near summit. Alt. ca. 2000 m. Flowers small, yellow. 15 August 1957. P.C.Hutchison 1191 (Holotype US). PARATYPE: PERU: Cuzco: Vilcabamba, Hacienda on Rio Chinchao, about 6000 ft. Clumps on moist sunny slopes. Rays deep yellow. 17-26 July 1923. J.F.Macbride 5192 (US).

The new species is closely related to L eggersii Hieron. of Ecuador but is most notably distinct in the lack of any dense arachnoid tomentum on the stems. Typical L. eggersii is a plant of lower elevations on the western side of the Andes and it has less ovate leaves with more truncate bases.

Munnozia liaboides (Less.) H.Robinson, comb. nov.

Alibum liaboides Less., Syn. Comp. 152. 1832.

Dr. Bertil Nordenstam of the Museum of Natural History in Stockholm has called my attention to the failure to give this name precedence in the generic revision (Robinson & Brettell, 1974) where it was treated as a synonym of M. lyrata (A,Gray) R.& B. Studies have now shown that the two species are not synonymous, M. lyrata being a typical Munnozia, and M. liaboides being a member of the subgenus Kastnera. It might be noted that the name Alibum would have priority over the name Kastnera at the generic level.

Munnozia campii H.Robinson, sp. nov.

Plantae scandentes usque ad 10 m altae. Caules fulvescentes teretes striati dense puberuli vel tomentelli, nodis non stipuliferis. Folia opposita, petiolis 2.0-4.5 mm longis non alatis; laminae herbaceae late deltoideae 6.5-11.0 cm longae et 3.5-8.5 cm latae base truncatae trinervatae margine utrinque 10-15 denticulatae apice acutae supra pilosae pilis apice minute glandulosis subtus pallide fulvo-tomentosae in nervis fulviores. Inflorescentiae in ramis terminales, pedicellis 2-10 mm longis subtomentellis. Capitula 7-9 mm alta et 8-10 mm lata. Squamae involucri ca. 24 ovatae vel lanceolatae inaequales ca. 4-seriatae 1-4 mm longae et 0.8-1.0 mm latae pallide virides in apicem atrovirides extus glabrescentes margine dense fimbriatae apice acutae; receptacula fimbrillifera, fimbriis usque ad 2 mm longis. Flores radii ca. 10; corollae albae, tubis 3-4 mm longis superne puberulis, limbis 8-9 mm longis sparse glandulo-punctatis base puberulis. Flores disci 9-11; corollae albae, tubis 3-4 mm longis superne puberulis vel pilosis, faucis ca. 1 mm longis base dense pilosis, lobis ca. 2.5 mm longis glandulo-punctatis

apice breviter recurvatis; filamenta in parte superiore 0.35 mm longa; thecae ca. 2 mm longae, cellulis exothecialibus solum in parietibus transversalibus noduliferis; appendices ovatae ca. 0.5 mm longae et 0.275 mm latae. Achaenia ca. 1.2 mm longa ca. 8-costata subglabra superne pauce glandulifera; setae pappi ca. 40 plerumque 6 mm longae apice interdum incrassatae setae breviores paucae. Grana pollinis ca. 35μ diam.

TYPE: ECUADOR: Santiago-Zamora ("Oriente"): Eastern slopes of the cordillera, valley of the Rio Negro, down to the Rio Pailas (on the trail to Mendez). Near junction of rios Pailas and Negro. 6000-7500 ft. Hollow-stemmed vine with milky sap, climbing to 10 m. Lvs. deep green above; nearly white-pubescent below. Bracts pale green, the tips dark green. Corolla glistening white, style-branches white. Anthers black. Pappus white. 20-24 Aug. 1945. Coll. Francisco Prieto. W.H.Camp E-4934 (Holotype NY, isotype US).

Munnozia campii is closely related to M. jussieui (Cass.) R.& B. (=Liabum nonoense Hieron.). Dr. Keck who originally determined the material noted some of the differences in a note "Nearest L. nonoense Hieron. Differs lf. blades deltoid-ovate, truncate at base, involucral bracts; pubescence of pedicels, etc., etc. . ." Not specified by Keck were two particularly significant differences, the lack of stipules on the nodes in M. campii and the presence of hairs on the upper surface of the leaves. In L. jussieui the stems always have stipules or a distinct ridge at the nodes, the leaf blades are ovate with less prominent angles, the upper surface is glabrous, the veins are trinervate from above the base of the blade with usually 1-2 pairs of weak secondaries below, the pedicels are completely covered with tomentum, and the phyllaries are lavender marginally. The heads of L. jussieui are generally larger with proportionately longer bracts.

The type locality is on the eastern slope of the eastern cordillera in the present province of Morona-Santiago about 25 km west of Mendez. The locality is more than 100 km south of the southernmost known locality of L. jussieui in Tungurahua.

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Liabum nudicaule H.Robinson, Holotype, United States National Herbarium. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Munnozia campii H.Robinson, Holotype, New York Botanical Garden.

Enlargements of heads: Top. Liabum nudicaule. Bottom. Munnozia campii.

A NEW SUBTRIBE IN THE HELIANTHEAE (COMPOSITAE): ESPELETIINAE.

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The genus Espeletia is known as the most representative taxonomic group of the paramo plant life. It is one with a high degree of diversification and endemism, yet growing in an apparently uniform environment. A few of the morphological modifications may be explained by mutation, isolation and ecological adaptation, as the variation in habit. This and other questions will be discussed, along with morphological study of every taxa, arranged according to a new natural classification, in a forthcoming monograph near completion. The purpose of this paper is to offer a summary of the main taxonomic conclusions affecting the present classification and nomenclature of the group, in order to make them available to the interested people before the publication of the whole revision.

The genus Espeletia Mutis was first published by Humboldt and Bonpland in Plantae Aequinociales, 1808, with three species from the Bogotá area. The floral characterization given was clearly that of the Heliantheae. Bonpland, in his remarks considered the genus close to Silphium from which it can be distinguished by the heavy white-woolly or silvery indumentum, by the phyllaries and by the angulate fruits. Surprisingly no mention was made of the unusual growth form of these plants. Humboldt, 1914, eventually, published a Trixis neriifolia Bonpl. name given to a resiniferous tree called "incienso" growing in the Andean forests of Silla de Caracas. Schultz Bip. transferred this species to the genus Espeletia in Weddell (1856) Chloris Andina. Weddell made two groups, one "Frutices" with two species (E. neriifolia, E. banksiaefolia) and the other "Herbae caespitosae" with nine species. In 1870, Ernst working in Caracas, unawhere of the transfer made by Schultz Bipontinus ex Weddell of the Trixis neriifolia, made a new genus for this species, Libanothamnus, which has been regarded as synonym to Espeletia by all subsequent botanist. Standley in 1915 was the first to mention and to publish photographs made by Jahn on the special stipitate rosette growth form of some species of Espeletia; in his key for 17 species he accepted Weddell's main division between trees and other forms. The real scientific treatment of Espeletia, complete at that time, was made by A. C. Smith and M. Koch, 1935, based in gross morphology, floral anatomy and palynology. Smith used largely his field experience in Colombia for the description of the habit and ecologic considerations. Thirty species distributed between Colombia and Venezuela, one extending into Ecuador, were recognized. They were arranged in

a workable key, in which the main division was between trees ("much-branched woody caudices") with 3 species, and Herbs ("caudex simple, subterranean or erect") with the remaining 27 species. Smith & Koch considered in the genus five groups defined on basis of habit: 1)branched caudices, 2) subligneous flowering branches, 3)herbaceous, 4) broad leaves with stout erect caudex, and 5) subterranean caudex with narrow leaves. A thorough comparative study of the groups, using many characters including floral anatomy, was presented. Important phylogentic considerations were brilliantly exposed. Smith recognized the close connection existing between Espeletia evolution and paramo ecology. He considered that the forebearer of the genus was derived from a woody ancestor similar to Polymnia which, as it migrated to the higher Andes adapted to the new environment; the main evolutionary trend would be from woody to herbaceous habit, a view generally accepted in recent times. Many of the diversification trends singled out by Smith may be sustained. With the considerable amount of information on Espeletia we have today, however, a new evaluation of the characters to be used for a natural classification has been necessary.

Since the classic publication by Smith & Koch in 1935, a flow of new collections from Colombia and Venezuela had been accumulating; this accounts for 61 new binomials totaling 91 validly published species of Espeletia in 1969, the year that I engaged in intensive final work to produce a monograph. This increase in the number of species was already shown in the excellent treatment of the genus by A. Aristeguieta in his vol. 10 of Compositae for the Flora of Venezuela, 1965, in which he recognizes 45 species, 27 more than in the Smith's monograph. Furthermore, since 1970 thirty-three more new species have been discribed, in great part due to my trips to the paramos and subparamos of Colombia and Venezuela in 1969, 1970 and 1973, with the great help and efficient field activity of my friends and field associates Drs. L. Ruiz-Terán, M. López-Figueiras of Merida, Drs. Garcia Barriga & R. Jaramillo of Bogotá and A. Cleef of Utrecht working in Colombia. The main purpose of my recent trips was, besides the eventual collection of undescribed species, to establish the true vegetative characteristics and type of inflorescences of many species, mainly the Venezuelan, which I had not had the opportunity of seeing "in vivo" before.

On these field trips, I became acquainted with the habit and other vegetative characters of almost all the species, features which can not be seen on the fragmentary herbarium collections with usually poor field annotations. The most important findings were already initiated the first day I collected in Venezuela when I discovered in Páramo del Zumbador that E. jahnii had very showy terminal inflorescences at the center of monocarpic, big rosettes, reminding me of pictures of Argyroxiphium. Similar observation followed near Páramo del Batallón, where I

found specimens of E. atropurpurea with broadly paniculate, profusely branched 2 m tall, terminal inflorescences, and so on. For every species, an attempt was made to find out its growth habit which often is obscured by the degradation of vegetation caused by excesive grazing and fires. The field observation were checked later with dried or preserved specimens at the herbarium, and after thorough study, several growth forms could be defined for Espeletia. These growth forms correlated with other vegetative and inflorescential characters proved to be of sufficient taxonomic importance to draw a new classification at the generic level. Following are listed in short the main types of growth form which prove to be of basic taxonomic significance.

1. Trees. Main erect trunk branched above the middle or at least the fourth of the total height. Branching dichasial or/ and pleiochasial, the main stem and main branches monopodial. Alternate leaves. Three types considered:

a) Inflorescences terminal. Distal branchlets growing sympodially. Leaf bases tubular, closed, embracing the stems. Rarely opposite leaves present. Fig.1

b) Inflorescences axillary of the upper leaves crowded at the branchlet-ends. Leaf bases closed, tubular or ring-shaped.

c) Inflorescences terminal. Branchlets growing sympodially. Leaf bases open.

2. Caulirosulae parvae ramosae. Dwarf shrubs or fruticeta, branched near the base, the branches first monopodial, later sympodial, usually decumbent or prostrate, ending each with a large dense rosette. Inflorescence single, terminal to each rosette, this dying after florescence, hence monocarpic.

3. Acaulirosulae with tuberose caudex, which might have short branching or lateral buds near the ground. Inflorescence terminal, the main supporting rosette dying after fructification, with further development of lateral buds. Rosettes monocarpic.

4. Acaulirosulae, with simple tuberose caudex and terminal inflorescence. Monocarpic.

5. Acaulirosulae with simple tuberose caudex, with axillary inflorescences. Polycarpic rosettes.

6. Acaulirosulae with rhizome, or semituberose subterranean caudex. Polycarpic rosettes with axillary inflorescences.

7. Caulirosula. Erect stem terminated with a large and dense rosette of permanent leaves. These are coriaceous and whitish lanate or tomentose. Below the crowded living leaves, often remain the marcescent leaves in the form of a dense cloak covering the whole length of the stem which looks much thick (up to 50 cm. diam) compared to the real width of the trunk (about 6-12 cm. diam). This is the most typical form of "frailejón". The trunk is fundamentally undivided, but eventually may be found with a pleiochasial branching near the base; the few branches in this case all grow erect and undivided, leaving the branching unnoticed, apparently,

without close examination. Accidental destruction of the terminal bud of the very young rosette may cause branching. There are two different types of caulirosula: with

a) Inflorescence single, central, terminal, usually very large. The whole plant dying after fructification. Monocarpic. Fig.2.

b) Inflorescences numerous, simultaneous, axillary, the caulirosula growing acropetally, indefinitely, along with continued flowering. Polycarpic. . Fig.3.

The biotype of "caulirosula" with short or long stem, is the most characteristic feature of the plant life of the high tropical mountains. It accounts for the physiognomy of the most part of the paramo vegetation. I have called the attention to this growth form since 1934 when I defined it and its collective designation (caulirosuletum). In 1934, I listed caulirosula and caulirosuletum under the heading of nanoarboretum. After many years of experience I consider that caulirosula has to be treated as an independent life-form with its own architecture either simple or branched.

With respect the inflorescences, the different types interesting here for taxonomic purposes are summarized as follows:

1) The thyrse of definite dichasial panicle with opposite branching and decussate bracts. The primitive basic inflorescence type. Fig.3.

2) The definite monochasial panicle with alternate branches, branchlets and bracts, usually adopting corymbiform arrangement. Fig.4 right.

3) The definite racemose, simple or compound disposition, with alternate branching and bracts. Fig.4 left.

4) The monocephalous scapi with opposite bracts.

5) The monocephalous scapi with alternate bracts. Each type of inflorescence is explained in order to avoid the existing confusion in the use of some technical terms (e.g. thyrse). It is the general assumption that number 2 is derived from number 1 by the way of abortion of half of the branches (simplification trend). The same explanation, following different mathematical rules, may be used to derive number 3 from number 1, number 4 from 1 or 3, and number 5 from number 2. Of all these types, the more elaborate are the first two, which show a complexity of structure in many cases, with some irregularity about the flowering succesion. The explanation must be that these inflorescences are in most cases compound inflorescences on monopodial growing axes until vegetative maturity. For this reason the use of the Troll's concept of synflorescence is here justified. It helps to interpret the variations in the rate of growth of different branches (partial inflorescences) and in the sequence of the anthesis at different levels. Some observations also, indicate the influence of the environment on the eventual asymmetry or other irregularities in the development of inflorescences.

A thorough study of more than one hundred recognizable species, presently known under Espeletia, proves that their differences in habit and inflorescence type are significant enough to base on them seven new basic groups separable at the genus level.

On the other hand, these new established genera have very much in common with respect to floral, fruit, heads and anatomic features which indicates that they compose a major taxonomic unity at the level of subtribe. The main characteristics of this subtribe are: Achenes triangular with at least the adaxial angle very acute, the abaxial side more or less convex and the surface smooth, the epidermis with amorphous traces of black pigment in the cells. Phyllaries at maturity thicker and harder, more or less embracing the achenes especially towards the base, often retaining them for a long time in the marcescent heads. Ray flowers 2-pluriseriate (rarely uniseriate); style branches with two marginal, thickened, stigmatic lines. Disc corollas tubular with broadened limb, 5-dentate. Anther appendices never glandular. Basic chromosome number x=19. Habit: trees, caulirosettes or acaulirosettes with coriaceous, xeromorphic, usually large leaves, at least abaxially densely hairy. All genera growing in cold and cold-temperate regions of the tropical high Andean mountains (paramos, subparamos, Anden forests near the timber line).

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ESPELETIINAE Cuatr. subtrib. nov. Helianthearum

Capitula heterogama. Receptaculum paleaceum nudum vel pilosum. Flores numerosi, ei radii feminei 2-pluriseriati, ei disci pseudohermaphroditi masculi fungentes. Corollae radii lamina ligulata alba vel lutea raro rubescenti vel purpurea, aut nulla, tubulo fere semper barbato. Rami stylorum radii binis lineis stigmaticis crassiusculis marginalibus. Corollae disci tubulares 5 dentatae, plerumque luteae. Antherae basi breviter sagittatae, cellulis exothecialibus oblongis in parietibus transversis noduliferis, appendicibus apicalibus ovatis mediale carinatis, nunquam glanduliferis. Stylus florum disci distale dense papilloso-pilosulus apice breviter bilobato non stigmatico, basi partiale in discum nectariferum tubulosum immersus. Achaenia exteriora obovoideo-triangulata facie abaxiali plus minusve convexa vel gibbosa, interiora plerumque oblonga quadrangulata; omnia glaberrima, laevia, calva, tantum rarissime pappo 1-3 paleis.

Involucrum pluriseriatum, phyllariis subherbaceis plus minusve inaequalibus, introrsum gradatim minoribus, imbricatis. Phyllaria fertilia maturitate plus minusve indurata, amplectentiuscula, achaenia retinentia. Paleae persistentes rigidulae amplectentes.

Grana pollinis tricolporata, a sphaeroideis prolatis usque sphaeroideis oblatis, ora saepe lalongata; exinium spinosum; tectum punctulatum, baculatum; cavum vice infratecti absenti.

Numerus basicus chromosomatum x = 19.

Arbores, aut frutices inferne ramosi vel caule simplice porrecto plus minusve elevato vel caudice rhizomatoso vel tuberoso, perennifoliati; plerumque polycarpici, aliquot monocarpici. Folia alterna, coriacea, vaginantia, in nodis valde approximatis nascentia, ad extremum caulis vel ramulorum crebra congeste fasciculata vel copiose rosulata, (saepe caulirosula). Lamina foliorum plerumque elongata, xeromorphica et saltem abaxiale dense trichomatosa. Schyzogeni canales et cellulae resiniferae universales in planta, kauranoide tetracyclici-diterpenoides efferentes.

Habitus foliorum rosulae vel subrosulae plerumque late comosus, valdeque conspicuus. Capitula parva vel lata in paniculis cymosis thyrsoideis, dichasialibus foliis decussatis, vel monochasialibus foliis alternis plerumque corymbiformibus, vel valde simplicibus usque ad singulum capitulum.

Species omnia regiones frigidae vel temperate frigidae Andium tropicorum Americae incola.

Typus: Espeletia Mutis ex Humboldt & Bonpland, Pl. Aeq. 2: 10, 1808. Species typica Espeletia grandiflora Humboldt & Bonpland, l.c. 2: 11. 1808.

Alia genera sunt: Libanothamnus, Ruilopezia, Tamania, Carramboa, Espeletiopsis et Coespeletia, illa clavis et diagnoses sequintur.

Clavis genericorum:

1. - Synflorescentiae terminales, floribundae.
2. - Arbores vel raro caulirosulae simplices. Vagina foliorum tubularis. Ligulae albae vel ochroleucae raro luteae. Receptaculum glabrum. Achaenia calva. Libanothamnus.

2'. Arbores vel frutices parvi vel caulirosulae simplices. Vagina foliorum aperta.

3. - Achaenia pappo 1-3 paleis instructa. Arbores. Ligulae luteae. Receptaculum parce pilosum. Tamania.

3'. Achaenia calva. Caulirosulae erectae et simplices, vel parvae, ramosae; foliis crebris dense rosulatis. Ligulae albae, luteae, aut rubro-purpureae. Receptaculum glabrum vel sparse pilosum. Ruilopezia.

1'. Synflorescentiae axillares. Achaenia calva.

4. - Arbores. Vagina foliorum tubularis. Folia ampla viridia. Receptaculum hirtum. Inflorescentiae floribundae ligulis luteis. Carramboa.

4'. Caulirosulae, erectae et elevatae vel subsessiles vel sessiles, simplices, interdum e basi pauce ramosae. Vagina foliorum aperta saepe grandis. Inflorescentiae aut floribundae aut modice floriferae vel valde reductae. Ligulae plerumque luteae, interdum albae, aut purpureae.

5. - Synflorescentiae corymboide-paniculatae, ramis ramulis foliis bracteisque alternis. Ligulae plerumque luteae, aut albae. Espeletiopsis.

5'. Synflorescentiae dichasiales vel racemiformes. Ligulae luteae.

6. - Synflorescentiae racemiformes, ramis ramulis bracteis foliisque alternis. Coespeletia.

6'. Synflorescentiae dichasiales; ramis, ramulis, foliisque saltem proximalibus semper oppositis. Espeletia.

LIBANOTHAMNUS Ernst, Vargasia, 7: 186. 1870.

Arbores perennifoliae foliis ad extremos ramulorum saepe glomeratis vel rosulatis raro caulirosula simplice.

Folia alterna, raro aliqua opposita. Vagina foliorum tubularis. Lamina anguste elliptica vel oblongo elliptica, rigide coriacea multiparalleli-nervata nervis patulis (angulo 70-90° ascendentibus) valde approximatis, supra viridis, abaxiale lanata vel tomentosa.

Synflorescentiae terminales, corymboide paniculatae multicapitulatae, ramis alternis, interdum aliquis oppositis; foliis partis proximalis vegetativae alternis, interdum oppositis.

Capitula parva vel mediana, radiata vel pseudodiscoidea. Ligulae albae vel eburneae, raro ochroleucae luteae vel obsoletae. Corollae disci limbo subcampanulato, dentato, luteo vel viridi. Receptaculum conicum glabrum. Phyllaria fertilia vel paleae saepe copiosis glandulis obovoideis ad marginibus notatis. Achaenia epapposa.

Species regiones temperate frigidae tropicorum Andium habitant. Venezuela, Colombia.

Typus: Libanothamnus neriifolius (B. ex H.) Ernst. = Trixis neriifolia Bonpland ex Humboldt.

LIBANOTHAMNUS ARBOREUS (Aristeg.) Cuatr. comb. nov.
Espeletia arborea Aristeg. Bol. Soc. Venez. Cienc. Nat. 20: 286. 1959.

LIBANOTHAMNUS BANKSIAEFOLIUS (Sch. Bip. et Ettingsh) Cuatr. comb. nov.
Espeletia banksiaefolia Sch. Bip. et Ettingsh. ex Wedd. Chl. And. 1: 67. 1856.

LIBANOTHAMNUS GLOSSOPHYLLUS (Mattfeld) Cuatr. comb. nov.
Espeletia glossophylla Mattfeld Nottizblatt 10: 702. 1929.

LIBANOTHAMNUS GRANATESIANUS (Cuatr.) Cuatr. comb. nov.
Espeletia granatesiana Cuatr. Phytologia 27: 44. 1973.

LIBANOTHAMNUS GRIFFINII (Ruiz-Terán & López-Figueiras) Cuatr. comb. nov.
Espeletia griffinii Ruiz-Terán & López-Figueiras, Rev. Fac. Farm. Univ. Andes Merida, 17: 7. 1976.

LIBANOTHAMNUS HUMBERTII (Cuatr.) Cuatr. comb. nov.
Espeletia humbertii Cuatr. Not. Syst. Paris 15: 233. 1956.

LIBANOTHAMNUS LISCANOANUS (Cuatr.) Cuatr. comb. nov.
Espeletia liscanoana Cuatr. Phytologia 27: 41. 1973.

LIBANOTHAMNUS LUCIDUS (Aristeg.) Cuatr. comb. nov.
Espeletia lucida Aristeg. Compositae in Fl. Venezuela 10(1): 420. 1964.

LIBANOTHAMNUS OCCULTUS (Blake) Cuatr. comb. nov.
Espeletia occulta Blake, Contr. U. S. Nat. Herb. 20: 537. 1924.

LIBANOTHAMNUS SPECTABILIS (Cuatr.) Cuatr. comb. nov.
Espeletia spectabilis Cuatr. Phytologia 27: 46. 1973.

LIBANOTHAMNUS SUBNERIIFOLIUS (Cuatr.) Cuatr. comb. nov.
Espeletia subneriifolia Cuatr. Mutisia 16: 3. 1953.

LIBANOTHAMNUS TAMANUS (Cuatr.) Cuatr. comb. nov.
Espeletia tamana Cuatr. Phytologia 27: 171. 1973.

LIBANOTHAMNUS WURDACKII (Ruiz-Terán & López-Figueiras) Cuatr. comb. nov.
Espeletia wurdackii Ruiz-Terán & López-Figueiras, Rev. Fac. Farm. Univ. Andes Merida, 17: 1. 1976.

RUILOPEZIA Cuatr. gen. nov. Helianthearum, subtrib. Espeletiinae.

Caulirosulae simplices monocarpicae, vel paulo et congeste pauciramosae. Caules dense adpresseque cum foliis marcescentibus tecti.

Folia coriacea flexibilia vel rigida crebra congeste rosulata. Vagina foliorum aperta. Lamina foliorum anguste elliptica elongata vel linearis, nervis secundariis angulo acuto vel patulis, abaxiale dense lanata vel sericea.

Synflorescentiae terminales corymboide vel thyrsoide paniculatae, multicapitatae, ramis alternis, foliis partis proximalis vegetativae alternis, rosula subtendenti monocarpica.

Capitula mediana radiata vel pseudo-discoidea. Ligulae albae, viridulae, eburneae, luteae raro rubescentes vel absentes. Corollae disci limbo subcampanulato dentato luteo, eburneo vel viridi, raro rubescenti. Receptaculum conicum vel convexum glabrum vel parce pilosum. Phyllaria et paleae saepe ± glanduliferae. Achaenia epapposa.

Species regiones frigidae et temperate frigidae tropicorum Andium incola. Venezuela.

Genus dicatus amici, professores Universitatis Andium Meridensis, Luis Ruiz Terán et Manuel López Figueiras, clari botanici, diligentissimi consociati exploratores Venezalensis florae, praecipue paramorum, qui plures species Espeletiinearum conjuncte invenerunt.

Typus: Espeletia figueirasii Cuatr.

RUILOPEZIA ATROPURPUREA (A. C. Sm.) Cuatr. comb. nov.
Espeletia atropurpurea A. C. Sm. Brittonia 1: 508. 1935.

RUILOPEZIA BRACTEOSA (Standl.) Cuatr. comb. nov.
Espeletia bracteosa Standl. Am. Journ. Bot. 2: 484. 1915.

RUILOPEZIA BROMELIOIDES (Cuatr.) Cuatr. comb. nov.
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Espeletia cardonae Cuatr. Rev. Acad. Colomb. Cienc. 5: 20. 1942.

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Espeletia coloradarum Cuatr. Phytologia 29 (5): 372. 1975.

RUILOPEZIA CUATRECASASII (Ruiz T. & López F.) Cuatr. comb. nov.
Espeletia cuatrecasassii Ruiz-Terán & López-Figueiras, Rev. Fac. Farm. Univ. Andes Mérida 14: 5. 1974.

RUILOPEZIA FIGUEIRASII (Cuatr.) Cuatr. comb. nov.
Espeletia figueirasii Cuatr. Phytologia 29: 475. 1971.

RUILOPEZIA FLOCCOSA (Standl.) Cuatr. comb. nov.
Espeletia floccosa Standl. Am. Journ. Bot. 2: 481. 1915.

RUILOPEZIA FRAILEJONOTA (Aristeg.) Cuatr. comb. nov.
Espeletia frailejonota Aristeguieta, Compositae in Fl. Venez. 10 (1): 425. 1964.

RUILOPEZIA GRISEA (Standl.) Cuatr. comb. nov.
Espeletia grisea Standl. Am. Journ. Bot. 2: 477. 1915.

RUILOPEZIA HANBURIANA (Cuatr.) Cuatr. comb. nov.
Espeletia hanburiana Cuatr. Soc. Venez. Cienc. Nat. 17: 86. 1956.

RUILOPEZIA JABONENSIS (Cuatr.) Cuatr. comb. nov.
Espeletia jabonensis Cuatr. Phytologia 23: 360. 1972.

RUILOPEZIA JAHNII (Standl.) Cuatr. comb. nov.
Espeletia jahnii Standl. Am. Journ. Bot. 2: 479. 1915.

RUILOPEZIA JOSEPHENSIS (Cuatr.) Cuatr. comb. nov.
Espeletia josephensis Cuatr. Phytologia 29 (5): 374. 1975.

RUILOPEZIA LEUCACTINA (Cuatr.) Cuatr. comb. nov.
Espeletia leucactina Cuatr. Phytologia 29: 377. 1945.

RUILOPEZIA LINDENII (Sch. Bip. ex Wedd.) Cuatr. comb. nov.
Espeletia lindenii Sch. Bip. ex Wedd. Chl. And. 1: 67. 1856.

RUILOPEZIA LOPEZ-PALACII (Ruiz-Terán & López-Figueiras.) Cuatr. comb. nov.
Espeletia lopez-palacii Ruiz-Terán & López-Figueiras, Rev. Fac. Farm. Univ. Andes Mérida, 17: 13. 1976.

RUILOPEZIA MARCESCENS (Blake) Cuatr. comb. nov.
Espeletia marcescens Blake, Contr. U. S. Nat. Herb. 20: 536. 1924.

RUILOPEZIA MARGARITA (Cuatr.) Cuatr. comb. nov.
Espeletia margarita Cuatr. Phytologia 27: 49. 1973.

RUILOPEZIA PALTONIOIDES (Standl.) Cuatr. comb. nov.
Espeletia paltonioides Standl. Am. Journ. Bot. 2: 482. 1915.

RUILOPEZIA RUIZII (Cuatr.) Cuatr. comb. nov.
Espeletia ruizii Cuatr. Phytologia 23: 362. 1972.

RUILOPEZIA VIRIDIS (Aristeg.) Cuatr. comb. nov.
Espeletia viridis Aristeg. Bol. Soc. Venez. Cienc. Nat. 20: 279. 1959.

TAMANIA Cuatr. gen. nov. Helianthearum subtrib. Espeletiinae.

Arbores perennifoliae foliis ad extremos ramulorum glomeratis vel rosulatis.

Folia alterna. Vagina foliorum semicircularis, aperta. Lamina foliorum coriacea ± flexibilis, late oblanceolata vel oblance-elliptica, nervis secundariis abaxiale prominulis 2-6 mm inter se distantibus, angulo 30-50° ascendentibus, indumento dense adpresseque sericeo molliterque leporino.

Synflorescentiae terminales corymboide paniculatae multicapitulatae, ramis alternis, foliis partis proximalis vegetativae alternis.

Capitula parva, radiata. Ligulae luteae. Corolla disci limbo subcampanulato, dentato, luteo. Receptaculum conicum parce pilosulum. Phyllaria paleaque eglanduliferae. Achaenia pappi 3-1 paleis lanceolatis rigidis, rarissime aliqua calva. Flores masculi etiam saepe pappo 1-3 paleis tenuibus linearibus.

Species regiones temperate frigidae tropicorum Andium. Páramo de Tamá, Colombia, Venezuela.

Typus: Espeletia chardonii A. C. Smith. Synonym: Espeletia leporina Cuatr.

TAMANIA CHARDONII (A. C. Sm.) Cuatr. comb. nov.
Espeletia chardonii A. C. Smith, Bol. Soc. Venez. Cienc. Nat. 7: 237. Apr. 1942. Venezuela. Espeletia leporina Cuatr.

Rev. Acad. Colomb. Cienc. 5: 17, fig. 3-5; 9D, C; pl 2. June 1942. Colombia.

CARRAMBOA Cuatr. gen. nov. Helianthearum subtrib. Espeletiinae.

Arbores perennifoliae bene vel parum ramosae, foliis latis ad extremos ramulorum glomeratis, seu rosulatis.

Folia alterna. Vagina foliorum tubularis. Lamina foliorum ampla coriacea ovata vel obovata vel elliptica, viridis, nervis secundariis abaxiale prominentibus, inaequalibus, angulo 60-80° ascendentibus, 1-6 cm inter se distantibus, abaxiale moderate villosa lanuginosa vel tomentosa.

Synflorescentiae axillares, corymboide paniculatae multicapitulatae, ramis proximalibus oppositis, alteris plerumque alternis, foliis partis proximalis vegetativae oppositis.

Capitula parva, radiata; ligulae amotis 6-8(-10) mm. Corollae disci limbo subcampanulato dentato luteo. Ligulae luteae. Receptaculum convexo-conicum hirtum. Phyllaria fertilia et paleae disci eglanduliferae, vel glanduliferae. Achaenia epapposa.

Species regiones temperate frigidae tropicorum Andium habitant. Venezuela. Nomen incolarum: "carrambo".

Typus: Espeletia pittieri Cuatr.

CARRAMBOA BADILLOI (Cuatr.) Cuatr. comb. nov.
Espeletia badilloi Cuatr. Ciencia (Mexico) 6: 261. 1945.

CARRAMBOA PITTIERI (Cuatr.) Cuatr. comb. nov.
Espeletia pittieri Cuatr. Ciencia (Mexico) 6: 262. 1945.

CARRAMBOA LITTLEI (Aristeg.) Cuatr. comb. nov.
Espeletia littlei Aristeg. Compositae in Fl. Venez. 10(1): 433. 1964.

CARRAMBOA TRUJILLENSIS (Cuatr.) Cuatr. comb. nov.
Espeletia trujillensis Cuatr. Mutisia 16: 5. 1953.

CARRAMBOA RODRIGUEZII (Cuatr.) Cuatr. comb. nov.
Espeletia rodriguezii Cuatr. Phytologia 29 (5): 379. 1975.

ESPELETIOPSIS Cuatr. gen. nov. Helianthearum, subtrib. Espeletiinae.

Caulirosulae simplices caule valde elongato erectoque vel brevi, interdum pauciramoso, polycarpicae. Caulis plerumque dense adpresseque cum foliis marcescentibus tectus, vel interdum mox denudatus.

Folia alterna coriacea plerumque rigida vel plus minusve flexibilia crebra congeste rosulata. Vagina aperta plana congeste imbricata. Lamina late vel anguste elliptica vel linearis abaxiale dense lanata vel sericea, nervis secundariis plerumque prominentibus.

Synflorescentiae vel inflorescentiae axillares, cymoso-monchasiales corymboide vel subcorymboide paniculatae, multiflorae vel interdum valde reductae, ramis alternis aliquando parcissimis oppositis; foliis partis proximalis vegetativae semper alternis.

Capitula parva vel mediana, radiata vel eradiata; ligulae luteae raro albae; corollae disci limbo tubuloso-campanulato dentato luteo interdum purpurascenti. Grana pollinis spinis 3-7 micronis longis. Receptaculum convexum vel conicum, glabrum vel pilosum. Achaenia calva.

Species regiones frigidae vel temperate frigidae, paramorum Andium tropicae Americae incola. Colombia et Venezuela.

Typus: Espeletia jimenez-quesadae Cuatr.

ESPELETIOPSIS ANGUSTIFOLIA (Cuatr.) Cuatr. comb. nov.
Espeletia angustifolia Cuatr. Bol. Soc. Venez. Cienc. Nat. 17 (85): 80. 1956.

ESPELETIOPSIS BOGOTENSIS (Cuatr.) Cuatr. comb. nov.
Espeletia bogotensis Cuatr. Rev. Acad. Colomb. Cienc. 3: 427. 1940.

ESPELETIOPSIS CALDASII (Cuatr.) Cuatr. comb. nov.
Espeletia caldasii Cuatr. Rev. Acad. Colomb. Cienc. 3: 431. 1940.

ESPELETIOPSIS COLOMBIANA (Cuatr.) Cuatr. comb. nov.
Espeletia colombiana Cuatr. Rev. Acad. Colomb. Cienc. 3: 249. 1940.

ESPELETIOPSIS CORYMBOSA (Humb. & Bonpl.) Cuatr. comb. nov.
Espeletia corymbosa Humb. & Bonpl. Pl. Aequin. 2: 16. 1808.

ESPELETIOPSIS CRISTALINENSIS (Cuatr.) Cuatr. comb. nov.
Espeletia cristalinensis Cuatr. Phytologia 27: 169. 1973.

ESPELETIOPSIS FUNCKII (Sch. Bip. ex Wedd.) Cuatr. comb. nov.
Espeletia funckii Sch. Bip. ex Wedd. Chl. And. 1: 64. 1855.

ESPELETIOPSIS GARCIAE (Cuatr.) Cuatr. comb. nov.
Espeletia garciae Cuatr. Phytologia 23: 358. 1972.

ESPELETIOPSIS GLANDULOSA (Cuatr.) Cuatr. comb. nov.
Espeletia glandulosa Cuatr. Rev. Acad. Colomb. Cienc. 3: 434. 1940.

ESPELETIOPSIS GUACHARACA (Diaz) Cuatr. comb. nov.
Espeletia guacharaca Diaz, Caldasia 11: 19. 1975.

ESPELETIOPSIS INSIGNIS (Cuatr.) Cuatr. comb. nov.
Espeletia insignis Cuatr. Rev. Acad. Colomb. Cienc. 3: 432. 1940.

ESPELETIOPSIS JAJOENSIS (Aristeg.) Cuatr. comb. nov.
Espeletia jajoensis Aristeg. Comp. in Fl. Venez. 10 (1): 424. 1964.

ESPELETIOPSIS JIMENEZ-QUESADAE (Cuatr.) Cuatr. comb. nov.
Espeletia jimenez-quesadae Cuatr. Rev. Acad. Colomb. Cienc. 3: 247. 1940.

ESPELETIOPSIS MERIDENSIS (Cuatr.) Cuatr. comb. nov.
Espeletia meridensis Cuatr. Mutisia 16: 4. 1953.

ESPELETIOPSIS MUISKA (Cuatr.) Cuatr. comb. nov.
Espeletia muiska Cuatr. Rev. Acad. Colomb. Cienc. 3: 429. 1940.

ESPELETIOPSIS PANNOSA (Standl.) Cuatr. comb. nov.
Espeletia pannosa Standl. Am. Journ. Bot. 2: 480. 1915.

ESPELETIOPSIS PETIOLATA (Cuatr.) Cuatr. comb. nov.
Espeletia petiolata Cuatr. Rev. Acad. Colomb. Cienc. 4: 338. 1941.

ESPELETIOPSIS PLEIOCHASIA (Cuatr.) Cuatr. comb. nov.
Espeletia pleiochasia Cuatr. Rev. Acad. Colomb. Cienc. 3: 432. 1940.

ESPELETIOPSIS POZOENSIS (Cuatr.) Cuatr. comb. nov.
Espeletia pozoensis Cuatr. Ciencia (Mexico), 6: 266. 1945.

ESPELETIOPSIS PURPURASCENS (Cuatr.) Cuatr. comb. nov.
Espeletia purpurascens Cuatr. Rev. Acad. Colomb. Cienc. 5: 16. 1942.

ESPELETIOPSIS SANTANDERENSIS (A. C. Smith) Cuatr. comb. nov.
Espeletia santanderensis A. C. Smith, Brittonia 1: 527. 1935.

ESPELETIOPSIS SCLEROPHYLLA (Cuatr.) Cuatr. comb. nov.
Espeletia sclerophylla Cuatr. Rev. Acad. Colomb. Cienc. 3: 436. 1940.

ESPELETIOPSIS TACHIRENSIS (Aristeg.) Cuatr. comb. nov.
Espeletia tachirensis Aristeg. Comp. in Fl. Venezuela 10 (1): 427. 1964.

ESPELETIOPSIS TRIANAE (Cuatr.) Cuatr. comb. nov.
Espeletia trianae Cuatr. Rev. Acad. Colomb. Cienc. 5: 18. 1942.

COESPELETIA Cuatr. gen. nov. Helianthearum, subtrib. Espeletiinae.

Caulirosulae simplices erectae, polycarpicae, raro rosula

sessili. Caulis infra rosulam crasse denssissime adpressissimeque cum foliis marcescentibus undique tectus.

Folia alterna coriacea vel subcoriacea plus minus rigida crebrissime rosulata. Vagina aperta plana congeste imbricata. Lamina anguste elliptica vel linearis crasse denseque lanata vel tomentosa.

Inflorescentiae axillares cymoso-monochasiales stricte racemoides, interdum reductissimae, vel synflorescentiae paniculato-racemoides, axe elongato, ramis semper alternis longitudine uniformi; foliis partis proximalis vegetativae semper alternis.

Capitula mediana vel grandia radiata; corollae radii saepe cum processis dentiformibus vel lingulatis adaxiale munitae; ligulae luteae vel aurantiacae; corollae disci limbo tubuloso dentato luteo. Grana pollinis spinis numerosis usque ad 3 micra longis. Receptaculum planum vel plano-convexum, hirtum. Achaenia calva.

Species omnes regiones frigidae paramorum Andium habitant. Venezuela.

Typus: Espeletia spicata Schultz Bip. ex Weddell.

COESPELETIA ALBA (A. C. Smith) Cuatr. comb. nov.
Espeletia alba A. C. Smith, Brittonia 1: 512. 1935.

COESPELETIA ELONGATA (A. C. Smith) Cuatr. comb. nov.
Espeletia elongata A. C. Smith, Am. Journ. Bot. 27: 546. 1940.

COESPELETIA LUTESCENS (Cuatr. & Aristeg.) Cuatr. comb. nov.
Espeletia lutescens Cuatr. & Aristeg. Comp., Fl. Venez. 10 (1): 443. 1964.

COESPELETIA MARCANA (Cuatr.) Cuatr. comb. nov.
Espeletia marcana Cuatr. Phytologia 20: 476. 1971.

COESPELETIA MORITZIANA (Sch. Bip. ex Wedd.) Cuatr. comb. nov.
Espeletia moritziana Sch. Bip. ex Wedd. Chl. And. 1: 65. 1856.

COESPELETIA SPICATA (Sch. Bip. ex Wedd.) Cuatr. comb. nov.
Espeletia spicata Sch. Bip. ex Wedd. Chl. And. 1: 65. 1856.

COESPELETIA THYRSIFORMIS (A. C. Smith) Cuatr. comb. nov.
Espeletia thyrsiformis A. C. Smith, Brittonia 1: 513. 1935.

COESPELETIA TIMOTENSIS (Cuatr.) Cuatr. comb. nov.
Espeletia timotensis Cuatr. Bol. Soc. Venez. Cienc. Nat. 17 (85): 84. 1956.

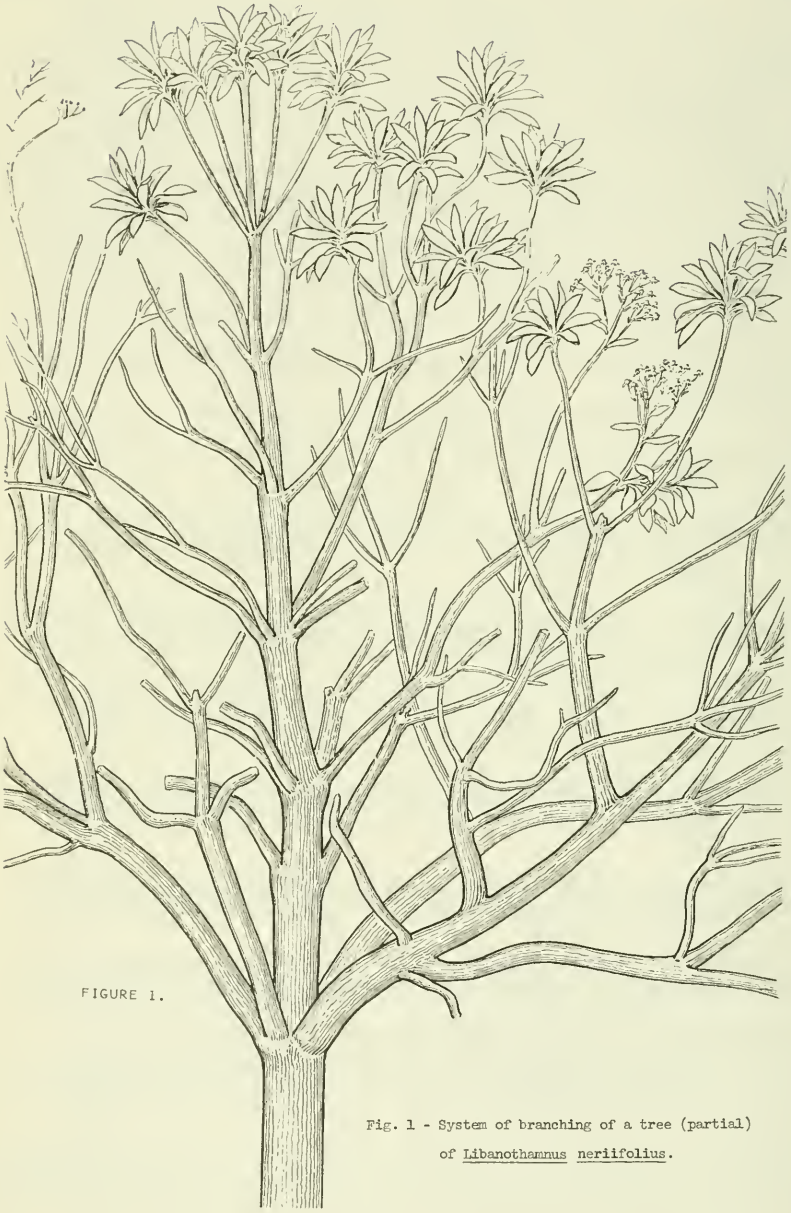

Fig. 1 - System of branching of a tree (partial) of Libanothamnus neriifolius.

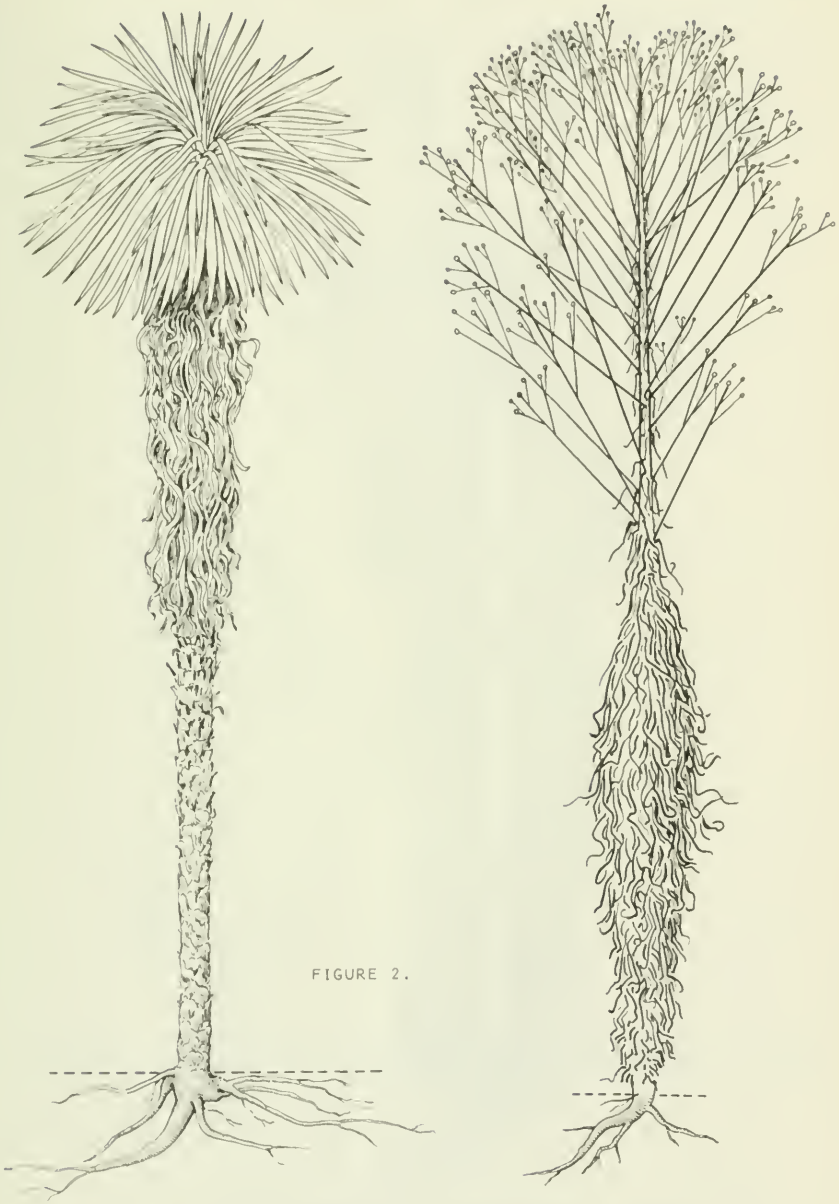

FIGURE 2.

Fig. 2 - Ruilopezia figueirasii, typical monocarpic caulirosula: sterile leafy plant (left, about 2 m tall); dying, fructifying individual (right, about 3 m high).

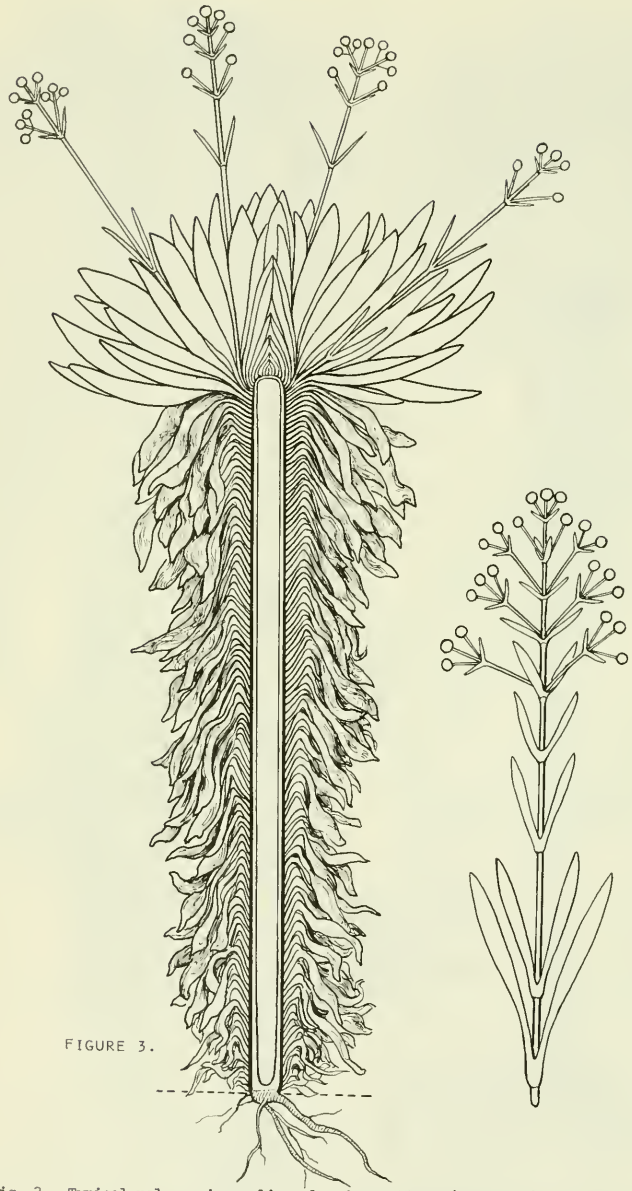

FIGURE 3.

Fig. 3 - Typical polycarpic caulirosula, in section, (about 1.6 m high) and the basic type of inflorescence of E. grandiflora (1 m. nat. size).

Fig. 4 - Inflorescences of Coespeletia spicata (1 m long, left) and Espeletiopsis jimenez-quesadae (80 cm long, right).

BOOK REVIEWS

Alma L. Moldenke

"GUIDE TO THE LITERATURE OF BOTANY; Being a Classified Selection of Botanical Works Including Nearly 6000 Titles Not Given in Pritzel's 'Thesaurus'" by Benjamin Daydon Jackson, xl & 626 pp., Facsimile Edition by Otto Koeltz Science Publishers, D-6124 Koenigstein, West Germany. 1974. DM.110.

The author was a bibliographer par excellence, a leader in the Index Society, Secretary to the Linnean Society and the source of the valuable historical introduction and informative annotations on many of the botanical publications garnered here under such topics as: Pre-Linnean Botany, Palaeobotany, Economic Botany, Local Floras, Botanical Gardens, etc. This work was first issued by Longmans, Green & Co., London, in 1881 for the Index Society. The first replication edition appeared in 1964 by the Hafner Publishing Company of New York. This is the second replication edition appearing just a decade later with rights now held by Sven Koeltz. The original Addenda portion is also included.

This is a valuable book. How fortunate that more copies of it are now hereby made available.

"HYDROBOTANICAL METHODS" by Richard D. Wood, x & 173 pp., illus., University Park Press, London, Tokyo & Baltimore, Maryland 21202. 1975. $10.75 paperbound, looseleaf spiral backing.

This guide provides training for aquatic ecologists through its well developed series of field and laboratory projects that are oriented for university student training and are equivalent to actual assignments given to competent professional aquatic biologists and environmentalists such as: radio-isotope uptake of ^{32}P and ^{65}Zn, Diel periodicity, vegetational analysis associated with varying degrees and kinds of water pollution, etc. There are carefully explained detailed directions and references given. The term "species" is misused several times in the text (e.g., p. 75). The specific name for the Eriocaulon on Rhode Island is now considered by some authorities as E. pellucidum Michx. Typographical errors in common words appear too often, as on p. 10. This page consists of a 1940 Fassett chart of more use to an amateur enjoying the "wet" out-of-doors. In the present manual its simplicity is misleading and/or unnecessary. Other illustrative diagrams are of good quality.

"FLORIDA LANDSCAPE PLANTS: Native and Exotic" revised edition by John V. Watkins & Thomas J. Sheehan, viii & 420 pp., illus., The University Presses of Florida, Gainesville, Florida 32603. 1975. $11.95.

A recent issue of this journal carried my review welcoming the 1974 fifth printing of the original edition. Herewith this fuller revised edition is also heartily welcomed for the many people interested in horticulture especially involving the growing of subtropical and tropical habitat plants; for the professional and/or amateur gardener and/or landscaper; for retirees seeking warmer climates without excessive winter fuel bills; for any English-reading school and/or horticulture teachers in not only Florida but in any other parts of this world where such plants do grow or can grow either naturally or by such encouragement as cutting back, drying out, covering or transferring indoors during cooler seasons, selective breeding.

This revision contains a few printing and illustration changes, the addition of over 50 new kinds of plants and 4 extra color plates. The familiar single page format for each plant provides attractively and accurately much valuable information.

"PROCEEDINGS OF THE EIGHTH INTERNATIONAL CONFERENCE ON NUMERICAL TAXONOMY" edited and directed by George F. Estabrook, xvii & 429 pp., illus., W. H. Freeman & Co., San Francisco, California 94104. 1976. $12.50.

This conference, held at the end of the summer of 1974 in Oeiras, Portugal, was supported by the Fundacão Calouste Gulbenkian.

This report gains and maintains its value by presenting not only honed scientific papers by leaders in this pioneering field (e.g., Gower, Gould, Johnston) but also the sensibly edited queries and comments by other participants (e.g., Rohlf, Sokal, Sneath) as integral closings to each session. The sessions were programmed as: I. Statistical criteria for phenetic clusters, II. Statistical inference and simulation of evolutionary trees, III. Nonstandard phenetics (v. charts on pp. 139 & 140), IV. Estimating evolution from molecular data, V. Interpopulation variation (e.g., house sparrows), and VI. The search for true cladistic characters. The papers give their bibliographic sources, but there is no general index. The text and illustrations, mostly as charts and formulae, are photocopied from neatly typed sheets. The paper of broadest appeal is the banquet address -- given between courses -- by Heywood on Contemporary Objectives in Systematics in which he interprets that evolutionary tree, evaluates early taxonomic efforts as "data processing before computers", the recent information explosion, conduct of present and projected research, the need for thoughtfully oriented criteria for the training of future taxonomists, etc. so that we

can be "prepared to stand back and take a broader view of the priorities now facing us, we may well find that within a few years the freedom of choice we now enjoy will have disappeared for good."

"ARCHAEOLOGICAL ATLAS OF THE WORLD" by David Whitehouse & Ruth Whitehouse, [iv] & 272 pp., illus. with 103 maps drawn by John Woodcock & Shalom Schotten, W. H. Freeman & Co., San Francisco, California 94104. 1975. $17.00 hard cover clothbound & $8.95 paperbound.

These Oxford and Cambridge trained author-archaeologists have attractively and carefully planned this Atlas "to meet the requirements of professional archaeologists, students, and the ever-increasing numbers of amateurs and interested laymen who wish to become familiar with the current archaeological scene both at home and abroad."

Over 5,000 pre- and proto-historic sites are pinpointed on these meticulously checked maps. They are so easily readable, being marked in soft tans and white for topographic features, standardized grid coordinates and leading modern cities and having superimposed in black both the names of the ancient sites and the symbols for the validating "remains" or "digs". For each full page map there is typically corresponding description of that civilization. Selective "Further Reading" is offered in each case. There is a several-columned, several-paged index for all site names with grid references.

Having all this material organized within a single book binding will prove a great convenience to many readers as well as a real service to science.

"FIELD PHOTOGRAPHY: Beginning and Advanced Techniques" by Alfred A. Blaker, xxi & 451 pp., illus., W. H. Freeman & Company, San Francisco, California 94104. 1976. $19.95.

The author's outstanding career at the University of California at Berkeley, his famous "Photography for Scientific Publications" (1965, Freeman) and his more recent training of assorted university field naturalists eminently qualify him to write this book.

The text is clearly explained and exemplified by 156 illustrations with 18 in color. Many of these plates have two original photographs showing results of different techniques. A "Field-Use Data Booklet" is provided with each copy of this text with technical tables, directions, and note spaces all condensed into a flexible booklet slightly smaller than this PHYTOLOGIA issue.

Blaker emphasizes the importance of a properly prepared approach so that primary attention can be given to the field events to be recorded on film.

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CONTENTS

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AN ALTITUDINAL SURVEY OF SPECIES OF *BEGONIA* HAVING A HORNED FRUIT[1]

by

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ABSTRACT

During the months of June, July, and August, 1973, twenty-five different species of *Begonia*, of which several belong to the section Casparya, were collected in Colombia; a significant characteristic of this section is the horned fruit. Of the eight species collected within Casparya having this fruit, seven were located above 2,000 meters. Altitudinal information subsequently were obtained from one hundred forty-five herbarium collections, of which one hundred twenty-four, or 86%, were recorded as occurring at or above this elevation. Of thirty-four species possessing this fruit types only five species have been observed to range both above and below 2,000 meters. Of the other twenty-nine species, whose distribution is more restricted, twenty-one have been observed to range from this altitude and higher; this represents 72% of the species on which data were obtained. Five additional species of Begonia have a horned fruit and are found at low elevations in Brazil. Those species belong to the largest American sections, Pritzelia and Begoniastrum; their elevations are tabulated here, also. This paper is intended only to present a survey of some altitudinal data and does not represent a complete ecological or taxonomic study of horned fruit species.

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[1]This research was supported in part by grants from the Colorado College Venture Committee and The American Begonia Society.

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INTRODUCTION

The Begoniaceae is primarily composed of the genus Begonia, which includes approximately 1000 species (Barkley, 1972). This genus is divided into sections varying in size from one species to one hundred or more in certain cases. Gradient analysis for elevation has been carried out by Whittaker (1967) where vegetation samples were taken along equal intervals. His findings for transects in the Great Smoky Mountains, Tennessee, indicate that certain tree species do not have sharply defined boundaries along a gradient. Rather the species show a peak density of individuals with a decreasing density at lower or higher elevations beyond the maximum. This paper presents only the elevational distribution of horned fruit species of Begonia, and tabulates some preliminary data on the average elevation of many American sections of the genus.

Species of Begonia possessing the horned fruit appear to be distributed at elevations generally greater than 2000 meters. This paper presents a tabulation and analysis of collections made by the author, held in the Gray Herbarium, and reported in the articles of Smith and Schubert (1946, 1958, and 1961), Smith and Smith (1971), Barkley (1972), and Smith (1973). Smith and Schubert (1946) provide the key to Colombian species of Begonia in their monograph. They distinguish among certain species having fruit which is either winged or horned. Their description of the latter being:

> Ovary and capsule turbinate, not winged but equally 3-horned from the upper part of the angles; stigmatic tissue usually covering all sides of the styles; capsule dehiscent at angles; staminate tepals 4.

Barkley's (1972) list of species of the Begoniaceae was also used to identify additional species placed in the section Casparya after 1961 and to determine the section to which other species belong. Collections made prior to 1946 were included in Smith and Schubert's paper, while any material at the Gray Herbarium obtained after their paper was used in this study. The additional data on horned fruit species placed in the sections Begoniastrum and Pritzelia was obtained from Smith and Smith's (1971) monograph on the Begoniaceae of Santa Catarina, Brazil. Smith's (1973) monograph on Venezuelan Begonia includes several newly described species, as well as altitude information on the distribution of other horned fruit species.

GENERAL ALTITUDINAL DISTRIBUTION OF AMERICAN BEGONIA

A survey of some literature (Smith and Schubert 1941, 1946, 1950, 1958, 1961; Smith and Smith (1971); and Smith (1973) was

TABLE 1

AVERAGE ELEVATIONS OF AMERICAN SECTIONS OF BEGONIA

SECTION	No. of Recognized Species	No. of Species Described	Lowest Elevation Recording (in meters)	Highest Elevation Recording (in meters)	Average Elevation (in meters)	Primary Geographical Distribution
Casparya Warburg	40	34*	500	3350	2280	Colombia, Venezuela
Gobenia A.D.C.	10	2	1650	2493	2070	Colombia
Barya A.DC.	3	2	1600	2500	2050	Andes, Mexico
Australes Smith & Schubert	14	3	850	3467	2030	Argentina
Lepsia A.DC.	4	3	815	2553	1850	Colombia
Eupetalum A.DC.	4	1	1675	1675	1680	Andes
Pildera A.DC.	2	1	920	2200	1640	Colombia
Ruizopavonia A.DC.	35	12	600	2400	1610	Peru
Huszia A.DC.	32	11	108	2950	1600	Andes
Knesebeckia A.DC.	34	6	415	2000	1330	Mexico
Rossmannia A.DC.	3	2	800	1900	1080	Andes
Gireoudia A.DC.	63	19	50	1980	1050	Mexico, Central America
Begoniastrum L.	103	16	233	2500	1040	Tropical America

TABLE 1 (Cont'd)

AVERAGE ELEVATIONS OF AMERICAN SECTIONS OF BEGONIA

SECTION	No. of Recognized Species	No. of Species Described	Lowest Elevation Recording (in meters)	Highest Elevation Recording (in meters)	Average Elevation (in meters)	Primary Geographical Distribution
Meionanthera A.DC.	1	1	560	1498	1030	Colombia, Ecuador
Weilbachia A.DC.	12	2	350	2000	1030	Mexico
Scheidweileria A.DC.	6	1	220	2200	990	Brazil
Podandra A.DC.	2	1	300	1400	850	Guatemala, Mexico
Cyathocnemis A.DC.	1	1	680	700	690	Peru
Doratometra A.DC.	13	8	61	1700	740	Tropical America
Pritzelia A.DC.	107	11	329	1900	660	Brazil
Bradea Toledo	11	1	100	1000	540	Brazil
Trendelenburgia A.DC.	2	1	5	1000	420	Brazil
Enita Brade	4	1	50	500	270	Brazil
Solananthera A.DC.	4	1	5	750	250	Brazil

*The 34 species listed for Casparya are not all described in the monographs; the majority of the altitudinal data was obtained from specimens at the Gray Herbarium.

TABLE 2

COLLECTIONS OF HORNED FRUIT SPECIES
MADE BY THE AUTHOR IN COLOMBIA

Species/Section	Approximate Altitude (in meters)	Department
Begonia ferruginea L. f - Casparya	2800 - 3000	Boyaca
B. killipana Smith and Schubert - Casparya	2700 - 2900	Cauca
B. hexandra Irmscher - Casparya	2700 - 2900	Cauca
B. toledana var. erubescens Smith and Schubert - Casparya	2700 - 2900	Cauca
B. urticae L. f. - Casparya	3000 - 3600 (two collections)	Boyaca & Cauca
B. libera Smith and Schubert - Casparya	1600 - 1800	Cauca
Begonia - get to be determined	2200 - 2400	Boyaca
Begonia - get to be determined	2200 - 2400	Boyaca

conducted in order to get a comparison between the elevations of horned fruit species and the normal winged fruit species of Begonia. Table 1 lists the sections which are represented by species in the monographs and includes the number of species per section, according to Barkley's list (1972), the number of species described in the literature, the lowest, highest, and average elevation recording for each section, and the geographical area where the sections are predominantly distributed.

The average elevation listed for each section is based on a simple arithmetic mean. The average elevation recordings for each species within a section were found and the mean for the section is thus based on the average for all species recorded, independent of the number of collections. Table 1 serves simply to show how other sections are distributed altitudinally in comparison to Casparya. The data are very preliminary, as indicated by the great difference in the number of species described in the monographs and the number of recognized species in each section.

The preliminary nature of these data do not allow for much interpretation though several points deserve mention. The section Casparya has the highest average elevation listing of all American sections; upon a thorough statistical analysis, where the number of collections is taken into account for each species, the average elevation for the section will undoubtedly be greater. Also, Casparya is the fourth largest section, exceeded in number of species only by Pritzelia, Begoniastrum, and Gireoudia. Two other large sections, Huszia and Knesebeckia, are characterized by many species which have a tuberous habit, though the former is found predominantly in the Andes and the latter in Mexico and Central America. Their average elevations, at this state of analyses, are very close.

RESULTS AND DISCUSSION

Tables 2, 3, and 4 show the data collected on the known species of American Begonia having a horned fruit. Table 2 includes just those species personally collected in Colombia during the three months of 1973. Table 3 compiles all data obtained for each species and includes: its section, observed number of collections, altitude, and country of collection. Table 4 categorizes the elevations of 5 additional horned fruit species occurring at low elevations near the Southeastern coast of Brazil. When the elevation was recorded as a range overlapping two of the zones used in the table, the lower end of the range was chosen for tabulation. Figure 1 presents the number of species and collections made within each altitude zone for Casparya and the other Western South American sections. It serves to graphically illustrate the discontinuity at 2000 meters.

TABLE 3

SECTIONS, SPECIES, AND ELEVATIONS
OF BEGONIA HAVING THE HORNED FRUIT

SECTION/SPECIES	ELEVATION ZONE WITH NUMBER OF OBSERVED COLLECTIONS MADE WITHIN THAT ZONE (in meters)						COUNTRY WHERE OBSERVED
	0-1000	1000-1500	1500-2000	2000-2500	2500-3000	3000-3700	
CASPARYA							
Begonia antioquiensis Rusby						1	Colombia
B. Diffusa Smith & Schubert					1	5	Colombia
B. ursina Smith & Schubert					1	1	Colombia
B. urticae L.f		1	2	8	17	13	Costa Rica to Peru
B. hexandra Irmscher					2		Colombia
B. hirta Smith & Schubert					2		Peru
B. formosissima Sandwith					2		Venezuela
B. gehrigeri L.B. Smith					1		Venezuela
B. lipolepis L.B. Smith					1		Venezuela
B. mariae L.B. Smith					1		Venezuela
B. trapa Smith & Schubert					1		Venezuela
B. ferruginea L.f				2	7	1	Colombia, Venezuela
B. cornuta Smith & Schubert				1	3		Colombia
B. killipiana Smith & Schubert				1	3		Colombia
B. trianae Warburg			2	1	1	1	Colombia
B. gamolipis Smith & Schubert				3	4		Colombia
B. udisilvestris C.DC.				6	1	2	Costa Rica, Panama
B. umbellata HBK				5	6		Colombia
B. colombiana Smith & Schubert		2		3	1	1	Colombia
B. toledana Smith & Schubert			1	5	2		Colombia, Venezuela
B. trispathulata Warburg				1			Colombia, Venezuela
B. vareschii Irmscher				1			Venezuela
B. grewiifolia Warburg				1			Colombia
B. brevipetala Warburg			1				Venezuela

SECTION/SPECIES	ELEVATION ZONE WITH NUMBER OF OBSERVED COLLECTIONS MADE WITHIN THAT ZONE (in meters)						COUNTRY WHERE OBSERVED
	0-1000	1000-1500	1500-2000	2000-2500	2500-3000	3000-3700	
CASPARYA							
B. kalbreyeri Smith & Schubert			1				Colombia
B. chlorolepis Smith & Schubert		1					Colombia
B. libera Smith & Schubert		1					Colombia
B. tetrandra Irmscher		1					Ecuador, Peru
B. valvata Smith & Schubert	1						Ecuador
B. oliveri Smith & Schubert	1						Colombia
APTERON C.DC.							
B. trujillensis Smith				1			Venezuela
HEXAPTERA Ziesenhenne							
B. oaxacana A.DC.			4				Mexico, El Salvador
UNIFORMIA Ziesenhenne							
B. heydei C.DC.	1	1		1			Guatemala, Honduras Costa Rica

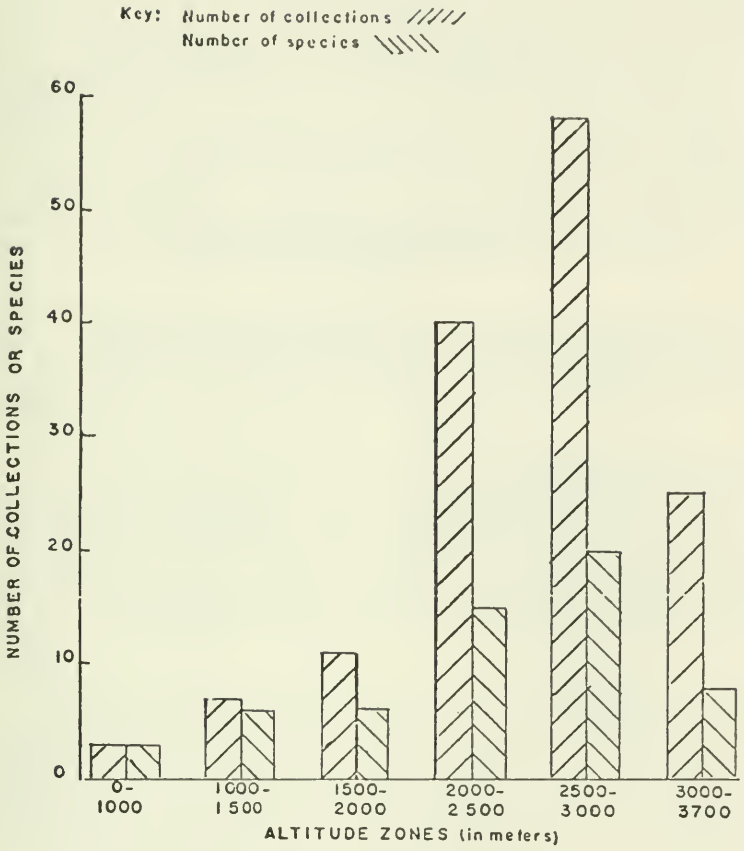

FIG. 1 – DISTRIBUTION OF SPECIES WITHIN ALTITUDE ZONES

TABLE 4

SECTIONS, SPECIES, AND ELEVATIONS OF BRAZILIAN BEGONIA HAVING A HORNED FRUIT

SECTION/SPECIES	ELEVATION ZONE WITH NUMBER OF OBSERVED COLLECTIONS MADE WITHIN THAT ZONE (in meters)					
BEGONIASTRUM	0-300	300-600	600-900	900-1200	1200-1500	1500-2000
B. hilariana A.DC.	2		1			
B. schenckii Irm. var. schenckii		5	1			
B. squamipes Irm.			2	2		
PRITZELIA						
B. catharinensis Brade		4	1		1	
B. solitudinis Brade				2		2

With these data available, a certain trend becomes apparent. Of the thirty-one species of Casparya on which data were obtained, twenty-four have been observed at 2000 or more meters in altitude. (No information was obtained on Begonia irmscheri Smith and Schubert, B. diversistipulata Irmscher, B. fuchsiifolia Warburg, B. lehmannii Smith and Schubert, B. longirostris Benthan, and B. raimondii Irmscher.) Several species within Casparya have only been collected at elevations less than this. These species are as follows: B. chlorolepis, B. kalbreyeri, B. libera, B. brevipetala, B. tetrandra, B. oliveri, and B. valvata. The data available show collections of only one specimen for each of these species. Four species of Casparya have been observed to range both above and below 2000 meters. These include B. colombiana, B. toledana, B. trianae, and B. urticae.

Collections of Casparya indicate the majority of species are found in Colombia and Venezuela, while few species have been observed in Peru and Ecuador. Though a substantial number of species have been collected in Venezuela, few collections have been made, the majority having come from Colombia.

A relatively small group of species formerly associated with the genus Semibegoniella and now included in Casparya includes B. grewiifolia, B. kalbreyeri, and B. oliveri (Barkley and Smith, personal communication). The limited collections of the above three species indicate a distribution from very low elevations to the higher ones, 2150 meters, 1600 meters, and 150 meters, respectively. (B. irmscheri was also included in Semibegoniella and is now placed in Casparya though no data were obtained on this species.)

Of all the species having a horned fruit, B. urticae has been the most abundatly collected, and has the widest distribution. B. urticae also is one of the most wide ranging of all American Begonia having been collected from Costa Rica to Peru. With the data observed on this species, thirty-eight of the total forty-one collections were made well over 2000 meters, for B. urticae is found most abundantly between 2500-3700 M.

Information was obtained on three other small sections with species having a horned fruit. The limited data observed on the Central American sections Hexaptera and Uniformia show a majority of collections have been made below 2000 meters, contrary to the recordings of most South American Casparya. Particular reference is to B. oaxacana of Hexaptera and B. heydei of Uniformia. The recently described species B. trujillensis, placed in the section Apteron, was located at 2300 meters in Venezuela. (No information was obtained on B. bakeri C.DC. of Auriformia.)

A difference in the morphology of the fruit is found in B. oaxacana and B. udisilvestris which deserves mention. Unlike the

majority of species in Casparya and the monotypic sections Uniformia and Apteron, which all fit the established definition of a horned fruit, these two above-mentioned species are not specifically characterized by the same form of the horned fruit. Smith and Schubert (1958) provide a description of the capsule of B. oaxacana: "...wings 3 or sometimes up to 6, subequal, narrow, angled at middle or somewhat above, giving the fruit a rhombic or obovate outline..." Also, for B. udisilvestris: "Capsule erect, ovoid, attenuate into slender beak, wings equal, very narrow." In these definitions, horned is not the descriptive word; this suggests some difference from species whose capsule is described as horned. It appears that the morphology of these fruits represents an intermediate form between the common winged type and the actual horn.

Thus, the majority of species possessing a horned fruit are generally observed at an elevation between 2000 and 3700 meters above sea level. The 2000 meter elevation zone is not just an arbitrary designation; these species are found more abundantly at or above this altitude, which determines this area as the most probable location for observing them. The specific environmental factors contributing to this distribution cannot be stated for data on environment was not collected and correlated with these plants. Those species observed at lower elevations are few in number and have not been observed with the frequency of the higher altitude ones. It appears that the horned fruit species are more successfully adapted to the higher elevations than to the lower elevations.

The five species occurring in Brazil that have a horned fruit differ significantly in many respects from species of Casparya. The styles have been observed to differ in the branching pattern. Species in Casparya are irregularly branched while the five Brazilian species are regularly bifid (Smith, personal communication). Table 3 shows the elevations where collections were made; the majority of which were located between 300 and 1200 meters, which is a much lower altitudinal range than for Casparya. Morphological differences also are found in two of the species in Begoniastrum; B. hilariana and B. schenckii have a rhizomatous habit. All of the species observed in Casparya have upright habits.

There is no question that the occurrence of horned fruit species placed in Begoniastrum, Pritzelia and Casparya causes one to question the taxonomic significance of the horned fruit. The altitudinal distribution of Casparya though is suggestive of a correlation with the horned fruit, thus serving to support this trait as a valuable taxonomic character, particularly since species in this section are found at some of the highest elevations of all known American Begonia, as Table 1 indicates. Also, the frequency of the horned fruit in comparison to the normal winged type is extremely rare from a percentage standpoint, though

the section Casparya is relatively large. Even with these apparent similarities, a considerable amount of taxonomic work remains to be done.

One other species in the Begoniaceae is known to have a horned fruit, though no altitudinal information was obtained on it. Symbegonia sanguinea Warburg possesses a horned fruit similar to those found in the majority of American Begonia, though, as with all Symbegonia, is restricted to New Guinea. To my knowledge, this species is the only member of the Begoniaceae having a horned fruit in a geographical location other than Central and South America.

There are five sections with species characterized by this particular fruit type, being: Casparya, Hexaptera, Apteron, Auriformia and Uniformia. The latter four sections here are small, though the species observed within these sections possess a horned fruit, or one that is morphologically similar. The five species with a horned fruit found in Begoniastrum and Pritzelia are the exception since these two large sections are characterized by the normal winged type fruits found in the majority of all Begonia. Several questions arise from the information presented. Is there any relationship between the horned fruit species in Begoniastrum and Pritzelia and those in Casparya? Also, does Symbegonia sanguinea have any affinity to the American horned fruit Begonia, or has the horned fruit evolved independently in both geographical locations?

ACKNOWLEDGEMENTS

Without the help from Professor Richard Schultes and Professor Fred Barkley, the studies in Colombia would never have occurred; thus, my appreciation is extended to each of them. My gratitude extends as well to the botanists at the Universidad National in Bogota, especially Dr. Forero for providing the necessary encouragement. Determinations of those species personally collected within the section Casparya were made by Dr. Bernice Schubert, to whom I express my appreciation. Without the advice and patience of Professor Thomas Kinraide, little formally would have been accomplished.

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ADDITIONS AND CORRECTIONS

TO THE BAHAMA FLORA - III

William T. Gillis

Once again it is necessary to alter usage of plant names as they apply to the Bahama flora, and to make additions of previously unknown plants in the flora. In our preparation of a new flora of the Bahamas (including the Turks and Caicos Islands), Mr. George R. Proctor and I have been noting corrections of nomenclature as well as additions to the flora. I present here an additional 34 name changes and nine species not previously reported from the islands.

As in previous papers, my use of the term "Bahamas" should be construed in its geographical sense to include the Turks and Caicos Islands as well. For ease of reference, this paper will follow the order of species presented in Britton and Millspaugh's Flora (1920). For brevity that flora is designated as B & M in the text of this paper. When corrections to the B & M text are discussed, the figure in the lefthand margin refers to the page in B & M on which the taxon in question is discussed. Herbarium abbreviations are those of Index Herbariorum (Holmgren and Keuken, 1974).

I should like to acknowledge with appreciation Dr. L.I. Nevling, Jr., Chairman of the Botany Department at the Field Museum of Natural History in Chicago for making collections there available to me. I also acknowledge with appreciation the Director and Curator of the herbarium of the New York Botanical Garden for lending specimens for my study. I should also like to acknowledge travel funds granted by Hope College for visits to herbaria in undertaking this study. A portion of the field work on South Andros was supported by a grant from the Society of the Sigma Xi for a study of the Cuban element in the flora of Andros. I am grateful to the Director and staff of the herbarium of the Botanischer Garten, Berlin-Dahlem for their courtesy in permitting me to examine the *Rajania* type material.

A D D I T I O N S

POLYPODIACEAE

Thelypteris ovata St. John in Small. This fern was included in *Thelypteris normalis* in B & M, but Smith (1971) has recognized it as a distinct taxon. It is found on North Andros and New Providence Islands. Moreover, hybrids among Bahama species

have also been recorded by Smith: *T. augescens* X *normalis* and *T. augescens* X *ovata*.

GRAMINEAE

Brachiaria subquadriparia (Trin.) Hitchc. has been found on Cat Island near Arthurs Town and is represented by collections of Roger Byrne (Nos. 353 and 538) at A. There was some speculation indicated on the herbarium specimens that the species may have been introduced in a sack of fertilizer; it is now established and is spreading.

BROMELIACEAE

Aechmea lingulata (L.) Baker. Dr. Robert R. Smith collected a specimen of this plant and sent it to the author for determination. I recognized it as a Bromeliad not previously known for the Archipelago, and sent it to Dr. Lyman B. Smith for determination. He and Dr. Robert W. Read made the determination and noted that this new station in the Bahamas is the first record for the species north of Puerto Rico. *R.R. Smith 3944* was collected in the middle of an island along the southern margin of North Granny Lake on San Salvador. The specimen in flower and young fruit was made 11 June 1975; it is deposited in the Hoysradt Herbarium of Hartwick College (HHH), Oneonta, New York. This record is another example of a San Salvador disjunct from either Hispaniola or Puerto Rico. I gratefully acknowledge assistance of Drs. Smith and Read in making the determination of this species, representing both a species and a genus new to the Bahama flora.

AMARANTHACEAE

Alternanthera canescens H.B.K. has recently been found in the West Indies (*Gillis & Proctor 12186* from Grand Turk). The types of two synonyms of this species name are from the West Indies, but the materials are too incomplete for certain identification. Since its discovery, it has been known for certain only from northern South America. The site on Grand Turk is as follows: north of Cockburn Town in *Acacia macracantha* scrub, growing in exceedingly dry clay under *Acacia*, near road to airport. Its collection history will be treated further in a forthcoming paper on the Gomphrenoideae of the Bahamas by Mears and Gillis (in press). I acknowledge the assistance of Dr. James Mears in determining the Grand Turk collection and for supplying other information to me.

PUNICACEAE

Punica granatum L. is cultivated on South Andros (near Kemps

Bay) and on Providenciales (near Blue Hills) where it escapes cultivation and enters the ruderal flora (*Gillis 12376* and *Gillis 12597*).

EUPHORBIACEAE

Chamaesyce ophthalmica (Pers.) Burch. This species was collected for the initial Bahama Flora of 1920 from New Providence, Grand Bahama, Long, Inagua, and Cave Cay in the Exuma Chain. B & M placed specimens in *C. hirta* or *C. berteriana*, whereas earlier in the writings of Millspaugh such collections were labeled *Euphorbia obliterata* or *E. pilulifera*. Derek Burch (1966) has correctly placed these materials in *C. ophthalmica* which will thus be an addition to the flora.

RUBIACEAE

Erithalis odorifera Jacq. On several islands of the Bahamas, there are populations of an *Erithalis* which heretofore have been considered to be large leaved representatives of *E. fruticosa*, the very common "black torch" of the West Indies and southern Florida. When one sees these populations adjacent to *E. fruticosa*, it is evident that two species are involved, the large leaved form being *E. odorifera*, not mentioned in B & M. Initially one might notice only the robust nature of *E. odorifera* as being distinctive: its larger leaves, flowers, fruits, and generally its taller growth form. Flower structure, however, is notably different as well. The flowers of *E. odorifera* have partially or completely reflexed petals; those of *E. fruticosa* do not. The flowers of *E. fruticosa* are fragrant at all times; those of *E. odorifera* are fragrant only up until 6 p.m. E.S.T. or approximately an hour or two before sunset. Populations of *E. fruticosa* exist on the southern islands with white fruits, but only black fruits are known for *E. odorifera*. I have collected materials of *E. odorifera* in the vicinity of Congo Town, South Andros (*Gillis 12525*). These populations have also been named *E. fruticosa* subsp. *odorifera* (Jacq.) Steyermark (1973), but I feel that their sympatry with typical *E. fruticosa* precludes this treatment until and unless some form of reproductive isolating mechanism is found.

The two species may be separated as follows:

Leaves 3-7.5 cm long; corolla 0.5 cm long or less; anthers 1 mm long, shorter than the filaments.... *E. fruticosa*.

Leaves 10-13 cm long; corolla longer than 0.5 cm; anthers 2 mm long or longer, as long or longer than the filaments..... *E. odorifera*.

COMPOSITAE

Helianthus argophyllus T. & G. is cultivated extensively and allowed to seed itself as a dooryard plant and species of abandoned fields in the vicinity of Kemps Bay, South Andros (*Gillis 12596*). It is also becoming weedy in downtown Nassau. I acknowledge the assistance of Dr. Charles B. Heiser in making a determination of this collection for me.

Dyssodia tenuiloba (DC.) Rob. var. *tenuiloba* is known from a single collection from New Providence Island where it was an apparent weed (*David Fairchild 2577*, US). Very likely this was a chance collection made at a time when the plant had been temporarily established on the island. It has probably not continued to be part of the ruderal flora inasmuch as it has not ever been collected again (see Flyr, 1973 and Strother, 1969).

C O R R E C T I O N S

GRAMINEAE

16 *Syntherisma sanguinalis* → **DI**GITARIA BICORNIS (Lam.) R.& S. Earlier (Gillis and Proctor, 1975), we followed Ebinger (1962) for the change of name of this species in the Bahamas to *Digitaria ciliaris*. Recently, Dr. Richard W. Pohl, and F.J. Veldkamp examined *Digitaria* collections from the Bahamas at the Field Museum for us and made a number of nomenclatural changes. We follow Veldkamp's treatment (1973) for distinguishing *D. ciliaris* from *D. bicornis*. He noted that *D. bicornis* is pectinate and has a reported chromosome number of $2n = 72$. *Digitaria ciliaris*, on the other hand, is non-pectinate and has a reported chromosome number of $2n = 54$. *Digitaria sanguinalis* (L.) Scop. is yet another species, more temperate in its distribution.

16 *Valota insularis* → DIGITARIA INSULARIS (L.) Mez ex Ekman. Earlier we noted the transfer of this species from *Valota* as in B & M to *Trichachne* as treated by Hitchcock (1936). Henrard (1950), Hsu (1965), and Veldkamp (1973) believe that *Trichachne* is only "artificially separated" from *Digitaria*. Hsu found no differences in such critical characters as epidermis of the fertile lemma, structure and position of lodicules, nor in the shape of style-bases.

41 *Eragrostis amabilis*, in part → ERAGROSTIS URBANIANA Hitch.
Eragrostis prolifera → ERAGROSTIS EXCELSA Griseb.
According to the treatment by Harley (1948), *Eragrostis amabilis* occurs on New Providence only (*Britton & Brace 788*), but the other specimens called *E. amabilis* by B & M actually represent *E. urbaniana*. Furthermore, the specimens called

E. prolifera from the Berry Islands are in fact *E. excelsa*. *Eragrostis excelsa* has pilose sheaths, is commonly papillose-pilose on the margins, on the collar, and occasionally elsewhere, and has open, loosely flowered panicles. *Eragrostis prolifera*, on the other hand, has glabrous sheaths or sheaths which are pilose only at the apex of the margins, and contracted, densely flowered panicles. *Eragrostis tephrosanthos* apparently does not occur in the Bahamas, despite its inclusion in B & M.

KEY TO BAHAMA *ERAGROSTIS* SPECIES

1. Keels of paleas ciliate; annuals.....2
1. Keels of paleas not long ciliate; perennials.....4
   2. Panicle 2-10 times as long as wide, open, not spiciform..... *E. amabilis*
   2. Panicle 12-30 times as long as wide, spiciform.3
3. Panicles densely spiciform with branches 5-10 cm long; spikelets 6-12 flowered..... *E. ciliaris*
3. Panicles with short, closely ascending branches, not densely spiciform; branches 5 cm long; spikelet 2-3 mm long, 12-18 flowered..... *E. urbaniana*
   4. Panicle branches stiffly spreading; spikelet with pedicels 1.5-4 times as long as the spikelet itself ..... *E. elliottii*
   4. Panicle lax; spikelets with pedicels shorter than the spikelet itself.....5
5. Panicle densely flowered; tufted plant; spikelets several times wider than thick..... *E. bahamensis*
5. Panicle open and sparsely flowered; culms 1-2 m tall..... *E. excelsa*

PALMAE

59 *Thrinax parviflora* → THRINAX RADIATA Lodd. ex J.A. & J.H. Schultes.

As stated before (Gillis, 1974a), *Thrinax parviflora* should be applied only to an endemic species of Jamaica. The thatch palm of South Florida often included within this name concept and to which B & M applied this name is now correctly *T. radiata* according to Read's latest treatment of *Thrinax* (1975), and not *T. floridana* as indicated earlier.

LILIACEAE

70 *Aletris bracteata* → ALETRIS FARINOSA L.

There appear to be no significant differences between the *Aletris* of the Florida Everglades and that of the adjacent northwestern Bahamas. In keeping with the treatment of Long and Lakela (1971) they are treated here as synonymous.

DIOSCOREACEAE

80 *Rajania microphylla* → RAJANIA HASTATA L.
The leaf shape in this species is highly variable, even on the same individual. It is evident that Kunth (author of the binomial *Rajania microphylla*) attributed species rank to populations with a different leaf shape from that of the classical Linnaean material. It is further evident that there is but one species in the Bahamas. On the other hand, after Britton and Millspaugh published the Bahama Flora (1920), Bahama variants were used to typify two additional names in *Rajania: R. bahamensis* Knuth and *R. urbaniana* Knuth, both based on *J. & A. Northrop 203.*

John and Alice Northrop spent a considerable period of time on New Providence and Andros Islands in the early 1890's. John Northrop paid especial attention to animals and geology, whereas Alice gathered extensive plant collections, the most thorough sampling of the Bahama flora to that date. Many of their specimens have been used to typify new species, some by Alice herself (1902), and others by Ignatius Urban in various volumes of his compendium of West Indian botany, the *Symbolae Antillanae.* The Northrops (actually only Alice) used great care in assigning collection numbers to their specimens. It is unusual, if not unique, that collection number 203 was used to apply to two different gatherings of a *Rajania*: one from Andros made in June 1890, and the other from New Providence on 25 January 1890. The two plants differ only in lobes of the leaf and are quite consistent with typical variation within a single species in nature. Both sprigs could indeed have come from the same individual. That they are different species is unthinkable.

The specimens available to Knuth when he assigned names to *Rajania bahamensis* and *R. urbaniana* were cited as being at Berlin. The holotypes escaped destruction in the World War II bombing of the Berlin Herbarium, and were examined by the author during a visit to Berlin this summer. Both are typical *Rajania hastata.* (See Fig. 1, 2).

In his treatment for Das Pflanzenreich, Knuth (1924) separated these species on staminate characters only: whether the inflorescence is 1 cm long or longer than 1.5 cm; whether the inflorescence rachis is filiform or capillaceous; and whether the inflorescence is manifestly flexuous or only somewhat flexuous. These obviously are not characters worthy of distinguishing species. Another anomaly associated with this *Rajania* is that Britton and Millspaugh attributed the binomial *R. microphylla* to Knuth whereas it should have been to R. Kunth. The following should characterize the pertinent data insofar as these names are concerned.

Fig. 1 - Holotype of Rajania bahamensis at Berlin Museum.

Fig. 2 - Holotype of Rajania urbaniana at Berlin Museum.

RAJANIA HASTATA L., Sp. Pl. Vol. 2: 1032. 1753.
Type: BM (Hort. Cliff.).
Rajania microphylla Kunth, Enum. 5: 451. 1870.
Type: B.
Rajania bahamensis R. Knuth, Notiz. Bot. Gart. Mus. Berlin 7: 220. 1917.
Type: Bahama Islands, New Providence Island. *J. & A. Northrop 203*, pro parte, January 25, 1890.
Holotype: B; isotypes: NY, US, F.
Rajania urbaniana R. Knuth, Notiz. Bot. Gart. Mus. Berlin 7: 220. 1917.
Type: Bahama Islands, Purser Point, Andros Island. *J. & A. Northrop 203*, pro parte, June 1890.
Holotype: B; lectotypes: NY, US.

I wish to thank Dr. Bernice G. Schubert for her assistance in searching the literature for the Knuth citations.

CASUARINACEAE

100 *Casuarina equisetifolia* → CASUARINA LITOREA L.
By invoking Art. 42 of the International Code of Botanical Nomenclature, Fosberg and Sachet (1975) have found it necessary to accept the earlier binomial *Casuarina litorea* for the common Australian pine, a weed tree throughout Florida and the West Indies.

PIPERACEAE

101 *Peperomia spathulifolia* → PEPEROMIA OBTUSIFOLIA L.
Dr. William C. Burger, specialist in tropical American Piperaceae, has examined the Bahama materials of this species at the Field Museum and identified them as *P. obtusifolia*. This binomial, being the older, should be taken up and applied to the Bahama populations. I acknowledge appreciation to Dr. Burger for assisting in resolving this matter.

URTICACEAE

106 *Fleurya aestuans* → LAPORTEA AESTUANS (L.) Chew
In his revision of *Laportea*, Chew (1965) merged all *Fleurya* species into *Laportea*. This treatment is followed here for the few populations of this weed known from the Bahamas.

CHENOPODIACEAE

121 *Dondia fruticosa* → SUAEDA TORREYANA Wats.
121 *Dondia insularis* → SUAEDA CONFERTA (Small) Johnston
Recent work by C.O. Hopkins (1974) has shown that the *Suaeda* (*Dondia*) *insularis* of the southern Bahamas and the Turks

and Caicos Islands is the same as *Suaeda conferta* of Hispaniola. Dr. Hopkins (personal communication) elected to use *S. torreyana* for the New World species, choosing to differentiate a variable, but wide-ranging *S. fruticosa* in the Old World.

PORTULACACEAE

138 *Portulaca gagatosperma* → PORTULACA PILOSA L.
Portulaca gagatosperma → PORTULACA HALIMOIDES L. var. HALIMOIDES

Millspaugh described the endemic species *Portulaca gagatosperma* for the purple-flowered, fleshy-leaved *Portulaca* populations in the Bahamas that have white tufts of hairs subtending the leaves and the inflorescences. As interpreted by Wilson (1932) and Legrand (1952) such populations do not fall into a species concept of an endemic species at all, but rather into that of two more wide-ranging species, *P. pilosa* and *P. halimoides*. In effect, one replaces a putative endemic species by two widely-distributed ones. The type of *P. gagatosperma* is clearly *P. pilosa*, but Britton and Millspaugh applied the name to various populations of *P. halimoides* as well. Because these species are difficult to distinguish, the following table is presented as a means of making appropriate comparisons:

TABLE 1 - Contrasting characters of two species of *Portulaca*.

	P. pilosa	*P. halimoides*
Flower color	purple	yellow or white with yellow center
Petal length	7-10 mm	3-4 mm
Sepal length	3 mm	2-4 mm
Petal width	2.5-4.5 mm	1.2-1.3 mm
Habit	Creeping	Erect
Leaf blades	Oblong-lanceolate, flattened	Oblong-linear, subcylindric
Stamen number	15-35	8-20
Involucre	6-10 bracts	4-8 bracts
Capsule shape	Elongate or ovoid	Subglobose
Capsule diameter	3-4 mm	1.5-1.6 mm
Seed size	0.3-0.4 mm	0.4-0.5 mm

KEY TO BAHAMA *PORTULACA* SPECIES

1. Leaves greater than 5 mm broad, obovate to spathulate..... *P. oleracea*
1. Leaves less than 4 mm, elliptic to linear-lanceolate.....2
2. Flowers purple; plant creeping; sepals less than

3 mm; seeds 0.3-0.5 mm..... *P. pilosa*
2. Flowers yellow; plant erect; sepals 2-4 mm; seeds 0.4-0.5 mm 3
3. Petals 2.5-3 mm long; seeds black; cap of capsule elongate to onion-shaped; fruit base 1.5 mm in diameter ..... *P. halimoides*
3. Petals 5-7 mm long; seeds brown; cap of capsule flat, dome-shaped, fruit base 3 mm in diameter.*P. rubricaulis*

MENISPERMACEAE

142 *Cissampelos tomentosa* → CISSAMPELOS PAREIRA L.
In noting this name change, I am following the recent monograph of *Cissampelos* by Rhodes (1975).

LEGUMINOSAE

157 *Pithecolobium discolor* → PITHECELLOBIUM GLAUCUM Urban
When Britton described *Pithecellobium discolor* (as *Pithecolobium*) in 1914, he chose a type from Batabano, Cuba (*Shafer 161* at NY), but he also stated: "apparently the same species at Old Kerr's Point, Abaco, Bahamas (*Brace 2017*)." The Brace collection is the only one known from the Bahamas, to my knowledge. It compares favorably to *P. glaucum* and is presumably a wide disjunct from Cuba, possibly even introduced and perhaps not even persistent. Léon and Alain (1951) in the Flora of Cuba (vol. 2) indicated that both species exist as separate entities and that both occur in the Bahamas. The latter is impossible inasmuch as only one collection of this taxon is known from the Bahamas and it manifestly cannot be two things! I recognize *P. glaucum* to be the correct name for the population in the Bahamas if, indeed, it still occurs there. It should be noted also that *Pithecollobium* (sic) *discolor* Pittier (Contr. U.S. Natl. Herb. 20: 464. 1922) is a later homonym.

167 *Cassia bahamensis* → CASSIA CHAPMANII Isely
Isely (1975) has determined that Philip Miller's name *Cassia bahamensis* has been misapplied by a number of authors. The specimen so named in the Miller collections at the British Museum (Natural History) is probably *C. ligustrina*. The common plant of Dade and Monroe Counties, Florida and the West Indies required a new name which Isely supplied.

169 *Chamaecrista riparia* → CASSIA NICTITANS var. ASPERA (Ell.) T. & G.
Chamaecrista lucayana → CASSIA CARIBAEA Northrop
Chamaecrista inaguensis → CASSIA CARIBAEA Northrop
Earlier (Gillis, 1974a), I made a note of changes in nomenclature for the *Chamaecrista* section of *Cassia* in keeping with

current usage by Dr. Howard Irwin and his associates at the New York Botanical Garden in their monographic treatment of *Cassia*. At that time I noted that Adams (1970) had interpreted *Cassia riparia* as an illegitimate name and had published *Cassia caymanensis* to replace it. Since that time, however, I have had occasion to examine populations in the field and herbarium specimens of what Britton and Millspaugh formerly referred to as *Chamaecrista riparia*. They are correctly *Cassia nictitans* var. *aspera* [or *C. aspera* as in Long and Lakela (1971) and Isely (1975)] as are their counterparts in South Florida. They very well may have reached the Bahamas from Florida inasmuch as the species is found within the islands only on the Great and Little Bahama Banks adjacent to the Florida Straits.

Also, since my earlier publication, I have examined types and isotypes of the several other "endemic" *Cassia* species to which B & M referred in their flora. Table 2 notes comparisons of critical factors regarding the morphology of the type collections. The major differences, it will be noted, centered around the petiolar gland. Mr. Rupert Barneby informs me that, within certain broad limits, the structure and location of this gland is not diagnostic in separating species of *Cassia*. Studies in the field within the islands where these three "species" are reported (Crooked, Acklins, Mayaguana, Inagua, and the Turks and Caicos Islands) show no consistent breaks between normal variants to be expected within one species. Again we have, as mentioned earlier (Gillis, 1974b) examples of two "phantom" species in the Bahama flora, i.e., plant "species" that are really not different from another species.

Britton himself did not visit most of the far southern islands in the archipelago. Once again (see Gillis, 1974b), when Britton attempted to determine specimens which he did not see in the field himself, he tended to note differences more thna similarities, and thus tended to overdescribe numbers of species in the flora.

The following should concisely state the situation in this *Cassia* complex:

CASSIA CARIBAEA Northrop, Mem. Torrey Bot. Club 12: 39 + pl. 6. 1902.
Type: Andros, Fresh Creek, *Northrop & Northrop 638*.
Holotype: F-130718; isotype: NY.

Cassia inaguensis Britton, Bull. N.Y. Bot. Gard. 3: 443. 1905.
Type: Inagua, near salt ponds, *Nash & Taylor 910*.
Holotype: NY; isotype: F-171399.

Cassia lucayana Britton, Bull. N.Y. Bot. Gard. 4: 138. 1906.
Type: Exuma Chain, cay north of Wide Opening. *Britton & Millspaugh 2774*. Holotype: NY.

TABLE 2 - Comparisons of characters from type collections of three Bahama "species" of *Cassia*.

	Cassia caribaea	*Cassia lucayana*	*Cassia inaguensis*
No. of leaflets	6-10	8-12	4-6
Tip of leaflet	Mucronate	Mucronate, slightly emarginate	Mucronate, slightly emarginate
Position of gland	Between second pair of leaflets	Below first pair of leaflets	Below each pair of leaflets
Venation prominence	Pronounced	Pronounced	Pronounced
Inflorescence	Single flower	Single flower	Single flower
Gland shape	Stalk with flattened top	Mushroom-shaped	Mushroom-shaped with crateriform top
Stipule shape	Linear	Linear	Linear-ovate, long acuminate
Breadth of flower	1.5 cm	Not present	1.5 cm
Leaflet Symmetry	Inequilateral	Inequilateral	Inequilateral
Fruit length	5-5.5 cm	4-6 cm	5 cm
Leaf pubescence	None	Scattered hairs, leaflet margin and base	None

I should like to express my appreciation to Dr. Howard S. Irwin and to Mr. Rupert Barneby for their critical reading of this portion of the manuscript and for sharing with me their interpretation of *C. nictitans* var. *aspera*.

188 *Bradburya floridana* → CENTROSEMA ARENICOLA (Small) Hermann

Although this species may not occur in the Bahamas, it is more likely an endemic to central peninsular Florida. To occur there and have an extension into the Bahamas would prove to be a pattern that is not known for any other species. None of the specimens attributed by B & M to this species is anything more than a variant of *C. virginianum*. *Centrosema arenicola* has lanceolate upper calyx lobes with an appreciably longer lower lobe, pods 4.5-5.5 mm broad, seeds 3.5-5 mm long; *C. virginianum* has all lobes of the calyx linear-subulate and all lobes equal or subequal in length, pods 3.5-4 mm broad, and seeds 7.5-8 mm long.

The epithet *arenicola* has seldom been applied to the endemic Florida plant, yet antedates *floridana* by one year. We presently say that *C. arenicola* is absent from the Bahama flora. I gratefully acknowledge information on these species, especially in regard to the earlier name employed herein, from Dr. Daniel B. Ward who has amassed data for an ultimate flora of Florida. Dr. Ward has been kind in sharing with me a portion of his manuscript for the flora and granted permission for me to use such information herein.

EUPHORBIACEAE

223 *Croton bahamensis* → CROTON HUMULIS L.

When Millspaugh published the binomial *Croton bahamensis* (1909), he probably had checked with the *Index Kewensis* to see if this combination had ever been previously published, and found that it was not listed. Unfortunately, the combination was published by Hamilton (1825) but never picked up by the editors of the Kew Index. Millspaugh's name, therefore, is illegitimate. The species does not need a new name, however, because it matches well with *Croton humulis* of Cuba and should be considered conspecific with it. The type of *C. bahamensis* Hamilton is at Herb. Desv. (Paris) and is *Croton lucidus*.

237 *Chamaesyce buxifolia* → CHAMAESYCE MESEMBRYANTHEMIFOLIA (Jacq.) Dugand

It is unfortunate that this common seaside species of Florida, the West Indies, and Central and northern South America must have a name change, and further that the earliest epithet is one of twenty letters! Dugand (1966) recognized that this earlier Jacquin name (1760) does indeed have priority and applies to the plant in question, despite the fact that

neither an illustration nor a specimen appears to be available to typify it. The type is the description. Dr. Derek Burch (personal communication), specialist in *Chamaesyce*, agrees that this earlier name must be taken up despite his earlier (1966) use of *C. buxifolia*. The basionym is *Euphorbia mesembrianthemifolia*, but Dugand changed the first "i" to a "y": *mesembryanthemifolia*. The Code provides for the spelling *Mesembryanthemum* whereas *Mesembrianthemum* is philologically preferable. Hence, *mesembryanthemifolia*, having been derived from it, must also be preserved.

239 *Chamaesyce bracei* → CHAMAESYCE CAYENSIS Millsp.
In his preliminary treatment of West Indian *Chamaesyce*, Burch (1966) did not deal with synonymies except when he published new names. His not having dealt with *C. bracei* led me to pursue the question of what he had done with this binomial. All material (essentially only the type collection of *C. bracei* and one other B & M collection) of this name in the collections at NY have been annotated by Burch as *C. cayensis*. Thus, they do not appear to be separate species.

RHAMNACEAE

256 *Reynosia northropiana* → AUERODENDRON NORTHROPIANUM (Urb.) Urb.
Urban (1924) published the genus *Auerodendron* for the species formerly in *Reynosia* that did not have ruminate endosperm. Although it is possible that one could make a case for merging this species into *Reynosia* (as done by B & M) as a monotypic subgenus, I am for the moment treating it as a distinct genus.

CACTACEAE

291 *Cephalocereus millspaughii* → CEREUS BAHAMENSIS (Britton) Vaupel
291 *Cephalocereus bahamensis* → CEREUS BAHAMENSIS (Britton) Vaupel
In my search for differences between *C. millspaughii* and *C. bahamensis*, I found very little evidence that any exist, except as differences between individuals. To begin with, cacti are notoriously ignored by herbarium collectors because of the difficulties encountered in trying to prepare herbarium materials of a spiny succulent. I have studied populations of this genus in the field and also examined all materials in pertinent herbaria (A, F, GH, NY, US). Materials are notably sparse, but I have seen the type collections and have concluded that no significant differences exist between these two taxa. I therefore consider them to be conspecific. They are night-flowering with a fetid scent of decaying meat emanating from the open flowers. The use of *Cereus* instead of *Cephalocereus* reflects a tendency to unite some of the more

artificial genera in the Cactaceae.

CEREUS BAHAMENSIS (Britton in Britton & Rose) Vaupel, Montasschr. Kakteenk. 23: 23. 1913.
Basionym: *Cephalocereus bahamensis* Britton in Britton & Rose, Contr. U.S. Natl. Herb. 12: 415. 1909.
Type: Berry Islands, Frozen Cay, *Britton & Millspaugh 2221*. Holotype: NY; isotype: F-173335.
Cereus millspaughii (Britton in Britton & Rose) Vaupel, Montasschr. Kakteenk. 23: 23. 1913.
Basionym: *Cephalocereus millspaughii* Britton in Britton & Rose, Contr. U.S. Natl. Herb. 12: 417. 1909.
Type: Exume Chain, Cave Cay, rocky scrubland, *Britton & Millspaugh 2832*.
Holotype: NY; isotypes: US-655733, US-474779.

ONAGRACEAE

309 *Isnardia repens* → LUDWIGIA REPENS Forst.
In keeping with trends of treatment within the Onagraceae, *Isnardia* is herein considered synonymous with *Ludwigia*.

VERBENACEAE

373 *Callicarpa hitchcockii* → CALLICARPA LANCIFOLIA Millsp.
Moldenke (1936) treated these two names as representing different species. The former had leaf blades obtuse at the apex, margins entire, and represented a much-branched shrub, occasionally scandent. The latter had leaf blades acute at the apex, margins minutely and irregularly crenate-denticulate, and represented a little-branched shrub. Populations in the Bahamas seem to show enough variation to encompass all of these characters, often on the same individual. Hence, I am treating them as synonymous, *C. lancifolia* being the older name.

SOLANACEAE

384 *Solanum blodgettii* → SOLANUM DONIANUM Walp.
In noting this name change, I am following the recent treatment of South Florida *Solana* by D'Arcy (1974).

APOCYNACEAE

337 *Rhabdadenia sagraei* → ANGADENIA SAGRAEI (A.DC.) Miers
Earlier (Gillis, 1974a) I recognized that *Rhabdadenia sagraei* of B & M was in fact an *Angadenia*, following Woodson (1936 and 1938). Since that time I have had occasion to examine type material of *Echites berteri* A.DC. and *E. sagraei* A.DC. at G. It appears that applying the epithet *berteri* to the species in the Bahamas is incorrect. The Bahama vine is

Fig. 3 - Type of Echites berteri DC., basionym of Angadenia berteri, at Jardin Botanique, Geneva.

Fig. 4 - Type of Echites sagraei DC., basionym of Angadenia sagraei, at Jardin Botanique, Geneva.

Angadenia sagraei (see fig.). Lippold in his recent appraisal of *Angadenia* in Cuba (1975) concurs with this interpretation.

COMPOSITAE

453 *Sachsia bahamensis* → SACHSIA POLYCEPHALA Griseb.
In order to evaluate the status of the four described species of *Sachsia* in South Florida, the Bahamas, and the Greater Antilles, one may turn to Badillo's recent (1975) revision of the genus. It appears that the genus is monotypic and that previously described additional names simply represent varying degrees of robustness.

453 *Bidens pilosa*→ BIDENS ALBA var. RADIATA (Schultz-Bip.) Ballard ex Melchert
The common weed of South Florida, the Bahamas, and Mexico, known as "Spanish needles" has had a number of names. Sherff (1937 and 1955) treated it as *Bidens pilosa* var. *radiata*. More recently Ballard (1975), on both chemotaxonomic and morphological grounds, has determined that these populations are part of the *Bidens alba* complex . Publication of the combination was in Melchert (1975).

457 *Emilia sonchifolia* → EMILIA FOSBERGII Nicolson
Earlier (Gillis, 1974a and Gillis and Proctor, 1975) we noted that the only *Emilia* in the Bahamas is *E. javanica*. Since that time Nicolson (1975) has found that the taxon known variously as *E. coccinea* or *E. javanica* (among other names) is actually three species, one of which was unnamed. The latter was described as *E. fosbergii*. In describing the new species -- the only *Emilia* now known from the Bahamas -- Nicolson chose a type specimen from the Bahamas: *Curtiss 6*, which is represented in a number of herbaria. The red-flowered Emilias in the Neotropics may be distinguished as follows (after Nicolson):

Flowers orange-red, half enclosed by involucre; leaf margins entire or shallowly-dentate; corolla lobes 1.7-2.1 mm long..... *E. coccinea*

Flowers red, 3/4 enclosed by involucre; leaves coarsely dentate; corolla lobes 1.2-1.4 mm long ..... *E. fosbergii*

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A New Asterostigma (Araceae) from Ecuador

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The family Araceae is most diverse in the wet tropics, but the subfamily Aroideae includes a number of species native to temperate and dry tropical areas. These are perennial herbs which have above-ground foliage only part of the year and survive the unfavorable season as subterranean tubers. The subfamily is primarily Eurasian in distribution, and is represented in the New World only by Arisaema in eastern North America and the tribe Asterostigmateae in South America, comprising eight genera and about two dozen species native to southern Brazil, Paraguay, Argentina and Bolivia.

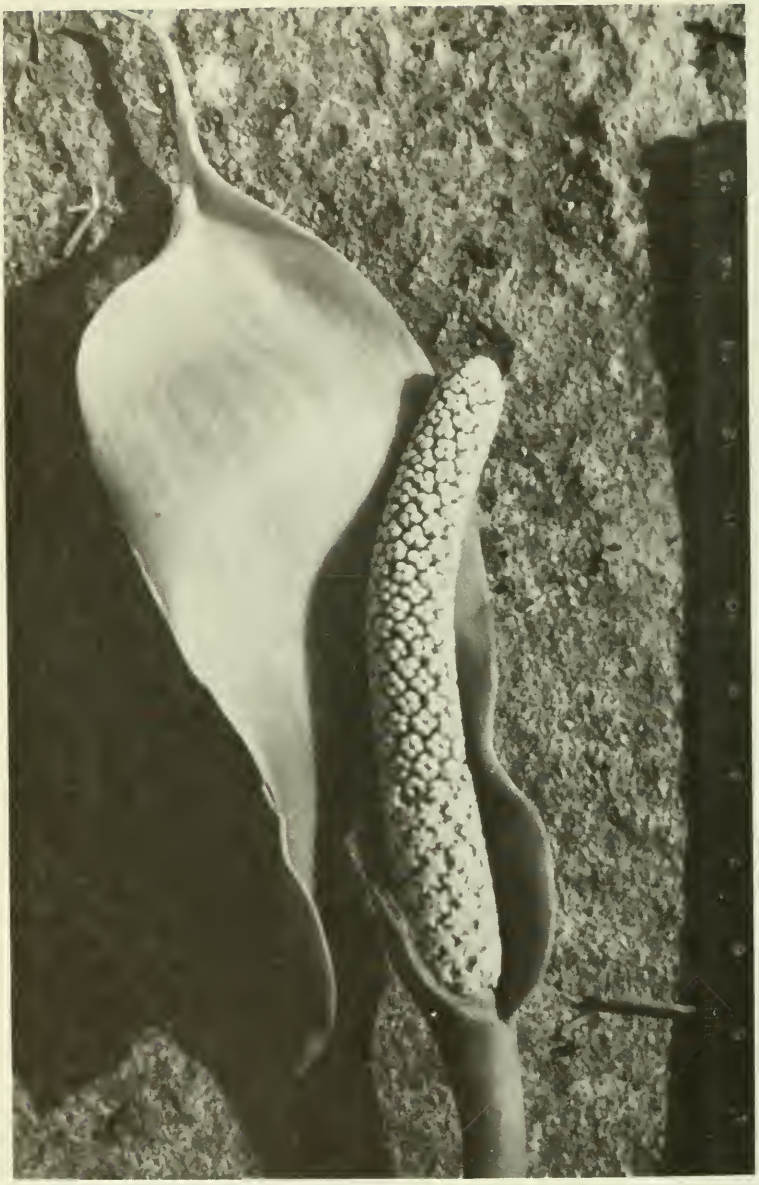
Like many other groups which are temperate South American in origin, the Asterostigmateae includes species which have migrated northward along the Andean cordilleras where they inhabit cool, middle elevation sites. The genus Asterostigma Schott is represented in Peru by A. pavonii, a rare species which has been collected several times in recent years. Plowman and Davis 4874 (GH) from Dept. Cuzco, Peru, is now in cultivation at the Selby Botanical Gardens; Madison 1129 (GH) from Dept. Amazonas, Peru, represents the northernmost station for the species. During a recent collecting trip in South America I found a population of plants representing a new species of Asterostigma which extends the known range of the genus northward to Ecuador.

Asterostigma integrifolia Madison, sp. nov.

Species foliis integris a congeneribus diversa.
Herba perennis tubere globoso 4-6 cm crasso; petiolus carnosus, teres, 60-80 cm longus, vagina membranacea 15-20 cm longa instructus; lamina integra, ovata, cordata, 24-30 cm longa, 20-25 cm lata, apice acuminata; pedunculus teres, 30-40 cm longus, 6-10 mm crassus; spatha cucullata, subviridis, circa 10 cm longa, apice acuminata; spadix vermiformis, 7 cm longis, 1 cm crassus, parte feminea quam parte staminata dimidio minori; pistilla virida, staminodiis incarnati circumcincta; stigmata stellatae, citrinae, 3-4 mm latae, ramis 5-6; synandria incarnata, antheras globosis.

Type Collection: ECUADOR: Prov. Loja: 14 km E of Loja along road to Zamora, foggy elfin forest, elev.2600 m., Madison 2441 (specimen lost); Holotype: from cultivated material of the above-cited wild collection, Madison 2942 (SEL, isotypes to be distributed).

Asterostigma integrifolia is readily distinguished by its entire leaves from the other species of the genus, all of which have pinnatisect leaves. In addition the pale green spathe and bright lemon-yellow stigmas are diagnostic features. The considerable differences between A. integrifolia and A. pavonii in a number of characters suggest that the former is not a geographic derivative of A. pavonii, but rather may represent an independent northward migration from a temperate South American origin.



Asterostigma integrifolia Madison, inflorescence

Luctatio Aroideis I. *Caladium* and *Xanthosoma*

Michael Madison

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The tribe Colocasieae (Araceae) comprises a dozen genera of terrestrial herbs found throughout the tropics, several species of which are cultivated for their edible starchy tubers. In the neotropics the two principal genera of this tribe are *Caladium* Vent. and *Xanthosoma* Schott. *Caladium*, with about fifteen species, is found in tropical South America and the Lesser Antilles, and is most diverse in the northern Andes. *Xanthosoma*, with about 45 species, also has its center of diversity in the northern Andes, with secondary centers in southern Brazil, the West Indies, and Mexico. Many of the species of *Xanthosoma* are weedy and occur abundantly in pastures and ditches, along roads and waterways, and at the margins of clearings. Caladiums are much less common and mostly inhabit dark sites in the forest understory.

The technical distinction of these genera is in the structure of the ovary: in *Xanthosoma* the ovary is 3-4 locular with axile placentation and is capped by a broad discoid style which is united to the styles of adjacent flowers. In *Caladium* the ovary is unilocular with 2-3 intrusive parietal placentae bearing ovules near the base; a discoid style is absent and the stigma is sessile on the rounded ovary.

These characters are difficult to observe in dried specimens, especially when the fleshy flowers have rotted into a slimy mass before drying, as is frequently the case. In practice the genera are usually distinguished by a number of other features summarized below:

Xanthosoma	*Caladium*
1. Large plants, 0.5-5 m tall	1. Diminutive plants, less than 0.5 m
2. Weedy, growing in full sun	2. Forest understory plants, not weedy
3. Stem erect, rarely tuberous	3. Stem a globose tuber
4. Peduncle usually much shorter than the petiole	4. Peduncle usually longer than the petiole
5. Spadices clustered in monochasia	5. Spadices solitary
6. Leaf sagittate or pedatisect, never peltate	6. Leaf sagittate or ovate, often peltate

In the course of studies of Caladium and Xanthosoma in Ecuador I have found two species which are intermediate between the genera. One of them is here described as a new species of Caladium:

Caladium plowmanii Madison, sp. nov.

Herba terrestris ad 30 cm alta. Rhizoma repens, interdum bulbilliferum, glabrum, internodia 10-14 mm crassa, 1-4 cm longa. Petiolus folii 10-25 cm longus, 2-3 mm crassus, vagina purpureo-maculata 2.5-4 cm longa instructus. Lamina glabra, late hastata, lobo antico 14-16 cm longo, lobis posticis 10-12 cm longis, supra saturate viridis, subtus praeter venas viridis pallida. Inflorescentia monochasialis spadicipus (4-5) composita. Pedunculus teres, 2 mm crassus, 20-25 mm longus, viridis; spatha flavovirens, albidescens, infra medium laete purpureomaculata, 5-6 cm longa, 15-20 mm supra basin constricta, pars supera 15 mm lata ubi aperta. Spadix albidus, 30-35 mm longus, 2-2.5 mm crassus, pars carpellata 12-14 mm longa, pars staminata 19-22 mm longa. Pistillum 1-1.5 mm latum, circa 0.5 mm altum, stigmate sessile rotundato coronatum. Synandrium 4-6 lobatum, circa 1 mm latum, 0.3 mm altum.

HOLOTYPE: ECUADOR: Prov. Napo: 31 miles W of Lago Agrio on road to Baeza, moist hillside forest, elev. 2100 ft., 30 July 1974, Plowman, Sheviak, & Davis 3979 (GH)
ADDITIONAL MATERIAL: Propagules of the type collection were sent to the Selby Botanical Gardens where the species is now cultivated. The illustration of the inflorescence (Fig. 1) is based on live material from this cultivated plant. As more individuals of the clone mature, specimens will be made for distribution to various herbaria.

The name honors Dr. Timothy Plowman of Harvard University, intrepid collector of neotropical aroids.

Caladium plowmanii is most closely related to C. longipodum K. Krause from Prov. Pastaza, Ecuador, which is distinguished by its smaller, sparsely pilose, narrowly sagittate leaves which are held stiffly erect in contrast to the spreading, glabrous, broadly hastate leaves of C. plowmanii.

As can be seen in Figure 1 the ovary of Caladium plowmanii is unilocular with two parietal (sub-basal) placentae, and the stigma is small and sessile; this clearly relegates the species to Caladium. However in a number of its other features C. plowmanii is closer to Xanthosoma. It has an elongate caudex, (creeping in the wild collection, erect in cultivated plants), rather than a globose tuber. The lamina is not peltate, as in most of the other species of Caladium with sagittate or hastate leaves, and the spadices are borne on short peduncles in monochasia or 4-5 spadices rather than solitary on long peduncles, as is typical of Caladium.

A second Ecuadorian species which is intermediate between the two genera is Xanthosoma eggersii (Engler)Engler, Figure 2. When cultivated material of this species flowered at the Selby Botanical Gardens I decided that it was an undescribed species of Caladium. However, after dissecting a number of flowers I began to think that it might be a Xanthosoma, and finally determined it as X. eggersii (Engl.)Engl. based on Caldium eggersi Engl. This specimen, (Dodson 5911, SEL) is apparently the first collection since the type was collected in 1897.

The fact that Engler had the same problem with determining the generic affinities of this species is indicative of its intermediate position. In cross section the ovary is 2-3 locular with axile placentation; yet the septa are so weakly united in the center that in sectioning they frequently separated and then appeared as 2 or 3 deeply intrusive parietal placentae, as in Caladium. As can be seen in Figure 2, the ovary is capped by a mantle-like style bearing a capitate stigma at its apex. However, the carpellate flowers are spread far apart on the spadix and adjacent styles are not coherent as in other species of Xanthosoma. This lax-flowered condition is found as well among the sterile flowers of the central portion of the spadix, which are purple in color and of unusual shapes quite unlike the white, hexagonal-prismatic sterile flowers of other species of Xanthosoma. The peduncle in X. eggersii is equal to or longer than the petiole, (a Caladium trait), and is so weak that it is only the encircling leaf sheath which holds the inflorescence erect.

The occurrence of intermediates between genera is not uncommon in the Araceae. In-between situations in the transition from axile to parietal to basal placentation are found in the tribe Monstereae where placentation is nonetheless a useful generic character. In the case of Xanthosoma and Caladium the nature of the style remains a single definitive character for purposes of taxonomy. The existence of a few intermediates at the geographic center of diversity of the tribe should not diminish the usefulness of a syndrome of additional characters which help to distinguish the genera in the rest of their ranges. However, the occurrence of these intermediates does raise the suspicion that other species described in the past on vegetative features may proove to have been placed in the wrong genus once their flowers are carefully studied.

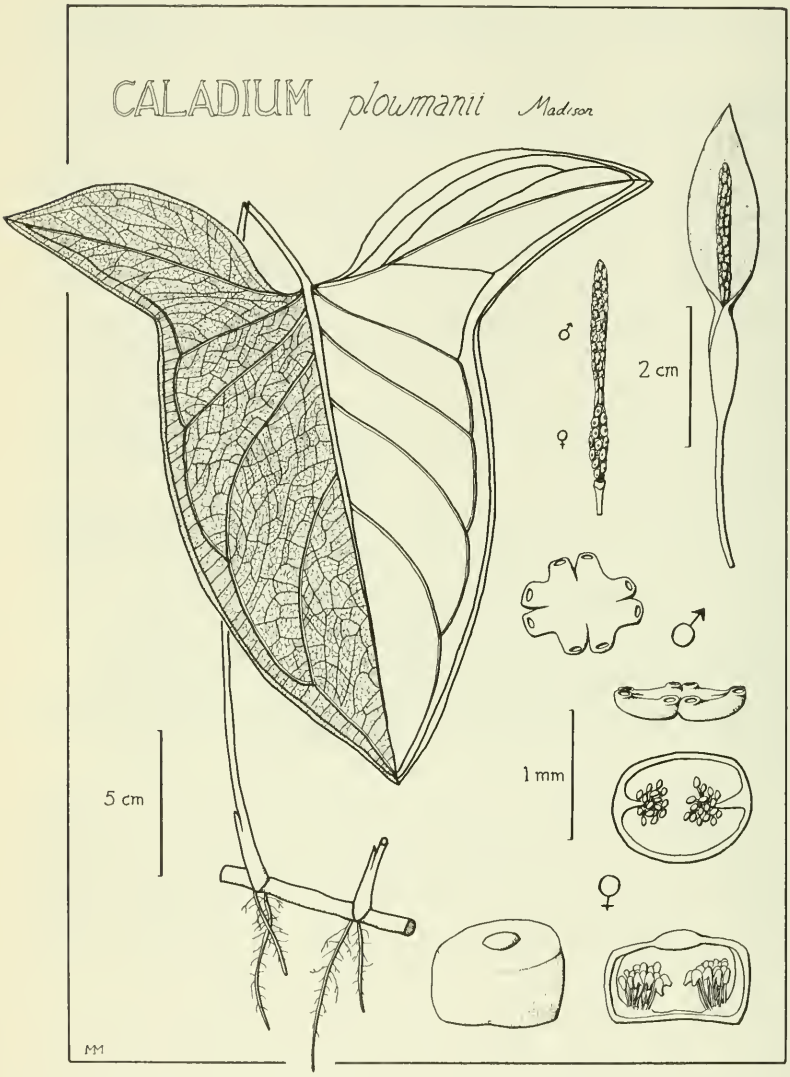

Figure 1. Caladium plowmanii Madison

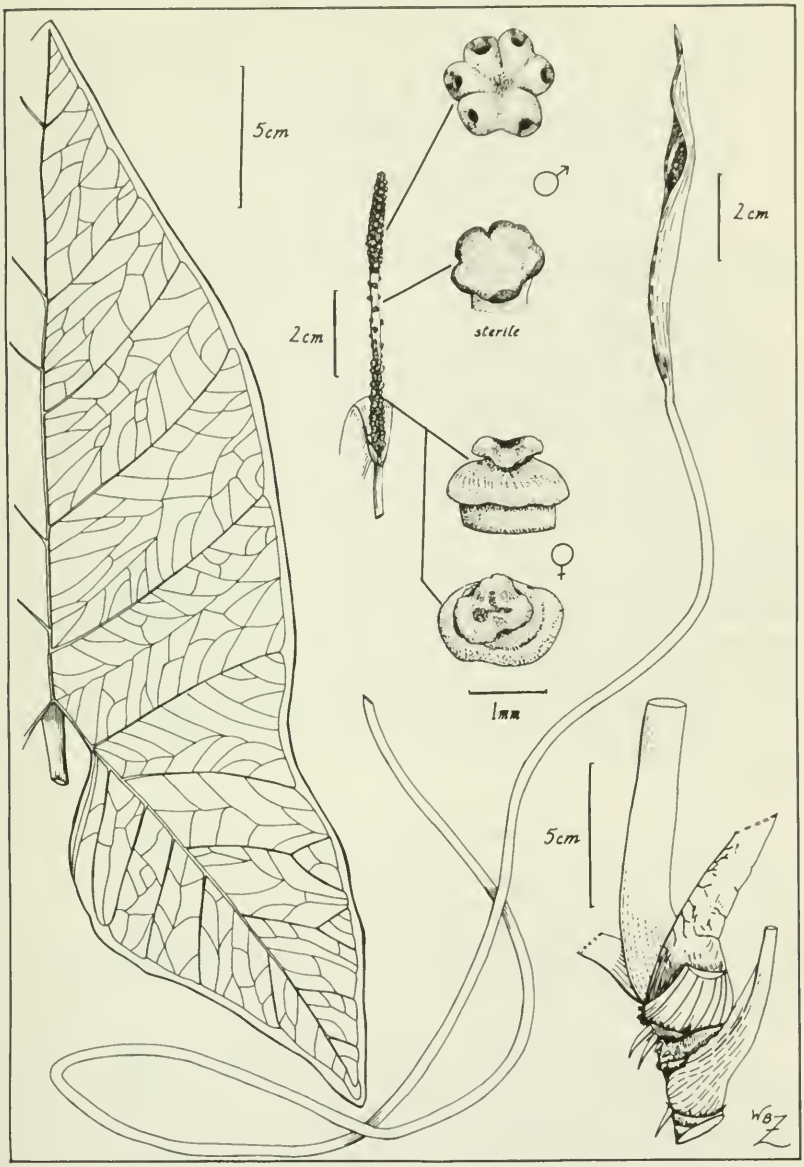

Figure 2. Xanthosoma eggersii (Engl.) Engl., drawn by Wendy Zomlefer from a cultivated specimen (Dodson 5911) from Ecuador

FLOTSAM AND JETSAM OF THE WORLD

Otto & Isa Degener

"WORLD GUIDE TO TROPICAL DRIFT SEEDS AND FRUITS" by C.R. Gunn & J.V. Dennis, IX & 240 pp., illus., Demeter Press Book, New York.

Habitués of tropical and warm coasts of the World, if interested in Botany or Natural History, will welcome this outstanding mélange of compilation and research about plant flotsam and jetsam. It concerns propagules - both fruits and seeds - that have been carried by ocean currents from equatorial regions both North and South. When cast upon beaches they are conspicuous treasures for the beach comber. In general, the farther we search away from the Equator, the less specimens in kind and number shall we find. This is so because many have been stranded before drifting far distances, while many others have had time to become sufficiently waterlogged to sink to the bottom. Some seeds, such as the sea-heart (Entada gigas) have been found as far north as Spitzbergen; while others, such as the *goatsfoot morning-glory (Ipomoea pes-caprae var. emarginata), have been found as far south as North Auckland, New Zealand. The common i-pil (Intsia bijuga) has drifted as far as South Africa, its seeds having been found even on both sides of the Cape of Good Hope.

No explanation is given why little drift is carried from cold climates, both North and South, toward the Equator. We suspect three main reasons: a cold climate, with its brief growing season, produces a fraction as many floatable propagules as does a warm one; currents, both North and South, hardly scour such coasts; nor do such coasts possess major rivers to transport quantities of fruits and seeds into the oceans.

Beside 79 plates (dubbed "figures") of easily identifiable propagules executed by British artist Pamela J. Paradine, the book is illustrated further with 16 photographs. The interesting text, perhaps a bit lavish in waste of space, is the work of the famed American seed specialists and beach combers Charles R. Gunn and John V. Dennis. The introductory chapter of eight pages is followed by one equally as long concerning "History." This is replete with folklore and tales of human interest such as the making of snuff boxes. Chapter 3 involves "Transport Currents and Collecting

Beaches" listed geographically. After "Collecting and Uses" the body of the work begins on page 58 with "Systematic Descriptions and Illustrations." Here a key for the identification of "disseminules" will aid the finder to identify his treasure if he has not long ago identified it by leafing through the fascinating drawings. Drawings of disseminules identified to the genera only and to the species total 114, while species mentioned and not illustrated approach 200. A few differences of opinion regarding binomials held by authors and us reviewers come to mind after making a spot check of the "Appendix." We prefer Vachellia (in place of Acacia) farnesiana for p. 209, Myristica surinamensis for p. 213, Swietenia mahoganii for p. 215, Tacca leontopetaloides andor some unidentified species for 215, and Messerschmidea (in place of Tournefortia) argentea for p. 215. Indulging in a check of the completeness of the "Bibliography," we note that Degener, O., & I. Flotsam and Jetsam of Canton Atoll, South Pacific. Phytologia 28(4):405-418. 1974 is conspicuous by its absence.

"World Guide to Tropical Drift Seeds and Fruits," published in 1976 and selling for $17.50, is highly recommended for residents of warm and tropical coasts. For the technical botanist interested in anatomy, living anywhere at all and with $65 to spare, we recommend E.J.H. Corner's two volumes about "The Seeds of Dicotyledons," published by the Cambridge University Press the same year.

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*Inappropriately named by us and others "soilbind morningglory," "seaside morningglory," and "railroadvine."

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NOTES ON NEW AND NOTEWORTHY PLANTS. XCV

Harold N. Moldenke

ERIOCAULON LAOSENSE var. MAXWELLII Moldenke, var. nov. Fig. 1

Haec varietas a forma typica speciei recedit plantis usque ad 6 cm. altis, petalis flosculorum masculorum infra insertionem staminum profunde fissis, sepalis flosculorum femineorum ad apicem non cuspidatis, petalis dorso pilosis.

This variety differs from the typical form of the species in having somewhat larger general aspect, the peduncles to 6 cm. long, the receptacular bractlets pilose, the staminate petals separate to far below the insertion of the stamens, the pistillate sepals not cuspidate at the apex, and the pistillate petals pilose on the back.

The type of the variety was collected by James F. Maxwell (no. 74-376) -- in whose honor it is named -- in open, moist, sandy

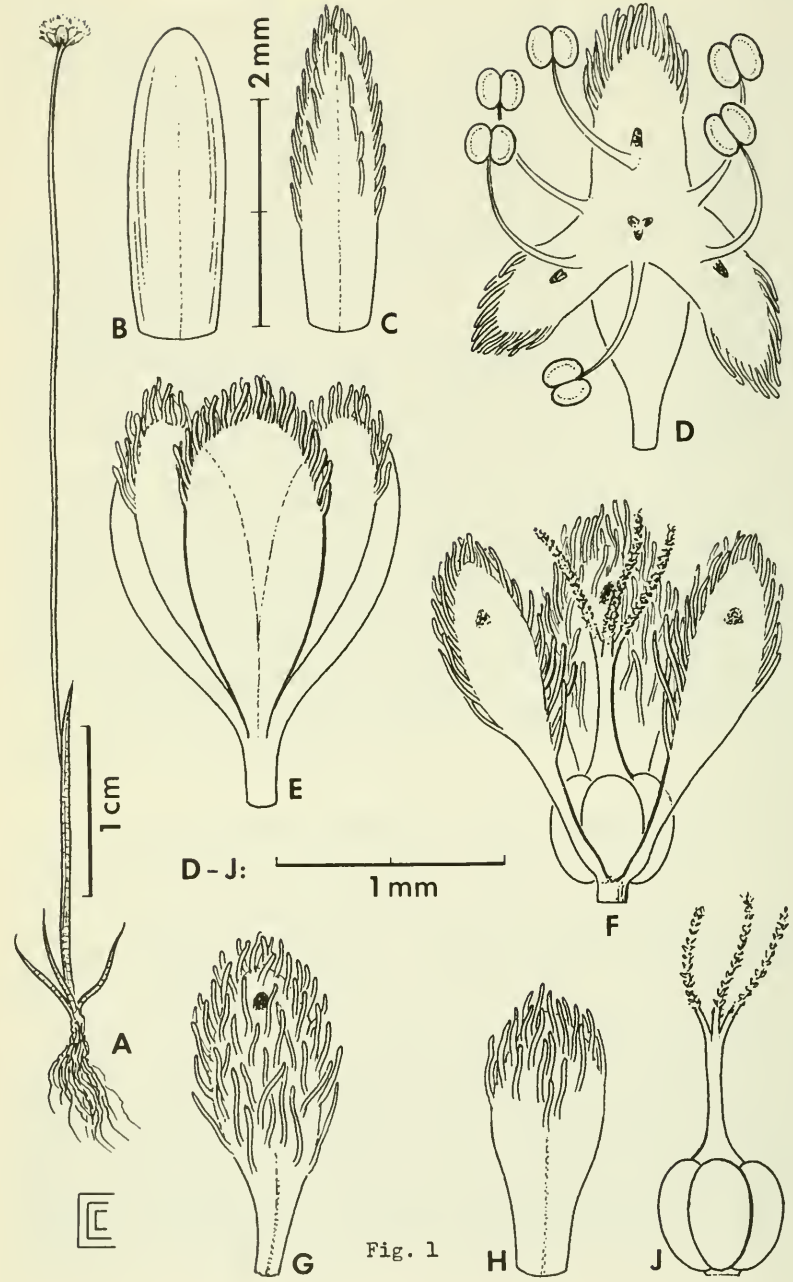

Fig. 1

areas in scrub forest at Klong Yai, Trat province, at an altitude of 150 meters, Thailand, on the Cambodian border, on May 5, 1974, and is deposited in the Herbarium Jutlandicum at Aarhus University. The collector describes the flower-heads as white.

Fig. 1: A - Habit; B - Involucral bractlet, exterior view; C - Receptacular bractlet, exterior view; D - Staminate floret with sepals removed; E - Staminate sepals; F - Pistillate floret with sepals removed; G - Pistillate petal; H - Pistillate sepal; J - Gynoecium. Drawn by Charles C. Clare, Jr., August 1976.

GLOSSOCARYA MOLLIS var. MAXWELLII Moldenke, var. nov.

Haec varietas a forma typica speciei recedit laminis foliorum supra subglabris subtus secus costam et venas secundarias plus-minusve dense pubescentibus.

This variety differs from the typical form of the species in having the upper surface of its leaf-blades glabrous or subglabrous, usually only with very widely scattered, short, whitish hairs, more densely pilose along the midrib, and the lower surface more or less densely pubescent only along the midrib and secondary veins, widely scattered pubescent on the lamina. The calyxes and fruiting-calyxes are densely canescent-strigose with short antrorsely-appressed hairs on the outer surface, while the fruits are conspicuously hirsute with perpendicular, elongate, white hair.

The variety is based on J. F. Maxwell 75-389 in an open evergreen area on a limestone mountain, at an altitude of 150 m., at Khao Chong, Trang Province, Thailand, on August 15, 1975, and is deposited in the Herbarium Jutlandicum at Aarhus University

PAEPALANTHUS SAXICOLA var. PILOSUS Moldenke, var. nov.

Haec varietas a forma typica speciei pedunculis pilosis capitulis 1.5--3 mm. latis et foliis usque ad 4 cm. longis recedit.

This variety differs from the typical form of the species in having its peduncles lightly pilosulous, the flower-heads only 1.5--3 mm. wide, and the leaves up to 4 cm. long.

The type of the variety was collected by Gert Hatschbach (no. 36832) at "corrego encachoeirado, sobre pedras no meio do rio (local sombrio)", Chapada dos Veadeiros, in the municipality of Alto Paraiso, Goiás, Brazil, on May 25, 1975, and is deposited in my personal herbarium at present at Plainfield, New Jersey.

LACHNOCAULON ENGLERI f. ABLUDENS Moldenke, f. nov.

Haec forma a forma typica speciei recedit bractei aliquis infernis valde elongatis lingulatis 4--4.5 mm. longis herbaceis viridibus, albo-marginatis. This form differs from the typical form of the species in having some of the lower bractlets in its flowering heads conspicuously elongated, strap-shaped or tongue-shaped, 4—4.5 mm. long, upwardly curved or somewhat patent, herbaceous, green, with white margins. The type of the form was collected by Hugh O'Neill (no. 7785a in part) on the north shore of Lake Jovita, Pasco County, Florida, on April 10, 1933, and is deposited in the United States National Herbarium in Washington.

ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXVI

Harold N. Moldenke

PAEPALANTHUS SUBTILIS Miq.

Additional bibliography: Moldenke, Phytologia 35: 35—36. 1976.

Gleason, in his unpublished Flora of British Guiana, gives this species' overall distribution as "Surinam to northern Brazil". Prance encountered it on "flooded sandy beach in black water", fruiting in February.

Ruhland (1903) cites for the typical form of this species: GUYANA: R. Schomburgk 236. SURINAM: Focke s.n., Weigelt s.n., Wizell s.n. (V). BRAZIL: Amazônas: Schwacke 4086, Spruce 2743. Bahia: Salzmann s.n. Pará: Burchell 9354, Huber 161, Sieber s.n., Spruce s.n., all in the Berlin herbarium except for the Wizell collection.

It is possible that the Eriocaulon arenarium Salzm., listed in the synonymy of P. subtilis, may actually belong, rather, in the synonymy of P. parvus Ruhl. since the type specimen of P. parvus is an unnumbered Salzmann collection labeled as "Eriocaulon arenarium Mart."

Material of P. subtilis has been misidentified and distributed in some herbaria as P. polytrichoides H.B.K. On the other hand, the W. A. Egler 47650, distributed as P. subtilis, is actually a mixture of P. oyapockensis Herzog and Syngonanthus glandulosus Gleason. The Ruiz-Terán & López-Palacios 11222a, cited below, is a mixture with Syngonanthus simplex (Miq.) Ruhl. Carrick 973 is S. gracilis (Bong.) Ruhl. and Carrick 985 is S. simplex.

Additional citations: VENEZUELA: Amazonas: Araque Molina & Barkley 18V186 (K, W--2683129); J. A. Steyermark 58447 (S). Bolívar: Merxmüller 22954 (Mu); Ruiz-Terán & López-Palacios 11222a, in part (Ac); J. A. Steyermark 86841 (Fg, N, Ve, Ve), 89700 (Mi); Steyermark, Steyermark, Wurdack, Wurdack, & Wiehler 106608 (Ld); G. H. H. Tate 1310 (N). GUYANA: C. B. Clarke s.n. [1897] (N); D. H. Davis 156 (N); S. G. Harrison 1050 (K), 1398 (K); Herb. U. G. Bio. 106-21 (N); Jerman 5170 (W--45357, W--936262); R. Schomburgk 236 (B, Ut--420, W--702595). SURINAM: Donselaar & Donselaar 408 (Ut--93608B); Florschütz & Florschütz 170 (Ut--80220B); Focke 1319 (Ut--380--type); Lanjouw & Lindeman 2984a (Ut--17888B), 3012 (Ut--17887B); Lindeman 4021 (W--2734383), 4193 (N); Pulle 539 (Ut--44058A); Schweinitz s.n. (T); Went 367 (Ut--380). BRAZIL: Amapá: Black & Fróes 51-12358 (Be--70179), 51-12401 (Be--70222); W. A. Egler 47650 (Ac, N); Maguire, Murça Pires, & Maguire 47129 (N, S); Murça Pires, Rodrigues, & Irvine 51062 (N). Amazônas: Prance, Steward, Ramos, Fidalgo, & Prance 20201 (Ld); M. Silva 965 [Herb.

Mus. Goeldi 32812] (N); Spruce 1503 (N, S, S), 2743 (B). Bahia: Salzmann s.n. [Bahia, in sabulosis aridis] (Br). Goiás: Hatschbach & Kummrow 38415 (Ld); Irwin, Grear, Souza, & Reis dos Santos 13483 (Ld, N, W--2759040). Maranhão: Murça Pires & Black 2340 (N). Pará: Archer 8441 (Be--11790, Mm, N, Sm, W--2199906, W--2278318); G. A. Black 860 (N), 52-15559 (Z); Burchell 9254 (Br, W--33275); Ducke s.n. [Herb. Mus. Goeldi 10806] (Z); Huber 1616 (Ut--1656); D. A. Lima 53-1337 (Be--8-869); Murça Pires & Silva 4243 (N, N), 4271 (N); Sieber s.n. [Pará, Bras.] (Br, N--photo, Z--photo); Spruce 609 (Mu), s.n. [Prope Santarem, Mart. 1850] (S, S). Rio Grande do Norte: Tavares 327 (W--2692387). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

PAEPALANTHUS SUBTILIS var. HIRSUTUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 157 [as "hirsuta"]. 1903.

Synonymy: Paepalanthus subtilis var. α Körn. in Mart., Fl. Bras. 3 (1): 358--359. 1863. Paepalanthus subtilis var. hirsuta Ruhl. in Engl., Pflanzenreich 13 (4-30): 157. 1903. Paepalanthus subtilis var. Körn. ex Ruhl. in Engl., Pflanzenreich 13 (4-30): 157, in syn. 1903.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 358--359. 1863; Ruhl. in Engl., Pflanzenreich 13 (4-30): 157 & 292. 1903; Moldenke, Known Geogr. Distrib. Erioc. 7 & 54. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 67 & 212. 1949; Moldenke, Résumé 77, 102, 328, & 490. 1959; Moldenke, Fifth Summ. 1: 132 & 167 (1971) and 2: 591 & 958. 1971; Moldenke, Phytologia 30: 318 (1975) and 31: 405. 1975.

This variety is based on an unnumbered Kegel collection from "an sandigen Stellen nahe Mariepaston", Surinam, probably deposited in the Berlin, Munich, or Göttingen herbaria. Ruhland (1903) describes it as "Differt a forma typical foliis dense et longe persistenti-ciliatis, pedunculis longe patenti-hirsutis". He cites only the original collection.

Citations: BRAZIL: Pará: W. A. Egler 309 (Z).

PAEPALANTHUS SUBTILIS var. PUBERULUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 157 [as "puberula"]. 1903.

Synonymy: Paepalanthus subtilis var. β Körn. in Mart., Fl. Bras. 3 (1): 358--359. 1863. Paepalanthus subtilis var. puberula Ruhl. in Engl., Pflanzenreich 13 (4-30): 157. 1903.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 358--359. 1863; Ruhl. in Engl., Pflanzenreich 13 (4-30): 157 & 292. 1903; Moldenke, Known Geogr. Distrib. Erioc. 16 & 54. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Phytologia 4: 205. 1953; Moldenke, Résumé 102, 328, & 490. 1959; Moldenke, Fifth Summ. 1: 167 (1971) and 2: 591 & 958. 1971.

This variety is based on an unnumbered Spruce collection from near Manáos, Amazônas, Brazil, probably deposited in the Berlin or Munich herbarium. It is known thus far only from the original

collection. Ruhland (1903) describes it as "Differt a forma typica vaginis pedunculisque brevissime patenti-puberulis".

PAEPALANTHUS SUCCISUS Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 384. 1863.

Synonymy: Dupatya succisa (Mart.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya succisa Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Paepalanthus succisus Körn. ex Ruhl. in Engl., Pflanzenreich 13 (4-30): 172 & 292, in syn. 1903.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 384—385 & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 126, 142, 172, 284, & 292. 1903; Alv. Silv., Fl. Mont. 1: 414. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16, 31, & 54. 1946; Moldenke, Alph. List Cit. 2: 412 (1948) and 3: 935. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Phytologia 4: 205. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 102, 282, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Fifth Summ. 1: 167 & 486 (1971) and 2: 958. 1971; Moldenke, Phytologia 28: 461 (1974) and 30: 321. 1975.

This species is based on an unnumbered collection of Martius from "im Gebiet von Diamantina, an sandigen feuchten Lokalitäten", Minas Gerais, Brazil, collect in June, 1818, and deposited in the Munich herbarium where it was photographed by Macbride as his type photograph number 18730.

Paepalanthus succisus Körn. has erroneously been regarded as a synonym of P. praemorsus Ruhl. Ruhland (1903) comments about P. succisus Mart. "An species potius ad Aphorocaulonem subsectionem pertinet?" He cites only the original collection. Silveira (1928) cites Silveira 497 from the Serra do Cipó, Minas Gerais, collected in 1905.

Citations: BRAZIL: Minas Gerais: Martius s.n. [In arenosis humidis districtu adamantium, Junio 1818; Macbride photos 18730] (Mu--type, N--photo of type, W--photo of type); A. Silveira 492 [Herb. Marie-Victorin 15838] (N--photo, Z--photo).

PAEPALANTHUS SUFFRUTICANS Ruhl. in Engl., Pflanzenreich 13 (4-30): 138. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 8, 125, 138, 139, & 292. 1903; Beauverd, Bull. Herb. Boiss., ser. 2, 8: 288 & 289, fig. 10 C 18—23. 1908; Prain, Ind. Kew. Suppl. 3: 126. 1908; Alv. Silv., Fl. Mont. 1: 106 & 414. 1928; Stapf, Ind. Lond. 4: 519. 1930; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 43. 1930; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 190. 1969; Moldenke, Fifth Summ. 1: 168 (1971)

and 2: 591 & 958. 1971; Moldenke, Phytologia 26: 250. 1973.

Illustrations: Beauverd, Bull. Herb. Boiss., ser. 2, 8: 289, fig. 10 C 18—25. 1908.

This species is based on Glaziou 15529 from Morro da Carapuça, Minas Gerais, Brazil, flowering in June, and deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10653. The Glaziou collection bears printed labels inscribed "Rio de Janeiro" although it appears that the collection was actually made in Minas Gerais. Ruhland (1903) cites only the original collection, but Silveira (1928) cites A. Silveira 332 from Caraça, also in Minas Gerais, collected in 1906, and comments that "Specimina hujus speciei ab Alvaro Silveira in Morro da Carupaça, Serra do Caraça, lecta, apr. 1905, caules valde elongatos, metrales et altiores habent. Specimina a cl. Ruhland indicata et a Glaziou in illo loco ipso collecta, caules 12 cm longitudine attingentes habent. Folia etiam in latitudine valde variabilia; in speciminibus ab Alvaro Silveira collectis ad Morro da Verruguinha, Caraça, 1,5—3 mm lata; in illis ad Morro da Carapuça lectis, 5—10 mm lata." Thus far the species seems to be known only from these collections.

Citations: BRAZIL: Minas Gerais: Glaziou 15529 [Macbride photos 10653] (B—type, N—photo of type, W—photo of type, Z—isotype).

PAEPALANTHUS SUFFRUTICANS var. ANGUSTIFOLIUS Alv. Silv., Fl. Mont. 1: 414 [as "angustifolia"]. 1928.

Synonymy: Paepalanthus suffruticans var. angustifolia Alv. Silv., Fl. Mont. 1: 414. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 414. 1928; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103, 328, & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 591 & 958. 1971.

This variety is based on A. Silveira 931 from Caraça, Minas Gerais, Brazil, collected in 1906 and deposited in the Silveira herbarium. Thus far it is known only from the original collection.

PAEPALANTHUS SUPERBUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 218. 1903.

Synonymy: Paepalanthus augustus Alv. Silv., Fl. Serr. Min. 59, pl. 20. 1908. Paepalanthus angustus Alv. Silv. apud A. W. Hill, Ind. Kew. Suppl. 8: 169, sphalm. 1933.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 12, 214, 218, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 127. 1908; Alv. Silv., Fl. Serr. Min. 59, pl. 20. 1908; Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 4. 1924; Alv. Silv., Fl. Mont. 1: 246, 249, 253—254, & 402, pl. 168. 1928; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 41 & 53. 1930; A. W. Hill, Ind. Kew. Suppl. 8: 169. 1933; Wangerin in Just, Bot. Jahresber. 57 (1): 475. 1937; Stapf, Ind. Lond. 4: 518. 1930; Worsdell, Ind. Lond. Suppl. 2: 183. 1941; Moldenke, Known Geogr. Distrib. Erioc. 10,

16, 45, & 55. 1946; Moldenke, Phytologia 2: 379. 1947; Moldenke, Alph. List Cit. 2: 412 (1948) and 3: 935. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 82, 88, 208, & 212. 1949; Moldenke, Phytologia 4: 135. 1952; Mendes Magalhães, Anais V Reun. Anual Soc. Bot. Bras. 234. 1956; Moldenke, Résumé 95, 103, 323, 485, & 490. 1959; Moldenke, Résumé Suppl. 1: 6, 19, & 25. 1959; Rennó, Levant. Herb. Inst. Agron. Minas 69. 1960; Moldenke, Phytologia 20: 362. 1970; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 577, 578, & 958. 1971; Moldenke, Phytologia 26: 235. 1973.

Illustrations: Alv. Silv., Fl. Serr. Min. pl. 20. 1908; Alv. Silv., Fl. Mont. 1: pl. 168. 1928.

This species is based on Glaziou 19972 and 19993 from dry campos in the Serra do Cipó, Minas Gerais, Brazil, flowering in April, and deposited in the Berlin herbarium where the former was photographed by Macbride as his type photograph number 10654. Ruhland (1903) cites only the original collections. Paepalanthus augustus was based by Silveira on his no. 373 collected "In pratis, locis siccis atque arenosis vel humosis prope Varzea do Lageado in the Serra do Cipó", collected in April, 1905, and also deposited in the Berlin herbarium.

Recent collectors describe this plant as having white bracts and have found it growing on rocky campo near streambeds in an area of cerrado on rocky hilltops with prominent sandstone outcrops and with recently burned "campo limpo" on the lower gentler slopes with sandstone soil and with gallery forest along the streams at the base of the hills, at 1125 meters altitude. It has been collected in anthesis from February to April.

Citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 36241 (Ld, N); G. Black s.n. [Herb. Jard. Bot. Belo Horiz. 44190] (N); A. P. Duarte 6456 [Herb. Brad. 22969] (Z); Glaziou 19972 [Macbride photos 10654] (B--cotype, Br--cotype, N--cotype, N--photo of cotype, N--photo of cotype, W--photo of cotype), 19972 (B--cotype); Mello Barreto 10746 [Herb. Jard. Bot. Belo Horiz. 31975] (N); A. Silveira 373 (B, N--photo, N--photo, Vi--15842, Z--photo); L. B. Smith 6781 (N); Smith & Ormond 6781 (Z).

PAEPALANTHUS SUPINUS Körn. in Mart., Fl. Bras. 3 (1): 352--353. 1863.

Synonymy: Eriocaulon supinum Herb. Vindob. ex Körn. in Mart., Fl. Bras. 3 (1): 352, in syn. 1863. Dupatya supina (Körn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya supina Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Paepalanthus jahnii Ruhl. in Engl., Pflanzenreich 13 (4-30): 161--162. 1903. Paepalanthus spunius Körn. ex Moldenke, Known Geogr. Distrib. Erioc. 55, sphalm. 1946.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 352--353 & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879 (1893) and imp. 1, 2: 402. 1894; Huber, Bol. Mus. Para. 2: 500. 1898; Malme, Bih. Svensk. Vet. Akad. Handl. 27 (3), no. 11: 27. 1901; Durand & Jacks., Ind. Kew.

Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 153, 161-163, 284, 290, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 126. 1908; Malme, Phanerog. 3: 9. 1933; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 13, 16, 50, & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 85, 88, 210, & 212. 1949; Moldenke, Phytologia 4: 205--206. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 103, 282, 326, 328, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 879 (1960) and imp. 3, 2: 402. 1960; Moldenke, Résumé Suppl. 3: 14. 1962; Moldenke, Fifth Summ. 1: 168 & 486 (1971) and 2: 514, 584, 591, & 958. 1971; Moldenke, Phytologia 30: 105, 317, & 320 (1975), 31: 385 & 387 (1975), and 33: 150. 1976.

This species is based on Silva Manso 78, collected in Mato Grosso, Brazil, and deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 29995. Paepalanthus jahnii, on the other hand, is based on Malme 1660 ["V. 2"] and Schwacke 4550 & 4987 from the same state, the first-mentioned from "Serra da Chapada, bei São Jeronymo, in feuchten, jähnen Felsspalten" and the two latter from Cuyabá, also deposited in the Berlin herbarium.

Körnicke (1863) says of P. supinus: "Foliis densissimis in apice caulis et ramorum patenti-diffusis, rosulatis, hirtis insignis", while Ruhland (1903) says of P. jahnii: "Species habitu P. bryoidi simillima quasi forma intermedia inter hanc sectionem et subsectionem Polyactidem Ruhl., cum rami jam in apice caulis ipso enascantur". The species also bears striking habital similarity to P. cryocephalus Alv. Silv.

Recent collectors describe this plant as a delicate herb, to 10 cm. tall, small and Eleocharis-like, the flowering heads white, and have encountered it among grass in dry places and in shade of outcrops on lower mountain slopes, at altitudes of 550--700 meters, flowering in March, June, and September.

Malme (1901), whose work is sometimes erroneously cited as having been published in 1903, cites Malme 1458 & 1660b from Mato Grosso, growing "In fissuris rupis praeruptae, loco humido, umbroso" and "In fissuris subhumidis rupium praeruptarum".

Material has been misidentified and distributed in some herbaria as Eriocaulon microcephalum H.B.K. and Paepalanthus chiquitensis Herzog. On the other hand, the Glaziou 17836, distributed as P. jahnii, actually is P. ovatus Körn. and G. A. Black 49-8245 is P. polytrichoides f. villosus Moldenke.

Citations: BRAZIL: Mato Grosso: W. A. Anderson 9900 (Ld, N); Irwin, Souza, Grear, & Reis dos Santos 17172 (Ld, N, W--2759041); Malme 1458 (S), 1660 (N), 1660 V2 [Macbride photos 10617] (N--photo, N--photo, W--photo), 1660b (B, Er, S, S, W--1194799), 2169 (B, Ca--524517, S), 2169a (B, S, W--1483495); Schwacke 4550 (B); Silva Manso 78 [Macbride photos 29995] (N--photo of type, W--photo

of type). Pará: W. A. Egler 1245 [Herb. Mus. Goeldi 24292; Herb. Inst. Nac. Pesq. Amaz. 24392] (Z). BOLIVIA: Chiquitos: Cutler 7038 (N).

PAEPALANTHUS SYCHNOPHYLLUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 197. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 190, 197, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 127. 1908; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Résumé Suppl. 1: 6. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 958. 1971.

This species is based on Glaziou 6448 from "auf Sand" at the Restinga de Tynca, Rio de Janeiro, Brazil, flowering in September, and deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10655. Pereira has also encountered it in a restinga, flowering in May. Ruhland (1903) cites only the original collection and comments that the "Species P. ithyphyllo Mart. valde affinis, differt jam foliis in ramis densius dispositis, illis caulini apicis sterilis patentioribus, forma bractearum flores stipantium et sepalorum floris ♂, nec non bracteis involucrantibus multo (dimidio) minoribus et pedunculis sparsius pubescentibus. Habitus in nostra specie omnino multo robustior est."

Citations: BRAZIL: Guanabara: Pereira 3684 [Herb. Brad. 6539] (Bd); N. Santos 5134 [229-3] (Ac, Ja), 5249 [235-1] (Ja, Ja, Ja). Rio de Janeiro: Glaziou 6448 [Macbride photos 10655] (B--type, N--isotype, N--photo of type, N--photo of type, S--isotype, W--photo of type).

PAEPALANTHUS SYNGONANTHOIDES Alv. Silv., Fl. Serr. Min. 67, pl. 13. 1908.

Synonymy: Paepalanthus syngonan-thoides Alv. Silv., Fl. Mont. 1: pl. 17 II, sphalm. 1928.

Bibliography: Alv. Silv., Fl. Serr. Min. 67, pl. 13. 1908; Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 5. 1924; Alv. Silv., Fl. Mont. 1: 273--274 & 414, pl. 17 II. 1928; Stapf, Ind. Lond. 4: 519. 1930; A. W. Hill, Ind. Kew. Suppl. 8: 169. 1933; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Worsdell, Ind. Lond. Suppl. 2: 184. 1941; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Phytologia 2: 381. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Phytologia 4: 206. 1953; Moldenke, Résumé 103, 328, & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 591 & 958. 1971.

Illustrations: Alv. Silv., Fl. Serr. Min. pl. 13. 1908; Alv. Silv., Fl. Mont. 1: pl. 17 II. 1928.

This species is based on A. Silveira 447 from "In campis uliginosis arenosisque in Serra do Batatal prope Capanema", Minas Gerais, Brazil, collected in April, 1906, and is deposited in the Silveira herbarium. Silveira (1908) comments that the species "A

P. saxicola Koern., speciei unica in subgenere Psilandra Kuhl. adhuc collocata, foliis multo longioribus et vaginis oblique fissis praecipue differt".

Additional citations: BRAZIL: Minas Gerais: Macedo 1637 (S); A. Silveira 447 (B--isotype, Z--isotype).

PAEPALANTHUS TATEI Moldenke in Gleason & Killip, Brittonia 3: 158--159. 1939.

Synonymy: Paepalanthus maguirei Moldenke in Maguire & al., Bull. Torrey Bot. Club 75: 198. 1949. Paepalanthus tafelbergensis Moldenke in Maguire & al., Bull. Torrey Bot. Club 75: 199. 1948.

Bibliography: Moldenke in Gleason & Killip, Brittonia 3: 158--159. 1939; Moldenke, Known Geogr. Distrib. Erioc. 6 & 55. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 158. 1947; Moldenke, Phytologia 2: 373 & 380. 1947; Moldenke in Maguire & al., Bull. Torrey Bot. Club 75: 198--199. 1948; Moldenke, Alph. List Cit. 2: 352 & 549 (1948), 3: 701 & 974 (1949), and 4: 985. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 64, 67, 210, & 212. 1949; Moldenke, Brittonia 7: 78. 1950; Moldenke, Mutisia 6: 3. 1952; Moldenke, Phytologia 4: 149 (1952) and 4: 206. 1953; Moldenke, Mem. N. Y. Bot. Gard. 8: 98. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 175. 1953; Uribe, Mutisia 25: 28. 1956; Moldenke, Résumé 68, 72, 75, 77, 326, 328, & 490. 1959; Lindeman & Görts-van Rijn in Lanjouw, Fl. Surin. 1 [Meded. Konink. Inst. Trop. 30, Afd. Trop. Prod. 11]: 331 & 333--334. 1968; Moldenke, Phytologia 20: 297. 1970; Moldenke, Fifth Summ. 1: 126, 130, & 132 (1971) and 2: 585 & 959. 1971; Moldenke, Phytologia 30: 47 (1975) and 33: 149. 1976.

Collectors describe this plant as having stems elongated, leaves flaccid and grass-green or firmly membranaceous, squarrose, rich-green above, paler beneath, involucres black, inflorescence-heads "black below, white above", and flowers white. Ruiz-Terán & López-Palacios describe it as a "Hierba aislada o cespitosa, caulescente, psamófila y heliófila, erecta, 20--30 cm. de alto, incluyendo inflorescencias, porcion foliada de 6 cm. de largo. Hojas deltado-lineares, sólo las distales clorofílicas, verde intensas, las restantes marcescentes, parduscas. Escapos de 15--30 cm. de largo. Capítulos subglobosos a hemisféricos, 5--6 mm. de diámetro. Flores blancas o blanquecino grisaceas."

It has been found growing along moist stretches of sandy alluvium, on rocks by, under, or at the top of waterfalls, on river banks and moist ledges, among rocks in open streambeds, and on south-facing forested slopes and southwest-facing sandstone bluffs, at altitudes of 500--2090 meters, flowering from November to March, May, and July to September, fruiting in December. Ruiz-Terán & López-Palacios encountered it on "orillas de la carretera" and in "bosque". Steyermark & Wurdack describe it as "locally frequent". Maguire and his associates report it as "common among rocks", "locally frequent in wet rocky bed of streams", "common in wet pockets of granite boulders", "locally common on savannas", "frequent in bogs about pools", "frequent on moist sandy banks among rocks", "frequent in wet places along banks among rocks and boulders",

"common in wet places along streams", "frequent in Sphagnum borders of seeps on bedrock of savanna", "frequent on moist rocks", and "frequent in cracks in rocks of streambeds".

The leaves on Cardona Puig 2969 are smaller than is usual in this species; Steyermark 75998 has viviparous or proliferous heads and Steyermark says of his no. 75491 "this appears to be a luxuriant larger phase of a smaller type encountered".

The species is known from the Cerro Sipapo, Cerro Duida, Cerro Guanay, and Cerro Yaví in the Guyana highlands, on Auyán-tepuí in Bolívar and in Lara, Venezuela, and the Sierra de la Macarena in Colombia. It is based on G. H. H. Tate 1326 from Auyán-tepuí, Bolívar, Venezuela. Paepalanthus maguirei is based on Maguire 24670 from cracks in rock of streambed, North Ridge Cascade, mixed high forest, Savanna I, 1500--1700 feet altitude, Tafelberg, Surinam, collected on September 8, 1944, and deposited in the Britton Herbarium at the New York Botanical Garden. Paepalanthus tafelbergensis is based on Maguire 24485 from the Sphagnum border of seeps, bedrock, Savanna VIII, Tafelberg, Surinam, collected on August 25, 1944, and deposited in the same herbarium. The former differs in having its leaves and peduncles more glabrous and in some differences in details of the inflorescence; the latter has its floral parts apparently a bit larger, stiffer, and more conspicuously barbate. Recent workers on the Surinam flora feel that P. tafelbergensis may, indeed, be a distinct species, but admit that P. maguirei and P. tatei are conspecific. Lindeman & Görts-van Rijn (1968) cite for P. tatei from Surinam: Maguire 24241, 24485, & 24670 and Tate 1326.

Paepalanthus tatei is obviously very closely related to P. cardonae Moldenke, P. leucocyaneus Tutin, and P. salticola Herzog. The C. B. Maguire 33045 and Steyermark & Wurdack 1080, distributed as P. tatei, are actually P. scopulorum Moldenke.

Additional citations: COLOMBIA: Meta: Philipson 2394 (Bm, Bm, Er, N). VENEZUELA: Amazonas: Maguire, Cowan, & Wurdack 30364 (E, Gl, N, Ve, W); Maguire & Maguire 35020 (N), 35021 (N), 35208 (N), 35436 (N); Maguire, Phelps, Hitchcock, & Budowski 31643 (N, W), 31718 (F, Gl, K, N, Ve, W); Maguire & Politi 27343 (Bm, Bo, E, F, Gl, Ja, K, N, Ut, Ve, W), 27702 (Bm, F, Ja, N, Ve, W); Phelps & Hitchcock 24 (N). Bolívar: Cardona Puig 2702 (N), 2969 (W--2436079); Koyama & Agostini 7532 (N, N); Pannier & Schwabe s.n. [Auyantepui] (Ve, Ve); Ruiz-Terán & López-Palacios 11290 (Mi), 11451 (Mi); J. A. Steyermark 75491 (Ss), 75504 (Ss), 75998 (Z), 90337 (Ca), 93450 (Lw, N, N, S), 93724 (Lw, N); Steyermark & Nilsson 723 (Mi, N); Steyermark & Wurdack 1080 (N, N), 1123 (N); Ule 8804 [Herb. Mus. Goeldi 13834] (Bs, N); Vareschi & Foldats 4541 (N, Ve--40467), 4788 (N, Ve--40482). Bolívar: Bogner 976 (Mu); J. A. Steyermark 111262 (Ld). GUYANA: Maguire & Fanshawe 32538 (Mu, N). SURINAM: C. B. Maguire 24241 (N), 24485 (N), 24670 (N), 24832 (N); Maguire, Schulz, Soderstrom, & Holmgren

54203 (N).

PAEPALANTHUS TENUICAULIS Alv. Silv., Fl. Mont. 1: 113—115, pl. 66, fig. 2. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 113—115 & 414, pl. 66, fig. 2. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; A. W. Hill, Ind. Kew. Suppl. 9: 200. 1938; Worsdell, Ind. Lond. Suppl. 2: 184. 1941; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Phytologia 2: 381. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103, 328, & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 591 & 959. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 66, fig. 2. 1928.

This species is based on A. Silveira 568, collected "In campis ad Pedra Pintada, prope Cocaes, Minas Gerais, praecipue in umbrosis sub rupibus" in January, 1910, and is deposited in the Silveira herbarium. Silveira (1928) says that the "Species ab omnibus illis sectionis Leptocephali bene distincta". Thus far it is known only from the original collection.

PAEPALANTHUS TESSMANNII Moldenke, Phytologia 3: 169—170. 1949.

Synonymy: Paepalanthus tessmanii Moldenke ex Angely, Fl. Paran. 10: 12. 1957. Eriocaulon tessmannii Moldenke, Résumé 293, in syn. 1959.

Bibliography: Moldenke, Phytologia 3: 169—170 (1949) and 4: 206. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 176. 1953; Angely, Fl. Paran. 10: 6, 12, & 15 (1957) and 12: 9. 1958; Moldenke, Résumé 103, 293, 428, & 490. 1959; Moldenke, Résumé Suppl. 1: 22. 1959; Angely, Fl. Paran. 16: 66 (1960) and 17: 24. 1961; Moldenke, Résumé Suppl. 6: 10 (1963) and 12: 4. 1965; Angely, Fl. Anal. Paran., ed. 1, 201. 1965; Moldenke, Phytologia 18: 55 (1968) and 19: 103. 1969; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 514, 591, & 959. 1971.

The type of this species was collected by Günther Tessmann (no. 3781) in wet places between grass on the campo at Piraquara, about 22 km. east of Curitibá, Paraná, Brazil, on January 15, 1949, and is deposited in the Britton Herbarium at the New York Botanical Garden. The species has been found in flower in January and October.

Material has been misidentified and distributed in some herbaria as Eriocaulon dictyophyllum Körn. On the other hand, the Hatschbach 1197 & 2057, Reitz 5281, and Tessmann 3649, distributed as P. tessmannii, are actually Eriocaulon sellowianum var. paranense (Moldenke) Moldenke & Smith.

Additional citations: BRAZIL: Paraná: Dombrowski 1727 [Kuniyoshi 1407] (Ld), 2040 [Kuniyoshi 1766] (Ac); Dombrowski & Saito 595/386 (Ac), 1033/850 (Ac); Hatschbach 3147 (Z), 32730 (Ld); Hatschbach & Moreira 6810 (Mi); Mattos 4330 (N); E. A. Moreira 147 (Ac, W—2369343); Reitz & Klein 17457 (Ac, N). Santa Catarina: Smith & Klein 13988 (Ac, N).

PAEPALANTHUS TORTILIS (Bong.) Mart., Flora 24, Beibl. 2: 58 & 60. 1841.

Additional synonymy: Eriocaulon tortile Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 624. 1831 [not E. tortile Steud., 1855]. Eriocaulon nigro-niveum A. St.-Hil., Voy. Dist. Diam. 1: 392--393. 1833. Eriocaulon nigro-niveum var. β A. St.-Hil., Voy. Dist. Diam. 1: 392. 1833. Eriocaulon nigro-niveum var. γ A. St.-Hil., Voy. Distr. Diam. 1: 392. 1833. Eriocaulon polyphyllum Salzm. ex A. St.-Hil., Voy. Dist. Diam. 1: 383, in syn. 1833. Eriocaulon nigro-niveum var. α A. St.-Hil. ex Kunth, Enum. Pl. 3: 503, in syn. 1841. Eriocaulon tortile var. glabra, subsimplex Mart., Flora 24, Beibl. 2: 60, in syn. 1841. Eriocaulon yuccaefolium Mertens ex Mart., Flora 24, Beibl. 2: 60. 1841. Paepalanthus nigro-niveus Kunth, Enum. Pl. 3: 502--503. 1841. Paepalanthus nigro-niveus f. intermedia Kunth, Enum. Pl. 3: 503. 1841. Paepalanthus nigro-niveus f. major Kunth, Enum. Pl. 3: 503. 1841. Paepalanthus nigro-niveus f. minor Kunth, Enum. Pl. 3: 503, in syn. 1841. Eriocaulon atrocephalum Steud., Syn. Pl. Glum. 2: [Cyp.] 276. 1855. Eriocaulon nigroniveum A. St.-Hil. apud Steud., Syn. Pl. Glum. 2: [Cyp.] 275 & 334. 1855. Paepalanthus nigroniveus Kunth apud Körn. in Mart., Fl. Bras. 3 (1): 354 & 505. 1863. Eriocaulon tortilis Mart. ex Wawra, Bot. Ergebn. Reise Bras. pl. 89. 1866. Dupatya tortilis (Bong.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya tortilis Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Eriocaulon nigro-niveum var. major A. St.-Hil. ex Moldenke, Known Geogr. Distrib. Erioc. 38, in syn. 1946. Eriocaulon nigro-niveum var. minor A. St.-Hil. ex Moldenke, Known Geogr. Distrib. Erioc. 38, in syn. 1946. Paepalanthus tertilis Mart. ex Mendes Magalhães, Anais V Reun. Anual Soc. Bot. Bras. 236, sphalm. 1956. Eriocaulon microcephalum Sellow ex Moldenke, Résumé Suppl. 1: 17, in syn. 1959 [not E. microcephalum Cham. & Schlecht., 1831, nor Hook. & Arn., 1854, nor H.B.K., 1816]. Paepalanthus nigrovirens Kunth ex Moldenke, Résumé Suppl. 1: 21, in syn. 1959. Eriocaulon pulchellum Zeyh. ex Moldenke, Résumé Suppl. 1: 18, in syn. 1959. Eriocaulon tortile var. glabra Mart. ex Moldenke, Résumé Suppl. 1: 18, in syn. 1959. Eriocaulon tortile f. normalis Mart. ex Moldenke, Résumé Suppl. 1: 18, in syn. 1959. Paepalanthus tortilis Körn. ex C. R. Metcalfe, Anat. Monocot. 3: 189. 1969. Eriocaulon tortile var. laxa Mart. ex Moldenke, Phytologia 31: 397--398, in syn. 1975. Eriocaulon tortilis Bong. ex Moldenke, Phytologia 31: 398, in syn. 1975. Eriocaulon yuccaefolium Mart. ex Moldenke, Phytologia 31: 398, in syn. 1975. Paepalanthus hygrophilus Mart. ex Moldenke, Phytologia 31: 404, in syn. 1975. Paepalanthus intermedius Mart. ex Moldenke, Phytologia 31: 404, in syn. 1975 [not P. intermedius Körn., 1863]. Paepalanthus nigro-niveus f. latifolia Spruce ex

Moldenke, Phytologia 31: 404, in syn. 1975.

Bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 624. 1831; Bong., Ess. Monog. Erioc. 8 & 24. 1831; A. St.-Hil., Voy. Dist. Diam. 1: 392--393. 1833; Steud., Nom. Bot., ed. 2, 1: 586. 1840; Kunth, Enum. Pl. 3: 502--503, 524, 572, 573, 613, 614, & 625. 1841; Mart., Flora 24: Beibl. 2: 58 & 60. 1841; A. St.-Hil., Linnaea 16: Lit. 187--188. 1842; D. Dietr., Syn. Pl. 5: 259 & 266. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 275--277, 333, & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 314, 354, 505, & 507. 1863; Wawra, Bot. Ergebn. Reise Bras. pl. 89. 1866; Körn. in Warm., Vidensk. Meddel. Nat. Foren. Kjöbenh. 1871: 311. 1871; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877, 879, & 880 (1893) and imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 153, 155, 160, 223, 284, 286--288, 291, & 292. 1903; Alv. Silv., Fl. Mont. 1: 120 & 414. 1928; Stapf, Ind. Lond. 4: 519. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877, 879, & 880 (1946) and imp. 2, 2: 402. 1946; Moldenke, Alph. List Cit. 1: 43 & 222. 1946; Moldenke, Known Geogr. Distrib. Erioc. 5, 6, 16, 31, 32, 37, 38, 41, 42, 51, & 55. 1946; Moldenke, Phytologia 2: 381. 1947; Moldenke, Alph. List Cit. 3: 710, 731, 814, 815, & 891 (1949) and 4: 984. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 61, 64, 88, & 212. 1949; Moldenke, Phytologia 4: 206. 1953; Mendes Magalhães, Anais V Reun. Anual Soc. Bot. Bras. 236--237. 1956; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 68, 72, 103, 282, 286, 290, 291, 293, 294, 326, 328, & 490. 1959; Moldenke, Résumé Suppl. 1: 17, 18, & 21. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877, 879, & 880 (1906) and imp. 3, 2: 402. 1960; Moldenke, Résumé Suppl. 2: 5. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Résumé Suppl. 11: 5. 1964; Moldenke, Phytologia 18: 303 & 305 (1969) and 19: 95. 1969; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 149, 159, 160, 167, 174, & 189. 1969; Moldenke, Phytologia 20: 14 & 113. 1970; Moldenke, Fifth Summ. 1: 119, 126, 168, & 486 (1971) and 2: 494, 506, 507, 509, 514--516, 518, 537, 591, 788, & 959. 1971; Moldenke, Phytologia 25: 164, 165, & 239 (1973), 29: 319 & 328 (1974), 30: 37, 92, 93, 100, & 118 (1975), 31: 397, 398, 404, & 405 (1975), 33: 52 & 374 (1976), and 34: 259. 1976.

Illustrations: Wawra, Bot. Ergebn. Reise Bras. pl. 89. 1866.

The type of this species was collected by Ludwig Riedel "In arenosis humidis prope Ilheos", Bahia, Brazil, and is doubtless deposited in the Leningrad herbarium. An isotype was photographed by Macbride in Munich as his type photograph number 18731. Bongard's original (1831) description is "Caule brevi, subramoso, folioso; foliis caulinis lineari-lanceolatis, pilosis; pedunculis fasciculatis, elongatis, gracilibus, spiraliter tortis, glabris; vaginis pilosis".

Saint-Hilaire (1833) also based his Eriocaulon nigro-niveum on a collection from the same Brazilian state, collected by himself

[probably Saint-Hilaire I.392]. Kunth (1841) describes Paepalanthus nigro-niveus f. major as "pedunculis 4--9-pollicaribus; capitulis magnitudine grani piperis nigri; vaginis glabris"; f. intermedia as "pedunculis 2--3 1/2 -pollicaribus; capitulis vix magnitudine grani cannabis; vaginis glabris"; and f. minor [probably based on Saint-Hilaire I.393] as "pedunculis 1 1/2 -- 1 4/3 [sic!] - pollicaribus; capitulis magnitudine grani sinapis; vaginis pilosis". He seems to cite unnumbered Saint-Hilaire collections as typifying each of these forms. He comments that P. nigro-niveus "Praecedenti [P. paludosus Kunth] affinis, nisi eadem species". On page 524 of the same work he affirms that it is also related to what is now known as Leiothrix graminea (Bong.) Ruhl., but in this case the likeness is certainly only superficial. Jackson (1893) regards Eriocaulon perpusillum Steud. as conspecific with P. tortilis, but I regard it as a separate, although certainly closely related, species, P. perpusillus Kunth.

It should be noted here that the Eriocaulon tortile credited to Steudel in the above synonymy is a synonym of P. flaccidus (Bong.) Kunth; P. intermedius Körn. and Eriocaulon pulchellum Körn. are valid species in their respective genera; and Eriocaulon microcephalum Cham. & Schlecht. is E. schiedeanum Körn., E. microcephalum Hook. & Arn. is E. benthami Kunth, and E. microcephalum H.B.K. is a valid species. Paepalanthus tortilis var. albidus Ruhl. is a synonym of P. caldensis Malme, a somewhat similar appearing species with glabrous foliage.

It should also be noted here that Eriocaulon yuccaefolium Mertens and E. tortile var. glabra Mart. are both apparently based on Martius 560, the former in the Brussels herbarium and the latter at Berlin; E. nigrovirens and E. tortile var. laxa are both based on Martius 551, the former in the Berlin herbarium and the latter at Brussels; E. tortile var. normalis is based on Martius 556 at Berlin, E. microcephalum Sellow on Sellow 1150 at Berlin, E. pulchellum Zeyh. on Herb. Zeyher s.n. at Berlin, E. polyphyllum Salz. on Salzmann s.n. [Bahia, in humidis] at Berlin, Paepalanthus hygrophilus on Pohl s.n. [1839] at Brussels, P. nigro-niveus f. latifolia on Spruce 2602 at Brussels, and P. intermedius Mart. on Houllet s.n. [Brasil 1843] at Brussels.

Saint-Hilaire's original(1833) description of Eriocaulon nigro-niveum is: "acaule v. caulescens: fol. linearibus, acutis, mollibus glabris aut interdum pilosi, ima basi lanatis, recurvis, superioribus erectis congestis; pedunculis subfasciculatis glabris, per siccationem spiraliter tortis, capitulis basi umbilicatis, squamis nigris exterioribus calycibus niveo-barbatis. Beschreibung. - var. β minor, caule nullo aut subnullo; fol. angustioribus interdum vaginisque pilosiusculis; pedunculis brevioribus; capitulis minoribus. - var. γ major, caule circ. bipollicari; fol. latioribus superioribus vaginisque pilosis; pedunculis longi-

oribus, manifesto fasciculatis, capitulis crassioribus. Ces 3 variétés se nuancente entre elles. La dernière a été recueille sur les bords de la mer a Bahia, par M. Salzmann, qui provisoirement l'avait appellé dans ses herbiers E. polyphyllum. L'E. nigro-niveum a de grands rapports avec. l'E. pellucidum Mich." Actually there is no close similarity whatever in the general appearance of these two taxa.

Recent collectors have found P. tortilis growing in dried-up swamps, restingas, moist sandy soil, and moist open sandy ground near the edge of cerrado, on beaches and on lakesides with Sphagnum, and in seepage between crags, at 850--2600 meters altitude, flowering from January to July and in September. Mendes Magalhães (1956) asserts that it flowers from April to November. It has been described by collectors as a slender herb, with bright-green rosettes of leaves, growing in colonies, with "grayish" or white flower-heads. Harley and his associates found it in an area of riverside damp sandy soil, sandstone rocks, and partly burned-over vegetation.

Bongard (1831) cites a plate "49" as illustrating this species, but the plate does not seem to have been published and probably exists only in the Leningrad library or herbarium. The photograph of Ule 868, cited below, is of a specimen deposited in the Hamburg herbarium.

Körnicke (1863) cites the following collections: VENEZUELA: Trujillo: Funck & Schlim 808, Linden 1436. BRAZIL: Amazônas: Spruce 2602. Bahia: Blanchet 1965 & 2438, G. Gardner 907, Lhotzky s.n., Luschnath 35 & s.n., Martius s.n., L. Riedel s.n., Salzmann s.n., Sellow s.n. Minas Gerais: L. Riedel s.n. Pernambuco: Forssell s.n. Rio de Janeiro: Gomez s.n., Lund s.n., Mikan s.n., L. Riedel 558 & s.n., Weddell s.n., Wied-Neuwied s.n.

Ruhland (1903) cites no specimens, merely asserting that the species occurs in "Venezuela, Colombia und Brasilien: Provinzen Amazonas, Pernambuco, Bahia, Rio de Janeiro und Minas Geraës". He comments that the "capitulis facillime dignoscenda". Silveira (1928) cites J. Michaeli 802 from Minas Gerais. Körnicke (1871) cites Glaziou 1254 and Lund s.n. from Rio de Janeiro "in campis arenosis paludosis; Julio fl." Blanchet 2438 is a mixture with some unrecognized leaves; Hexia 5756 is a mixture with Syngonanthus gracilis (Bong.) Ruhl.; and Coêlho de Moraes 2212 is a mixture with Syngonanthus gracilis var. glabriusculus Ruhl.

Paepalanthus tortilis is certainly closely related to P. obtusifolius (Steud.) Körn., which may be distinguished by its generally broader and more obtuse leaves, and to P. viridis Körn. Material has also been misidentified and distributed in some herbaria as P. fasciculatus (Rottb.) Kunth and Syngonanthus gracilis (Bong.) Ruhl. On the other hand, the Pickel 2772, distributed as P. tortilis, is actually P. lamarckii Kunth, Spruce 931 is P. myocephalus var. minor Körn., and Blanchet 3584 is P. obtusifolius (Steud.)

Körn.

Additional citations: VENEZUELA: Trujillo: Funck & Schlim 808 (B, Br); Linden 1436 (Br). BRAZIL: Amazônas: Spruce 2602 (Br). Bahia: Belém 1680 (Ac), 1743 (Ac); Blanchet 1463 (Mi), 1648 (P), 2438, in part (C); M. A. Chase 8010 (W--1282173); G. Gardner 907 (N); Glocker 236 (S); Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15957 (Ld); Lhotsky s.n. [Bahia] (B); Luschnath 23 (B), 31 (B, Br), 35 [Martius 560] (N, Br, Br, Mu), s.n. [prope Brocó, Julio 1834] (B, Br); Lützelburg 471 (Mu); Martius 551 (B, B, Br, E, Mu, S, Z), 556 (B, Br, Mu), s.n. [prope Almada et Ferradas in distr. Ilheos, prov. Soteropolit. Dec. 1818] (Mu); Salzmann s.n. [Bahia, in humidis] (Br, N); Sellow 1150 (B), s.n. [Bahia] (B). Distrito Federal: Beyrich s.n. [Sept. 1822] (B); Glaziou 1254 (N, P); E. Pereira 3853 (Bd--6485, Z). Guanabara: Alston & Lutz 133 (Ja--114118); Saldanha & al. 5972 (Ja--47851, Ja); N. Santos 5330 [244-1] (Ac, Ja), 5406 (Ja); Santos, Machado, & Martins Exc. 261, Col. 2 [N. Santos 5961] (Ac); Schwacke s.n. [Copacabana 1887] (Ja--47946). Mato Grosso: Argent in Richards 6472 (Ld, N). Minas Gerais: Mexia 5756, in part [Herb. Leonard 7656] (B, Ba, Er, Go, Mi, Mv, N, S, Ut--50242A, W--1571902). Paraíba: Coêlho de Moraes 2212, in part (Mm); Tavares 1031 (W--2407869), 1067 (W--2407870). Pernambuco: Forssell 76 (S, S); Pickel 141 (B), 3164 (B, Mi, N, S), s.n. [Jan. 1931] (Ba, W--1523228); Tavares 827 (W--2403784). Rio de Janeiro: Collector undetermined s.n. [8/4/1875] (Ja--47860); Forssell s.n. (S); G. Gardner 348 (W--1066425), 848 (S, W--936287); Gaudichaud 309 (B); Glaziou 5352 (S), 5452 (W--1112474); Gomes s.n. [Rio Janeiro] (Mu); Martius s.n. [Maná] (Ja--47948); Mikan s.n. (Br); Netto, Glaziou, & Schwacke s.n. [Cabo Frio, Sept. 1881] (Ja--47859); L. Riedel 5 [Macbride photos 18731] (B--isotype, Mu--48-isotype, N--photo of isotype, S--isotype, Ut--381--isotype, W--photo of isotype), 558 (B); A. Saint-Hilaire I.392 (B), I.393 (B); Schwacke s.n. [Mana, 16/I/1887] (Ja--47947); Segadas-Vianna 4151 (Sm), 4281 (Ja), 5032 [Brade 20366] (Ja); Segadas-Vianna, Dau, Ormond, Machline, & Lorêdo 135 (Sm), 139 (Ja), 148 (Ja), 160 (Ja), 161 (Sm), 346 (Ja), 580 (Sm), 936 (Ja); L. B. Smith 6590 (Z); Ule 29 (Ja--47949, Ja), 868 (Hg, N--photo, Z--photo); Weddell 548 [41] (Br); Wied-Neuwied s.n. [ad Campos et alibi Bras. orient. 1829] (Br). State undetermined: Beyrich s.n. [Brazil] (Mi); P. Clausen 177 [P.56] (N, Qu); Herb. Zeyher s.n. (B); Houllet s.n. [Brasil 1842] (Br); J. E. Pohl s.n. [1839] (Br), s.n. [In Brasilia] (Mu). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

PAEPALANTHUS TORTILIS var. MINOR Moldenke, Phytologia 33: 374. 1976.

Bibliography: Moldenke, Phytologia 33: 374 (1974) and 34: 259.

1976.

Citations: BRAZIL: Espirito Santo: Araujo 376 [A. L. Peixoto 246; Herb. Jard. Bot. Rio Jan. 164992] (Z--type).

PAEPALANTHUS TRIANGULARIS (L.) Körn. in Mart., Fl. Bras. 3 (1): 470. 1863.

Synonymy: Plantaginella aurea alopecuroides brasiliana, foliis gramineis Breyn., Exot. Min. Cog. Pl. Cent. 1: 108. 1678. Plantaginella aurea alopecuroides brasiliana fol. gramineis, Breijnei Moris., Pl. Hist. Univ. 3: sect. 8, pl. 16, fig. 17. 1699. Eriocaulon triangulare L., Sp. Pl., ed. 2, 128. 1762. Eriocavlon plantaginella Crantz, Inst. Rei Herb. 1: 360. 1766. Eriocavlon triangulare L. apud. Reich. in L., Syst. Pl. 1: 243. 1779. Paepalanthus triangularis Körn. in Mart., Fl. Bras. 3 (1): 470. 1863. Dupatya triangularis (L.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Eriocaulon plantaginella Crantz apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879, in syn. 1893. Dupatya triangularis Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902.

Bibliography: Breyn., Exot. Min. Cog. Pl. Cent. 1: 108--109, pl. 50. 1678; Moris., Pl. Hist. Univ. 3: 259--260, sect. 8, pl. 16, fig. 17. 1699; L., Sp. Pl., ed. 2, 128. 1762; Crantz, Inst. Rei Herb. 1: 360. 1766; J. A. Murr. in L., Syst. Veg., ed. 12, 109. 1774; Reich. in L., Syst. Pl. 1: 243. 1779; J. A. Murr. in L., Syst. Veg., ed. 13, 1: 108 (1783) and ed. 14, 127. 1784; Palau y Verdera, Part. Práct. Bot. 1: 531. 1784; Jacq., Ind. Pl. 63. 1785; Lippert, Pflanzensyst. 1: 187. 1786; J. F. Gmel. in L., Syst. Nat., ed. 13, 2: 206. 1791; Lam., Tabl. Encycl. Méth. [Illustr. Pl.] 1: 214. 1791; Henckel, Nom. Bot. 68. 1797; Pers. in L., Syst. Veg., ed. 15, 132. 1797; Raeusch., Nom. Bot. 30. 1797; Willd. in L., Sp. Pl., ed. 4, 1: 485. 1797; Jolyclerc, Syst. Sex. Vég., ed. 1, imp. 1, 92. 1798; J. A. Murr. in L., Syst. Veg., ed. 15 nov., 106. 1798; Jolyclerc, Syst. Sex. Vég., ed. 1, imp. 2, 92. 1803; Mouton-Fontenille in L., Syst. Pl. 1: 147. 1804; Pers., Syn. Pl. 1: 110. 1805; Jolyclerc, Syst. Sex. Vég., ed. 2, 1: 101. 1810; Pers., Sp. Pl. 1: 283. 1817; Roem. & Schult. in L., Syst. Veg., ed. 15 nov. 2: 861--862. 1817; Steud., Nom. Bot. Phan., ed. 1, 313. 1821; Spreng. in L., Syst. Veg., ed. 16, 3: 775. 1826; Roem. & Schult., Mant. 3: 671. 1827; Bong., Ess. Monog. Erioc. 3, 6, & 8. 1831; Steud., Nom. Bot., ed. 2, 1: 585 & 586. 1840; Kunth, Enum. Pl. 3: 548, 572, & 614. 1841; D. Dietr., Syn. Pl. 5: 266. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 283 & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 470 & 508. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879 (1893) and imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 279, 287, & 292. 1903; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16, 31, 38, & 55. 1946; Moldenke, Known Geogr. Distrib.

Verbenac., [ed. 2], 88, 206, 212, & 214. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 103, 282, 291, 293, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 879 (1960) and imp. 3, 2: 402. 1960; Moldenke, Résumé Suppl. 18: 12. 1969; Moldenke, Phytologia 18: 305--306, 429, & 433 (1969) and 20: 14 & 18. 1970; Moldenke, Fifth Summ. 1: 168 & 486 (1971) and 2: 515, 517, 518, & 959. 1971; Moldenke, Phytologia 31: 406. 1975.

Illustrations: Breyn., Exot. Min. Cog. Pl. Cent. 1: pl. 50. 1678; Moris., Pl. Hist. Univ. 3: sect. 8, pl. 16, fig. 17. 1699.

The original description of this plant by Breyne (1678) reads as follows: "Plantaginella aurea alopecuroides Brasiliana, foliis gramineis. En ex minimis unam, sed rarissimis charissimisq [sic]; nostris plantulis. Radix ejus exigua, mille fibris niveis comata, Foliola multa graminea & angusta Graminis Luzulae minoris Johanni Bauhino, sed omninò glabra, in orbem diffundens: ex quorum gremio, coliculi quinquaginta vel plures prosiliunt, tenuissimi, plantae exilitatem Globulis oblongiusculis lanuginosisque, Plantaginis angustifoliae paniculis Lagopi minoribus, uberrimè compensates, singuli, singulis coliculis triuncialibus vel brevioribus insidentes, compositi ex pilis lenissimis leucophaei coloris, inter quos Flosculi flavi perminuti, summâ amoenitate, veluti punctula aurea, emicant, quod jucundissimum huic plantulae in Brasiliâ vigenti, aspectum conciliat."

Morison (1699) repeats this description almost verbatim: "Plantaginella aurea alopecuroides Brasiliana foliis gramineis, Breyn. Cent. 1. Radix ei exigua, mille fibris niveis comata, foliola multa, graminea & angusta, Graminis Luzulae minoris, J. B. sed omnino glabra, in orbem diffundens. Ex horum autem gremio coliculi quinquaginta vel plures prosiliunt, tenuissimi, plantae exilitatem globulis oblongiusculis lanuginosisque Plantaginis angustifoliae paniculis Lagopi minoribus uberrime compensates, singuli singulis coliculis triuncialibus vel brevioribus insidentes, compositi ex pilis lenissimis, leucophaei coloris, inter quos flosculi flavi, perminuti, summa amoenitate, veluti punctula aurea, emicant. Atque hi jucundissimum huic plantulae in Brasilia vigenti aspectum conciliant."

A glance at the illustrations given by Breyne and repeated by Morison shows without any doubt that this taxon has nothing whatever to do with Eriocaulon microcephalum H.B.K., although what evidence there is for removing it from the genus Eriocaulon, where Linnaeus placed it, and shifting it to Paepalanthus, as Kornicke has done, I cannot see. The illustration appears to be a good one and the plant ought to be recognizable among the Brazilian members of the Eriocaulaceae.

Sprengel (1826) regarded Eriocaulon microcephalum H.B.K. as a synonym of E. triangulare L., but since Linnaeus based his name on the plant illustrated by Breyne, such a disposition of the Humboldt, Bonpland, and Kunth name seems quite out of the question. Linnaeus (1762) originally described his E. triangulare as follows: "ERIOCAULON culmos triangulari, foliis ensiformibus, capitu-

lo ovato. Plantaginella aurea alopecuroides brasiliana, foliis gramineis Breyn. Cent. pl. 50; Moris. Hist. 3: 259, s. 8, t. 16, f. 17. Habitat in Brasilia. Flosculus non potui perspicere in Herb. Pisonis apud Burmannum." Reichard (1779) repeats Linnaeus' description and comments. Sprengel adds "Quito", apparently based on a specimen to which he mistakenly applied Linnaeus' binomial -- a specimen which may well have been one of E. microcephalum H.B.K.

Ruhland (1903) places P. triangularis in his Species dubiae and says "Folia ensiformis; pedunculus triangularis; capitulum ovatum. Brasilien. Nota. Planta omnino dubia. Dubium etiam utrum species (potius) ad genus Paepalanthum an ad Eriocaulum an aliud genus pertineat." He uses the name, Paepalanthus triangularis, for it. Kunth (1841), at the end of his detailed description of Eriocaulon microcephalum H.B.K., notes "Sprengel (Syst. 3. 775) infauste cum E. triangulari jungit." In his very brief paragraph on Eriocaulon triangulare L. he notes "Be visio videtur Eriocaulon legitimum. Sprengel (Syst. 3. 775.) huc ducit E. microcephalum Humb. et Kth." Crantz (1766) says merely "Eriocaulon culmo triangulari, foliis ensiformibus, capitulo ovato", citing only Morison's illustration. Steudel (1840), on page 585 of his work, gives E. triangulare as a synonym of E. microcephalum, but on page 586 lists it as a valid species! Sprengel's description (1826) is: "E. scapis 3-angularibus caespitosis folia lanceolato-linearia superantibus, capitulo ovato sericea Brasil. Quito" and claims it to be conspecific with E. microcephalum H.B.K.

Lamarck (1791) gives the French vernacular name, "joncinelle triangulaire", for P. triangularis, while Lippert (1786) gives the German name, "3winklichte Kugelbinse", for it. The specific epithet of Eriocaulon plantaginella is often uppercased, as, for instance, by Jackson (1893) because of its original use as a generic name.

Nothing is known to me of this puzzling taxon except what is given in its rather large but repetitive bibliography. In my opinion it will probably prove to be a species of Leiothrix, possibly in the affinity of L. dielsii Ruhl.

PAEPALANTHUS TRICHOLEPIS Alv. Silv., Fl. Mont. 1: 32--33, pl. 14. 1928.

Synonymy: Paepalanthus trichocephalus Alv. Silv. apud Wangerin in Just, Bot. Jahresber. 57 (1): 477, sphalm. 1937.

Bibliography: Alv. Silv., Fl. Mont. 1: 32--33 & 414, pl. 14. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; A. W. Hill, Ind. Kew. Suppl. 9: 200. 1938; Worsdell, Ind. Lond. Suppl. 2: 184. 1941; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 14. 1928.

The type of this species was collected by Álvaro Adolpho da Silveira (no. 703) "In campis prope Diamantina", Minas Gerais, Brazil, in April, 1918, and is deposited in the Silveira herbarium. Silveira (1928) comments that the species is "A P. calvo Koern. bracteis involucrantibus extus dense villosus praecipue differt." In his text he erroneously refers to his illustration as "Tabula XV" -- plate 15 actually depicts P. albo-villosus and is correctly referred to as "Tabula XV" in his discussion of that species. Paepalanthus tricholepis is depicted on plate 14.

As far as I know, this species is known only from the original collection.

PAEPALANTHUS TRICHOPEPLUS Alv. Silv., Fl. Serr. Min. 47. 1908.

Bibliography: Alv. Silv., Fl. Serr. Min. 47. 1908; Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 4. 1924; Alv. Silv., Fl. Mont. 1: 151--152 & 414, pl. 95. 1928; A. W. Hill, Ind. Kew. Suppl. 8: 169. 1933; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Worsdell, Ind. Lond. Suppl. 2: 184. 1941; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 95. 1928.

The original publication of this taxon has not been available to me, but it seems most probable that Silveira's citation in his 1928 work is the type collection, viz., Silveira 353 from "In pratis arenosis, locis siccis, Serra do Cipó", Minas Gerais, Brazil, collected in April, 1905, and deposited in the Silveira herbarium, although on page 414 of the same work he cites his no. 356, also from the Serra do Cipo and collected in 1905.

Irwin and his associates describe the plant as a tufted herb, the inflorescence to about 15 cm. tall, the heads gray, and found it growing on sandy slopes, at 1200 m. altitude, flowering in February.

Citations: BRAZIL: Minas Gerais: Irwin, Maxwell, & Wasshausen 20075 (N, Z), 20076 (Ld, N); A. Silveira 353 (B--isotype, Z--isotype).

PAEPALANTHUS TRICHOPETALUS Körn. in Mart., Fl. Bras. 3 (1): 399--400 [as "trichopetalum"]. 1863.

Synonymy: Paepalanthus trichopetalum Körn. in Mart., Fl. Bras. 3 (1): 399 & 507. 1863. Dupatya trichopetala (Körn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya trichopetala Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Paepalanthus trichopefalus Alv. Silv., Fl. Mont. 1: 154 [as "trichopefalo"], sphalm. 1928. Paepalanthus trichopetalus Alv. Silv. ex Moldenke, Résumé 328, in syn. 1959.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 290, 308, 399--400, & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in

Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 201, 204, & 292. 1903; Alv. Silv., Fl. Mont. 1: 154 & 414. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Phytologia 4: 206. 1953; Durand & Jacks., Ind. Kew. Supol. 1, imp. 3, 145. 1959; Moldenke, Résumé 103, 328, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Phytologia 20: 366. 1970; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 591 & 959. 1971; Moldenke, Phytologia 30: 111 (1975) and 33: 48. 1976.

This species is based on G. Gardner 5268 from Minas Gerais, Brazil, deposited in the herbarium of the Botanisches Museum in Berlin where it was photographed by Macbride as his type photograph number 10658. Ruhland (1903) cites only the type collection and comments "Etiam ego hujus speciei nihil vidi nisi 2 folia et 1 pedunculorum capituliferum". Silveira (1928) cites A. Silveira 492 from Diamantina, Minas Gerais, Brazil, collected in 1903.

Additional citations: BRAZIL: Minas Gerais: G. Gardner 5268 [Macbride photos 10658] (B--type, N--photo of type, N--photo of type, W--photo of type). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

PAEPALANTHUS TRICHOPHYLLUS (Bong.) Körn. in Mart., Fl. Bras. 3 (1): 319. 1863.

Synonymy: Eriocaulon trichophyllum Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 636. 1831. Paepalanthus trichophyllus Körn. in Mart., Fl. Bras. 3 (1): 318. 1863. Dupatya trichophylla (Bong.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya trichophylla Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902.

Bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 636. 1831; Bong., Ess. Monog. Erioc. 36. 1831; Steud., Nom. Bot., ed. 2, 1: 586. 1840; Kunth, Enum. Pl. 3: 578, 579, & 614. 1841; D. Dietr., Syn. Pl. 5: 268. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 283 & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 318--319 & 506. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879 (1893) and imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 184--185, 287, & 292. 1903; Alv. Silv., Fl. Mont. 1: 414. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16, 41, & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Phytologia 4: 206. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 103, 293, 328, & 490. 1959.

[to be continued]

Two Lectotypes in Charpentiera (Amaranthaceae)
Hawaiian Plant Studies 51

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The two following formae in Charpentiera were described by Suessenguth, each based on several collections, but without any designation of holotypes. Below the needed lectotypes are selected. This genus has recently been monographed by Sohmer (1972), but he failed to mention or dispose of these two formae, though he listed two of the syntypic specimens.

Charpentiera obovata Gaud., forma parvifolia Suesseng., Fedde Repert. 44: 38, 1938.

Lectotype: Maui, Auwahi, O. Degener 8,826 (BISH).

Sohmer (1972: 299) lists Degener 8,826 as C. obovata Gaud., but does not cite the three other Degener collections.

Charpentiera obovata Gaud., forma grandifolia Suesseng., Fedde Repert; 44: 38, 1938.

Lectotype: Hawaii Island, Kohala, O. Degener 8,824 (GH).

Of the three syntypes listed by Suessenguth, Sohmer (1972: 302) lists both the above chosen lectotype, and Degener 8,820, as C. tomentosa Sohmer, var. tomentosa, but does not mention the third one, Degener 8,830.

Literature Cited

Sohmer, S. H., 1972. Revision of the genus Charpentiera (Amaranthaceae). Brittonia 24: 283-312, figs. 1-14.

Suessenguth, K., 1938. Amarantaceen-Studien. 1. Amarantaceae aus Amerika, Asien, Australien. Fedde Repert. Spec. Nov. 44: 36-48.

SCROPHULARIACEAE IN NICARAGUA

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In identifying specimens of Scrophulariaceae from Nicaragua, I was confronted by obscure characters. Sometimes it was impossible to tell whether the upper lip of the corolla covered the lower lip or whether the lower lip covered the upper; or how many stamens there were or whether the anther cells were parallel or divergent. Sometimes the specimen in question was fruiting and corollas were not present. Or, if corollas were only 4-5 mm long as in Stemodia verticillata, the stamens were most difficult to observe. Even when a good corolla was present, I hesitated to destroy by dissection the only corolla.

Obsessed by the suspicion that something can be done by way of identifying Scrophulariaceae even when corollas are not present, and without the help of obscure characters, I developed the following key with the hope that it will be useful to some others.

The distinction between a synopsis and a key needs to be maintained. A synopsis gives the fundamental characters on which members of a taxon are classified. A key, on the other hand, is a device for identifying unknown specimens. It is needed by those who do not know the family well and should be adapted to that purpose.

As species not yet known in Nicaragua may at any time be found there, all species known to occur in Central America are included in this article.

Scrophulariaceae are distinguished from other families mainly by the following characters. Usually herbs but sometimes shrubs or even trees. Flowers usually axillary but sometimes seemingly terminal. Leaves without stipules, either opposite or alternate, or both on the same stem, almost always simple. Calyx shallowly or deeply 4-5-lobed or of seemingly distinct sepals. Corolla 4-5-lobed or of almost distinct petals, from

long-tubular to united merely at base, from almost regular to very irregular. Stamens inserted on the corolla, 2 or 4; sterile rudiments often present. Pistil 1. Ovary usually 2-locular, usually many-seeded.

I wish to express my thanks to Dr. Willard W. Payne and to Dr. Daniel B. Ward and his staff for the use of the Herbarium of the University of Florida. To Dr. Lyman B. Smith and Dr. David B. Lellinger, I express my thanks for reference to the United States National Herbarium. Dr. Reed C. Rollins, Director of the Gray Herbarium and Dr. Richard A. Howard, Director of the Arnold Arboretum, I thank for the privilege of examining specimens in their respective herbaria. I thank Dr. William C. Burger of the Field Museum for important information by correspondence. I am deeply indebted to the authors listed in the bibliography at the end of the article or cited in connection with a particular genus.

An artificial key to genera of Scrophulariaceae in Central America for fruiting specimens. As this key can be used for flowering specimens also, some flowering characters are given.

A. Leaves all basal or nearly so; stem, if any, almost or quite leafless B.
  B. Leaves long, linear, like petioles, or widened near tip; stem creeping, p. 21 Limosella acaulis Sesse & Mocino
  B. Leaves wider, various, 2-8 cm wide, p. 17 . Tetranema
A. Leaves, some of them, borne on stem well above base C.
  C. Upper leaves alternate or clustered (fasciculate) D. cp. p. 4
    D. Lower leaves opposite E.
      E. Bracts of inflorescence large, leaf-like, often brightly colored, about as long as or longer than corolla; calyx 9-25 mm long, p. 35 . . . Castilleja
      E. Bracts of inflorescence small or none, not leaf-like, not colored F.
        F. Leaves narrowly linear to filiform; flowers solitary in axils of upper leaves or bracts; calyx tubular; plant black when dry, hispid or scabrous, p. 33 . . . . . Buchnera
        F. Leaves lanceolate or wider G.
          G. Petioles and pedicels twining; blades triangular, 3-5-lobed; pedicels axillary 2-10 cm long, p. 10 . . . . . Maurandya
          G. Petioles and pedicels not twining; flowers in terminal racemes H.

H. Calyx lobed 1/2 way, lobes about equaling tube; lower blades spatulate, rounded at tip, bluntly toothed; stem 4-12 cm tall; flowers in racemes without bracts or leaves, p. 19 . . . . . Mazus japonicus (Thunb.) Kuntze

H. Calyx lobed nearly or quite to base I.

I. Capsule compressed, notched, often wider than long; corolla with 4 spreading lobes, tube very short, p. 30 . . . . . Veronica

I. Capsule ovoid or oblong, not compressed; flowers (at least lower ones) in axils of reduced leaves or bracts J.

J. Calyx-lobes oval or ovate, obtuse, very hairy, 4-6 mm long; corolla 4 cm long, p. 10 . . . . . Snapdragon, Antirrhinum majus L.

J. Calyx-lobes narrow, acute K.

K. Calyx up to 3 cm long, puberulent; corolla 6-8 cm long; pedicels up to 6 cm long, p. 8 . Eremogeton grandiflorus (Gray) Standley & L. Wms.

K. Calyx 3.5-4 mm long, glabrous; corolla 1-2 cm long; stem 4-angled; pedicels 8-20 mm long L.

L. Leaves on petioles, serrate; plant glabrous or nearly so, p. 8 . . . . . Alonsoa meridionalis (L. f.) Kuntze

L. Leaves sessile or subsessile, serrulate or subentire, glabrous or hairy, p. 8 Angelonia

D. Lower and other leaves alternate M. cp. p. 2

M. Bracts of inflorescence as long or longer than corolla, red (usually) or orange or green; calyx 9-25 mm long; inflorescence terminal, spike-like, p. 35 . . . . Castilleja

M. Bracts or leaves of inflorescence green, large or small N.

N. Stem prostrate; blades orbicular-kidney-shaped, toothed or lobed, p. 28 . . . Sibthorpia repens (L.) Kuntze

N. Stem erect or ascending O.

O. Calyx longer than pedicels P.

P. Leaves pinnately divided; calyx-lobes shorter than tube, p. 37 . Pedicularis orizabae C. & S.

P. Leaves entire or toothed; calyx lobed almost to base Q.

Q. Inflorescence 1-sided; flowers turned downward; leaves dentate or almost entire, p. 31 . . . . . Foxglove, Digitalis purpurea L.

Q. Inflorescence not 1-sided; flowers ascending; leaves entire, p. 10 . . . . . Snapdragon, Antirrhinum majus L.

O. Calyx shorter than pedicels; subtending leaves longer than pedicels R.
R. Capsule about 4-6 mm long, abruptly tipped, notched; corolla about 1 cm long 28. Capraria biflora L.
R. Capsule 2-3 cm long, tapering; corolla 6-8 cm long p.8. Eremogeton grandiflorus (Gray) Standley & L. Wms.

C. Upper leaves opposite or more than 2 at a node S. cp. p. 2
S. Plant a shrub or small tree; corolla tubular, equaling or much longer than calyx T. cp. p. 5
T. Blades entire; calyx-tube cup-shaped U.
U. Fruit dry (capsule); stamens 2 or 4; staminodes sometimes 2; calyx-lobes 4, linear, slightly longer than tube; flowers terminal, in racemes or spikes, p. 37 . . . . . Lamourouxia longiflora Bth.
U. Fruit fleshy (berry); fertile stamens 4; staminode present; calyx shallowly lobed; flowers axillary V.
V. Pairs of leaves unequal; calyx 5-toothed; corolla tubular, not 2-lipped, lobes small, nearly equal, p. 28 . . . . . Gibsoniothamnus
V. Pairs of leaves equal; calyx 3-4-toothed; corolla cup-shaped, 2-lipped, lobes large, unequal, p. 11 . . . . . Schlegelia
T. Blades dentate; stamens 4; fruit dry (capsule) W.
W. Calyx deeply 4-lobed (in Central America); staminode present X.
X. Flowers dense, many; pedicels 1-2 mm long; petioles up to 8 cm long; blades very hairy above and beneath, p. 18 Uroskinnera spectabilis Lindley
X. Flowers in axils of upper leaves or bracts; pedicels 2 -10 mm long; petioles none or short; blades hairy or glabrous, p. 37 . . . . . Lamourouxia
W. Calyx 5-lobed or -toothed Y.
Y. Calyx shallowly toothed; leaves viscid-villous, almost sessile; stamens 4, all fertile, p. 18 . . . . . Hemichaena fruticosa Bth.
Y. Calyx lobed nearly to base Z.
Z. Leaves glabrous or sparsely hairy; pedicels up to 2 cm long; petioles up to 1 cm long; sepals up to 12 mm long; corolla 9-16 mm long, p. 20 . . . . . Stemodia fruticosa Lundell
Z. Leaves densely hairy above and beneath; pedicels as much as 6 cm long; petioles short; sepals up to 3 cm long; corolla 6-8 cm long, p. 8 . . Eremogeton grandiflorus (Gray) Standley & L. Wms.

S. Plant an herb Aa. cp. p. 4

Aa. Blades lobed or divided; plants glabrous; anthers 4 Ab.

Ab. Lobes of blade lanceolate or wider; petioles long Ac.

Ac. Flowers in cymes; lobes of blades acute; blades pinnately nerved, p. 9 . . . . . Calceolaria

Ac. Flowers (in ours) solitary in axil of leaves; blades palmately nerved; lobes of blades obtuse; stem prostrate, p. 9 . . . . . Cymbalaria muralis GMS.

Ab. Lobes of blade linear or filiform or oblong; flowers solitary in axils of leaves Ad.

Ad. Growing under water; leaves sessile; pedicels 2.5-6 mm long; calyx 3 mm long, p. 21 Bacopa naias Standley

Ad. Growing out of water; stem erect Ae.

Ae. Calyx 6-7 mm long, lobes triangular-acuminate, shorter than tube, p. 37 . . . . . Lamourouxia multifida HBK.

Ae. Calyx 2-4 mm long Af.

Af. Capsule 10-15 mm long; blades not more than 1 cm long, p. 21 Schistophragma pusilla Bth.

Af. Capsule not more than 3 mm long; blades up to 15 mm long, p. 29 Scoparia annua C. & S.

Aa. Blades entire or toothed Ag.

Ag. Calyx-lobes shorter than tube Ah. cp. p. 6

Ah. Blades (median and upper) linear, 1-2 mm wide or narrower; plants blackened in drying Ai.

Ai. Calyx slender, cylindric at flowering time, longer than thick; flowers sessile; stem unbranched or slightly branched, p. 33 . . . . . Buchnera

Ai. Calyx cup-shaped; flowers sessile or on pedicels; stem usually bushy-branched, p. 32 . Gerardia

Ah. Blades 6-30 mm wide Aj.

Aj. Calyx 4-6 cm long; capsule 2-3 cm long; flowers in racemes in axils of bracts, p. 31 . . . . . Escobedia

Aj. Calyx at flowering time 0.35-2 cm long Ak.

Ak. Calyx at flowering time 2 cm long, papery-inflated in fruit; flowers terminal or axillary, in spikes or racemes; lower leaves alternate, p. 32 Melasma physalodes (D. Don) Melchior

Ak. Calyx 0.35-1 cm long Al.

Al. Calyx at flowering time 5-8 mm long; teeth wide; corolla yellow; leaves 1-5 cm long, p. 19 . . . . . Mimulus

Al. Calyx 3.5 mm long; teeth lanceolate; corolla purple or lilac; leaves 0.7-1.5 cm long, p. 26 Lindernia crustacea (L.) F. Muell.

Ag. Calyx-lobes as long as tube or longer; tube sometimes very short or none Am. cp. p. 5

AmCapsule compressed, usually notched at tip; corolla-lobes spreading; corolla-tube very short; sepals distinct; stamens 2, p. 30 . . . . . , Speedwell, Veronica

Am. Capsule not compressed; corolla often tubular An.

An. Pedicel shorter than calyx or none; petiole very short or none Ao. cp. p. 7

Ao. Calyx-lobes 4, hairy, 0.5-0.7 mm long; stem prostrate; stamens 2; leaves entire, glabrous, 2-9 mm long, p. 26 . . . . . Micranthemum

Ao. Calyx-lobes 5; stamens usually 4 Ap.

Ap. Calyx lobed about 1/2 way; capsule depressed-globose; stem and leaves hirsute; flowers sessile, p. 32. . Alectra aspera (C. & S.) L. Wms.

Ap. Calyx lobed nearly to base Aq.

Aq. Leaves abundantly dotted (at least beneath), glabrous or nearly so, serrate or almost entire, sessile, 2-3.5 cm long, p. 21 . . . . . some species of Bacopa

Aq. Leaves not dotted (punctate) Ar.

Ar. Leaves linear, mostly less than 10 mm long; pedicels shorter than leaves; stems glabrous; capsule linear, 10-15 mm long; calyx 2-4 mm long, p. 21 . . . . . Schistophragma pusilla Bth.

Ar. Leaves oblong or ovate to orbicular As.

As. Leaves acute or acuminate at tip, sessile, at least lower ones serrate, 2-8 cm long; stem erect, atmost 40-100 cm tall; pedicels almost none; sepals 5 mm long; herb, p. 21 . . . . . Stemodia durantifolia (L.) Sw.

As. Leaves obtuse or rounded at tip, 7-20 mm long; stems up to 15 or 20 cm tall, spreading, much branched; leaves on petioles; pedicels very short At.

At. Leaves rounded at base; whole plant short-hairy or glabrous; capsule oblong, 8-11 mm long, p. 27 . . . . Lindernia diffusa (L.) D. & J.

At. Leaves cuneate at base; stem densely viscid-hairy; capsule 2.5-3 mm long, subglobose, p. 20 . . . . . Stemodia verticillata (Miller) Sprague

An. Pedicels longer than calyx or equaling calyx Au.
Au. Stems abundantly hairy Av.
Av. Leaves on petioles, crenate, rounded to cuneate at base, often dotted (punctate) beneath; calyx-lobes much longer than tube, nearly equal; stems sometimes with long hairs, p. 20 . . . some species of Stemodia
Av. Leaves sessile; calyx-lobes ovate or cordate, not much, if any, longer than tube Aw.
Aw. Leaves clasping stem, entire, 8-15 mm long; calyx-lobes conspicuously unequal, longer ones 4-5 mm long; stem with long hairs; herb, p. 24 . . . . . Bacopa salzmannii (Bth.) Wettstein
Aw. Leaves united around stem, toothed, up to 16 cm long; calyx-lobes somewhat unequal, not quite equaling tube, about 1.5 cm long, p. 18 . . . . . Hemichaena fruticosa Bth.
Au. Stem glabrous or slightly hairy; calyx-tube short or none; leaves sessile or petiole short Ax.
Ax. Calyx-lobes unequal, outer ones ovate, p. 21 . . . . . some species of Bacopa
Ax. Calyx-lobes equal or nearly so, lanceolate or narrower Ay.
Ay. Leaves 2-7 cm long, glabrous; petiole 1 cm long; calyx up to 12 mm long, lobes slightly unequal, linear or linear-lanceolate; stem up to 1 m tall, shrubby, p. 20 . . . . . Stemodia fruticosa Lundell
Ay. Leaves 3-20 mm long; calyx 2-10 mm long Az.
Az. Leaves not dotted or only slightly so Ba.
Ba. Leaves linear or oblanceolate; calyx 3.5 mm long; capsule globose or subglobose; corolla yellow, 8-10 mm long, p. 19 . . . . . Gratiola oresbia Rob.
Ba. Leaves ovate, 1-2 cm long; calyx 2-3.5 mm long; corolla white to purple, p. 26 . . . . . some species of Lindernia
Az. Leaves copiously clearly dotted (punctate); sepals 1.5-2.5 mm long Bb.
Bb. Stem erect, not rooting at nodes, commonly much branched; lower leaves toothed or lobed or entire; leaves narrowed at base to short petiole; corolla yellow or white, p. 29 Scoparia
Bb. Stem creeping, rooting at nodes; lower and other leaves entire or nearly so, obtuse or rounded at tip, rounded or truncate at base, p. 27 Lindernia rotundifolia (L.) Standley & L. Wms.

1. EREMOGETON Standley & L. Williams

Herbs, somewhat woody, to small trees, hairy. Leaves alternate, entire or nearly so. Flowers axillary, solitary, on long pedicels. Calyx deeply lobed; lobes 5. Corolla wide-tubular, 2-lipped; lobes 5, almost equal. Stamens 2; sterile stamens none. Capsule ovoid, acuminate.

1. Eremogeton grandiflorus (Gray) Standley & L. Wms., Ceiba 3:172. 1953. Small tree, sometimes 6 m tall. oung branches tomentose. Leaves elliptic, or ovate, or obovate, obtuse , toothed or entire, acute at base, hairy above and beneath; petioles short. Pedicels sometimes 6 cm long. Calyx-lobes narrow, acute, unequal, finely hairy, sometimes 3 cm long; Corolla 6-8 cm long, white or yellowish. Capsule 2-3 cm long. Guatemala (US).

2. ALONSOA Ruiz & Pavon

Herbs, glabrous except in inflorescence. Upper leaves alternate, others opposite or more than 2 at a node. Flowers on pedicels, in terminal racemes. Calyx lobed to base. Corolla campanulate; lobes unequal. Stamens 4. Capsule ovoid.

1. Alonsoa meridionalis (L. f.) Kuntze, Rev. Gen. Pl. 2: 457. 1891. Leaves on petioles, larger ones 5 - 10 cm long. Calyx 4 mm long. Corolla about twice as long as calyx, orange or reddish. S. Mexico, Salvador, Honduras, Costa Rica to Peru. Fl. Costa Rica 1100. 1938. Fl. Guatemala 9:326. 1973.

3. ANGELONIA Humboldt, Bonpland & Kunth

Herbs, glabrous or hairy. Leaves opposite or the upper alternate, sessile or almost sessile, serrulate or almost entire. Flowers on pedicels, axillary or in terminal racemes. Calyx 5-lobed almost to base. Corolla 5-lobed, 2-lipped, blue, lilac or violet; tube very short. Stamens 4. Capsule globose (in ours) or ellipsoid.

A. Blades narrowed to base, 5-10 cm long . . . . . 1. Angelonia angustifolia Bth.

A. Blades widened, often clasping at base, 2-5 cm long . . . . . 2. Angelonia ciliaris Rob.

1. Angelonia angustifolia Bth. in DC. Prodr. 10:254. 1846. S. Mexico and cultivated in Guatemala, Honduras, Salvador and Costa Rica (US).

Nicaragua: Dept. Managua, Managua, cult. Maxon, Harvey & Valentine 7246 (US).

2. Angelonia ciliaris Robinson, Proc. Amer. Acad. 45:400. 1910. British Honduras (US). Nicaragua (specimen not seen); Fl. Guatemala 9:327. 1973.

4. CALCEOLARIA Linnaeus

Herbs (in Central America) or shrubs. Leaves opposite or more than 2 at a node, in ours toothed to deeply lobed or pinnatisect; lobes acute. Petioles long. Flowers in cymes, mostly yellow. Calyx deeply 4-parted; lobes almost equal. Corolla 2-lipped, parted almost to base, lower lip much larger than upper lip, often inflated, globose; tube short. Stamens 2.

A. Petioles widened and clasping at base; calyx-lobes 10-15 mm long at flowering time; corolla 1.5 cm long . . . . . 1. Calceolaria trilobata Hemsley

A. Petioles not widened, not clasping at base B.

B. Blades pinnatisect or lowest 3-lobed; calyx at flowering time 4-6 mm long; corolla 1 cm long . . . . . 2. Calceolaria mexicana Bth.

B. Blades toothed, not deeply divided; corolla 2 cm long C.

C. Blades oblong-lanceolate, acuminate, hairy . . . . . 3. Calceolaria irazuensis Donn. Smith

C. Blades narrowly lanceolate, 9-16 mm wide, 4-7 cm long, gradually long-attenuate, minutely puberulent . . . . . 4. Calceolaria storkii Standley

1. Calceolaria trilobata Hemsley, Biol. Centr. Amer. Bot. 2:439. 1882. Calceolaria sciadephora Donn. Smith, Bot. Gaz. 25:151. 1898.
Guatemala (US), Costa Rica (US), Panama; Fl. Guatemala 9:341. 1973.

2. Calceolaria mexicana Bth., Pl. Hartweg. 47. 1840. Costa Rica (US), Salvador to Panama; Fl. Guatemala 9:339. 1973.

3. Calceolaria irazuensis Donn. Smith, Bot. Gaz. 20:292. 1895. Calceolaria costaricensis Kraenzl., Ann. Hofmus. Wien 22:192. 1907. Costa Rica (US).

4. Calceolaria storkii Standley, Fieldiana, Bot. 18, part 3, 1103. 1898. Costa Rica (FLAS, US).

5. CYMBALARIA Hill

Herbs, prostrate, glabrous. Leaves opposite, palmately lobed; lobes obtuse. Petiole long. Flowers solitary in axils of leaves. Calyx deeply 5-lobed. Corolla 2-lipped. Stamens 4.

1. Cymbalaria muralis Gaertner, Meyer & Schreber, Fl. Welt. 2:397. 1800. Linaria cymbalaria (L.) Miller, Gard.

Dict. ed. 8, no. 17. 1768. Leaves kidney-shaped, 3-5-lobed. Petioles long. Corolla blue or lilac. Guatemala, Honduras (US), Costa Rica, Europe. Fl. Guatemala 9:348. 1973.

6. ANTIRRHINUM Linnaeus Snapdragon

Herbs. Leaves entire, alternate. Flowers in terminal racemes or lower ones axillary. Calyx 5-lobed almost to base. Corolla irregular, 2-lipped. Stamens 4. Capsule ovoid (in ours) or globose.

1. Antirrhinum majus L., Sp. Pl. 617. 1753. Stem glandular-hairy above. Leaves acute at each end, 2.5-7 cm long. Flowers on pedicels, various in color. Corolla much longer than calyx. Calyx 4-6 mm long. Capsule 5-10 mm long. Honduras (US), Salvador (US).

7. MAURANDYA Ortega

Herbs, climbing. Leaves on petioles; blades triangular, 3-5-lobed, upper ones alternate, lower ones opposite. Flowers axillary, solitary. Pedicels 2-10 cm long. Calyx united at base. Corolla 2-lipped. Stamens 4. Capsule globose.

A. Stem and leaves densely or sparsely villous; pedicels 2-6 cm long; calyx 1.5-2 cm long; seeds winged . . . . . 1. Maurandya erubescens (D. Don) Gray

A. Stem and leaves glabrous; calyx 10-15 mm long at flowering time; seeds not winged B.

B. Pedicels 3-5 cm long; calyx glandular-pilose . . . . . 2. Maurandya barclaiana Lindley

B. Pedicels 5-10 cm long; calyx glabrous . . . . . 3. Maurandya scandens (Cav.) Pers.

1. Maurandya erubescens (D. Don) Gray, Proc. Am. Acad. 7:377. 1868. Central and s. Mexico, Guatemala; Fl. Guatemala 9:377. 1973.

2. Maurandya barclaiana Lindley, Bot. Reg. 13:t. 1108. 1827. Guatemala and other parts of Central America; Fl. Guatemala 9:377. 1973.

3. Maurandya scandens (Cav.) Pers., Syn. Pl. 2:15, t. 160. 1807. Mexico, Guatemala, and in many places in the tropics; Fl. Guatemala 9:377. 1973.

8. LEUCOCARPUS D. Don

Herbs. Stem narrowly winged. Leaves opposite, sessile, cordate-clasping at base, serrulate. Cymes axillary, on peduncles. Calyx 5-toothed, cup-shaped, teeth short. Corolla long-

tubular, 2-lipped. Fruit fleshy, globose.

1. Leucocarpus perfoliatus (HBK.) Bth. in DC. Prodr. 10: 335. 1846. Plant glabrous. Leaves narrowly lanceolate, cordate-clasping. Flowers on pedicels. Corolla 1.5 cm long. Fruit white, 1 cm or more thick.
Guatemala, Honduras, Salvador, Costa Rica, Panama.

9. GIBSONIOTHAMNUS L. Williams

Shrubs, much branched. Leaves opposite, on petioles. Calyx 5-lobed, cup-shaped. Corolla regular, tubular; lobes almost equal, short. Stamens 4; 1 sterile rudiment present. Fruit fleshy.

A. Blades 1.5-2.5 cm wide, 4-6 cm long; inflorescence of sessile cymules; pedicels 1.5-2 cm long . . . . . 3. Gibsoniothamnus moldenkeanus (Standley) L. Wms.
A. Blades 3-8 cm wide, 5-13 cm long B.
B. Flowers in fascicles; calyx-lobes 1-2 mm long . . . . . 1. Gibsoniothamnus cornutus (Donn. Smith) A. Gentry
B. Flowers in racemes or solitary; pedicels at most 2 cm long; calyx-lobes 3.5 mm long . . . . . 2. Gibsoniothamnus mimicus (St. & St.) L. Wms.

1. Gibsoniothamnus cornutus (Donn. Smith) A. Gentry, Fieldiana, Bot. 34:55. 1971.
Guatemala; Fl. Guatemala 9:357. 1973.

2. Gibsoniothamnus mimicus (St. & St.) L. Wms., Fieldiana, Bot. 32:214. 1970.
Guatemala; Fl. Guatemala 9:357. 1973.

3. Gibsoniothamnus moldenkeanus (Standley) L. Wms., Fieldiana, Bot. 32:214. 1970.
Mexico; known only from type; Fl. Guatemala 9:359. 1973.

10. SCHLEGELIA Miquel Dermatocalyx Oersted

For full descriptions, see Gentry, A. H. Fl. Panama, Ann. Mo. Bot. Gard. 60:923-930. 1973.

Vines, shrubs or small trees, sometimes epiphytic, glabrous except when young and in inflorescence. Leaves entire, opposite, on petioles, leathery. Flowers in axillary racemes or panicles. Calyx cup-shaped, shallowly 3-4-toothed, persistent; teeth short, wide. Corolla tubular, 5-lobed. Stamens 4; staminodium 1. Fruit globose, fleshy,

A. Calyx 4-8 mm long B.
  B. Veins of blades conspicuously raised beneath; blades 4-13.2 cm wide, 10-33 cm long, 2-5 times as long as wide; panicle very dense 5. Schlegelia sulfurea Diels
  B. Veins not conspicuously raised beneath; blades 2.3 times or less than 2 times as long as wide; petiole 1-2.5 cm long; inflorescence open or less dense C.
    C. Inflorescence an open, unbranched raceme . . . . . 3. Schlegelia fuscata A. Gentry
    C. Inflorescence a contracted panicle; blades cuneate at base . . 4. Schlegelia parviflora (Oersted) Monachino
A. Calyx 9-14 mm long D.
  D. Petiole 24-30 mm long; blades rounded at both ends, 11-20 cm wide, 30-45 cm long; veins raised beneath . . . . . 1. Schlegelia dressleri A. Gentry
  D. Petiole 8-16 mm long E.
    E. Branchlets hairy at least at nodes; blades rounded or apiculate at tip, widely cuneate at base, 3.8-7.4 cm wide, 7.6-11 cm long; petiole 8-16 mm long . . . . . 2. Schlegelia nicaraguensis Standley
    E. Branchlets glabrous; blades acute or obtuse, 4-9 cm wide, 7-14 cm long; petiole about 1 cm long . . . . . 6. Schlegelia silvicola L. Wms.

1. Schlegelia dressleri A. Gentry, Ann. Mo. Bot. Gard. 60: 924. 1973. Panama, La Encida near Cerro Jefe. Dressler 3507 (MO, holotype; PMA, isotype).

2. Schlegelia nicaraguensis Standley, Tropical Woods no. 16: 44. 1928. Guatemala, Nicaragua, Panama; Fl. Panama 60: 927. 1973.
Nicaragua, Dept. Zelaya, Bluefields. Englesing 99 (F, GH, K).

3. Schlegelia fuscata A. Gentry, Ann. Mo. Bot. Gard.60:925. 1973. Doubtfully distinct from Schlegelia parviflora.
Panama, Cerro Jefe. Gentry 2875, type (MO).

4. Schlegelia parviflora (Oersted) Monachino, Phytologia 3: 103. 1949. Dermatocalyx parviflorus Oersted, Kjoeb. Vidensk. Meddel. 29. 1856. British Honduras and Honduras to Brazil; Fl. Panama 60:928. 1973. Nicaragua; Fl. Guatemala 9:398. 1973.

5. Schlegelia sulfurea Diels, Notizblatt. Bot. Gard. Berlin 14:39. 1938. Guatemala to Ecuador; Fl. Panama 60:930. 1973.

6. Schlegelia silvicola L. Wms., Fieldiana, Bot. 34:126, t. 3. 1972. Guatemala (US);
Nicaragua; Fl. Guatemala 9:398. 1973.

11. RUSSELIA Jacquin

Reference: Carlson, Margery C. Monograph of the genus Russelia. Fieldiana, Bot. 29:231-292. 1957.

Herbs, with young stems angled. Leaves opposite or more than 2 at a node, sessile or nearly so, ovate, serrate or rarely entire, usually with resinous dots (punctate). Flowers in axillary cymes or terminal panicles. Calyx 5-lobed. Corolla red, tubular, 2-lipped. Stamens 4; staminodium short or none. Capsule almost globose or ovoid.

A. Blades small, falling very early; pedicels 1-1.5 cm long . . . . . 1. Russelia equisetiformis C. & S.

A. Blades persistent; petioles 1-5(-9) mm long B.

B. Stem terete or only slightly angled C.

C. Young stems densely or abundantly hairy; calyx-lobes hairy; capsules 4 mm long D.

D. Leaves crenate-serrate, pilose with septate hairs above and beneath; calyx-lobes 5-7 mm long, pilose . . . . . 2. Russelia rugosa Rob.

D. Leaves sharply serrate, with gland-tipped hairs above and beneath; calyx-lobes 8-10 mm long, densely glandular-hairy 3. Russelia steyermarkii Carlson

C. Young stems glabrous or nearly so except sometimes at tip E.

E. Blades resinous-dotted on both surfaces, 3-4.5 cm wide, 6-9 cm long; sepals 3.5-4.5 mm long . . . . . 4. Russelia acuminata Carlson

E. Blades dotted on lower surface only F.

F. Internodes 4-5 cm long; petioles less than 2 mm long; peduncles 8-10 mm long . . . . . 5. Russelia laciniata St. & St.

F. Internodes 8-10 cm long; petioles 4-5 mm long; peduncles 5-8 mm long; calyx 4-7 mm long . . . . . .6. Russelia coccinea (L.) Wettstein

B. Stems definitely ridged or angled or winged G.

G. Blades entire; petioles 7-9 mm long; internodes 2.5-7 cm long; calyx 3.5 mm long; capsules globose, 1 cm long including beak 7. Russelia campechiana Standley

G. Blades toothed; petioles 1-5 mm long H.

H. Calyx-lobes 6-7 mm long, lanceolate, hairy on midrib; stem glabrous except at tip; internodes 2-5 cm long . . . . . .8. Russelia longisepala Carlson

H. Calyx-lobes 3-4(-4.5) mm long, ovate I.

I. Capsules about twice as long as calyx, about 8 mm long; blades 1-5 cm wide, 1.5-8 cm long, glabrous or hairy, glandular-dotted or not; peduncles more than 5, up to 20 mm long; blades truncate or rounded at base . . . . . 9. Russelia sarmentosa Jacq.

I. Capsules less than twice as long as calyx, sometimes shorter than calyx, at most 5.5 mm long J.

J. Blades 8-15 mm wide, 1-2.5 cm long, truncate to wedge-shaped at base K.

K. Blades glabrous above and beneath; capsule slightly longer than calyx; young stems glabrous . . . . . 10. Russelia standleyi Carlson

K. Blades densely hirsute above and beneath; capsule equaling calyx; young stem densely hirsute . . . . . 11. Russelia parvifolia Carlson

J. Blades 3-4.5 cm wide, 6-10 cm long L.

L. Peduncles less than 5 mm long; blades sparsely or densely hairy, 4 cm wide, up to 7 cm long, widely cuneate or obtuse at base; capsule longer than calyx, 5.5 mm long; stems hairy or glabrous . . . . . 12. Russelia chiapensis Lundell

L. Peduncles 10-15 mm long; blades, at least when young, resinous-dotted above and beneath, glabrous or minutely hairy on main veins beneath, acute to acuminate at base; stem tending to be woody at base, glabrous or nearly so; inflorescence 5-7-flowered; capsules globose, without beak . 13. Russelia longifolia Carlson

1. Russelia equisetiformis C. & S., Linnaea 6:377. 1831. Mexico (US), Guatemala (US), Salvador (US). Nicaragua; Dept. Zelaya, Bluefields. Nichols 896 (BM, ENAG, SEYM).

2. Russelia rugosa Rob., Proc. Am. Acad. 43:58. 1907. Guatemala (US); Nicaragua, Salas, 1966.

3. Russelia steyermarkii Carlson, Fieldiana, Bot. 29:272, fig. 4. 1957. Guatemala; Fl. Guatemala 9:394. 1973.

4. Russelia acuminata Carlson, Fieldiana, Bot. 29:248, fig. 1. 1957. Guatemala; Fl. Guatemala 9:389. 1973.

5. Russelia laciniata St. & St., Field Mus. Bot. 11:379. 1940. Guatemala, known from the type only, Steyermark 37982; Fl. Guatemala 9:392. 1973.

6. Russelia coccinea (L.) Wettstein in Engler & Prantl, Pflanzenfam. IV, 3b:62 1891. Mexico, Guatemala, West Indies, China; Fl. Guatemala 9:390. 1973.

7. Russelia campechiana Standley, Contr. U. S. Nat. Herb. 23:1309. 1924.

Mexico (US), British Honduras (US), Guatemala (US).

8. Russelia longisepala Carlson, Fieldiana, Bot. 29:254, fig. 2. 1957. Guatemala, cotype (US).

9. Russelia sarmentosa Jacq., Enum. Pl. Carib. 25. 1760. Russelia polyedra Zucc. in Abh. Akad. Muench. 2:328. 1831-6. Russelia sarmentosa f. eglandulata Carlson, Fieldiana, Bot. 29: 263. 1957. Russelia sarmentosa f. pubescens Carlson, Fieldiana, Bot. 29:263. 1957. Russelia sarmentosa f. velutina Carlson, Fieldiana, Bot. 29:263. 1957.

A. Thickened angles of stem glabrous or nearly so; blades glabrous to sparsely hairy beneath on veins; at least young leaves resinous-dotted above and beneath . . . . . var. sarmentosa

A. Thickened angles of stem usually hairy; blades densely hairy beneath on veins, with only occasional dots beneath; black pits sometimes beneath, especially on young blades . . . . . var. nicaraguensis Carlson

Var. sarmentosa. Mexico (US), British Honduras (US), Guatemala (US), Honduras (US), Salvador (US), Costa Rica (US), Panama (US). I have seen no specimen from Nicaragua which is this variety.

Var. nicaraguensis. Carlson.

All the specimens from Nicaragua which I have seen are this variety.

Nicaragua:

Dept. Zelaya, Puerto Cabezas. Marshall & Neill 6579 (ENAG, FLAS, MO, SEYM, US).
Rama. Zelaya 320 (VT); Marshall & Neill 6483 (ENAG, FLAS, MO).

Dept. Nueva Segovia, Ocotal. Seymour 867 (VT).

Dept. Madriz, Yalaguina. Moore 939 (VT).

Dept. Esteli, NW of Puebla Nueva. Williams & Molina 42402 (US).

Dept. Esteli?, 43 miles S of Nicaragua-Honduras boundary, Inter American Highway, Morley 753 (US).

Dept. Chinandega, Volcan El Viejo. Baker 880 (US).

Dept. Leon, Momotombo. Robbins 6117 (VT).
Near Santa Rosa. Williams & Molina 42441 (US).

Dept. Boaco, Boaco. Nichols 1477 (NY, WDP, WIS): Seymour 5432 (SEYM, SMU, UC).

Dept. Boaco?, Between Boaco cutoff and Acoyapa. Bunting & Licht 707 (US).

Dept. Chontales, Acoyapa. Dudey 1672 (ENAG, GH, SEYM); Marshall & Neill 7081 (MO).
Apompua. Seymour 2695 (BM, SEYM).
San Miguelito. Shank & Molina 4583 (US).
Santo Tomas. Nichols 282 (VT).

Dept. Managua, El Crucero. Atwood & Neill 6764 (FLAS, MO).
Managua. Chaves 63 (US); Artemio 12 (US), 69 (US); Garnier 267 (US); Maxon, Harvey & Valentine 7366 (US), 7451 (US).
Masachapa. Nichols 1376 (VT).

Dept. Masaya, La Concepcion. Nichols 917 (VT).
Masaya. Baker 580 (US); Hamblett 87 (BM, NY, SMU, WDP, WIS); Zelaya 155 (ENAG, F, GH, MO, SEYM, UC).
Santiago. Robbins 5549 (DUKE, ENAG, MICH, MO, SEYM).
Santiago Volcano. Maxon 7654 (US), 7665 (US); 7434, type (US).
Volcan Masaya. Atwood A342 (MSC).

Dept. Carazo, Casa Colorada. Narvaez 542 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP).
Santa Teresa. Atwood 1281 (BM); Dudey 1287 (ENAG, F, GH, MO, SEYM, UC); Nichols 1318 (SMU).

Dept. Rivas, Ometepe Is. Shimek & Smith 20 (US).
San Juan del Sur. Narvaez 1257 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP); Nichols 1262 (MO, SEYM).

Without definite locality. Wright (US).

10. Russelia standleyi Carlson, Fieldiana, Bot. 29:257, fig. 2. 1957. Guatemala, type, Standley 77093.

11. Russelia parvifolia Carlson, Fieldiana, Bot. 29:282, fig. 6. 1957. Guatemala, type, Deam 6096.

12. Russelia chiapensis Lundell, Field & Lab. 13:12. 1945. Known from Mexico only, Contreras 5579.

13. Russelia longifolia Carlson, Fieldiana, Bot. 29:268, fig. 3. 1957. Guatemala, Honduras (US); Fl. Guatemala 9:392. 1973.

Excluded species. Russelia verticillata HBK., Nov. Gen. & Sp. 360. 1817. Carlson (l. c.) does not indicate its occurrence outside of Mexico and comments: "It is evident that the species has not been understood . . . ."

12. PENSTEMON Mitchell Beard-tongue

Herbs or rarely shrubs. Leaves opposite, lower ones on petioles, upper ones smaller, sessile. Flowers in terminal panicle. Calyx deeply 5-lobed, lobes overlapping. Corolla tubular, long, 2-lipped. Fertile stamens 4; additional stamen sterile. Capsule ovoid.

A. Stem viscid-villous; stem-leaves clasping, finely serrulate or almost entire; sepals 10 mm long, acute or almost obtuse, densely viscid-villous . 1. Penstemon perfoliatus Brongn.
A. Stem glabrous except sometimes in inflorescence; sepals 6-8 mm long, glabrous or hairy B.
B. Leaves sharply serrate; sepals acute-attenuate . . . . . 2. Penstemon campanulatus (Cav.) Willd.
B. Leaves entire; sepals obtuse . . . . . 3. Penstemon gentianoides (HBK.) Poiret

1. Penstemon perfoliatus Brongn., Hort. Univ. 5:265. 1844. Central and s. Mexico, doubtfully in Guatemala; Fl. Guatemala 9:386. 1973.

2. Penstemon campanulatus (Cav.) Willd., Sp. Pl. 3:228. 1800. Mexico, Guatemala; Fl. Guatemala 9:385. 1973.

3. Penstemon gentianoides (HBK.) Poiret, Dict. Sci. Nat. 38:385. 1818. Mexico, Guatemala (US).

13. TETRANEMA Bentham

Herbs. Stems very short or almost none. Leaves opposite, mostly near base of stem, crenate-dentate or entire. Flowers axillary, cymose or subumbellate, on long peduncles. Calyx of distinct, attenuate-acuminate sepals. Corolla cup-shaped; lobes shorter than tube. Stamens 4. Capsule ovoid, glabrous.

A. Peduncle equaling or surpassing leaves; flowers in umbels; pedicels 5-13 mm long . . . . . 2. Tetranema roseum (M. & G.) St. & St.
A. Peduncle shorter than leaves; flowers in cymes B.
B. Pedicels 1-2 cm long; calyx 6-8 mm long . . . . . 1. Tetranema evolutum Donn. Smith

B. Pedicels 5 mm long; calyx 2.5-3 mm long . . . . . .
. . . . . 3. Tetranema cymosum L. Wms.

1. Tetranema evolutum Donn. Smith, Bot. Gaz. 14:29. 1889. Guatemala (US).

2. Tetranema roseum (M. & G.) St. & St., Field Mus. Bot. 23:235. 1947. Allophyton mexicanum Pennell, Proc. Acad. Nat. Sci. Phila. 77:271. 1925. Honduras (US), Costa Rica (US). S. Mexico, British Honduras, Honduras; Fl. Guatemala 9:409. 1973.

3. Tetranema cymosum L. Wms., Fieldiana, Bot. 34:129, fig. 1972. Guatemala, type Steyermark 39858.

14. UROSKINNERA Lindley

Shrubs, hairy. Leaves opposite, dentate, on petioles. Flowers in terminal or axillary spikes or racemes. Calyx tubular-campanulate, 4-5-toothed. Corolla tubular, dilated upward, 5-lobed; lobes almost equal. Stamens 4; staminode present. Capsule globose.

1. Uroskinnera spectabilis Lindley, Gard. Chron. 36. 1857. Leaves 2.5-10 cm wide, 4-18 cm long, densely pilose beneath. Calyx 5 mm long, hirsute. Corolla 4 cm long.
Guatemala (US). Cultivated in Europe, Java and British Guiana.

15. HEMICHAENA Bentham

Herbs or shrubs. Leaves opposite toothed. Flowers axillary. Calyx 5-toothed, cup-shaped. Corolla 2-lipped. Stamens 4, fertile. Pedicels 12-25 mm long. Capsule ovoid or oblong.

A. Blades 1.5-4.5 cm long, acute or obtuse, almost sessile, not united around stem; calyx 6-10 mm long; corolla red or orange, 2.5-3.5 cm long 2. Hemichaena rugosa (Bth.) Thieret
A. Blades at most 16 cm long, acute to attenuate, united around stem; calyx 2 cm long; corolla yellow, 4-5 cm long . . . . .
. . . . . 1. Hemichaena fruticosa Bth.

1. Hemichaena fruticosa Bth., Pl. Hartweg. 78. 1841. Herb, densely hairy. Stem simple, 1 m tall. Leaves sessile, cordate at base, acuminate, toothed. Flowers in axillary cymes on peduncles. Calyx-lobes narrow, 5. Corolla 4-5 cm long. Capsule as long as calyx.
Mexico, Costa Rica; Fl. Guatemala 9:362. 1973.

2. Hemichaena rugosa (Bth.) Thieret, Fieldiana, Bot. 34: 96. 1972. Mexico, Honduras; Fl. Guatemala 9:363. 1973.

16. MIMULUS Linnaeus Monkey-flower

Herbs (ours), rarely shrubs. Leaves opposite. Flowers solitary in axils of leaves, or terminal in racemes. Calyx tubular or cup-shaped, 5-toothed, teeth much shorter than tube. Corolla 2-lipped or lobes equal. Stamens 4. Capsule oblong or linear.

A. Upper leaves sessile, clasping, rounded at tip, 3-5-palmately nerved; stem glabrous or sparsely villous or puberulent . . . . . 1. Mimulus glabratus HBK.

A. Upper leaves (and others) on petioles, acute at tip, pinnately nerved; stem with long soft hairs . . . . . 2. Mimulus pachystylus Grant

1. Mimulus glabratus HBK., Nov. Gen. & Sp. 2:370. 1817.
United States, Mexico, Guatemala (US), s. America.
Nicaragua: Dept. Esteli, Salto de Estanzuela.
Atwood & Neill 148 (MSC).

2. Mimulus pachystylus Grant, Ann. Mo. Bot. Gard. 11:234. 1924. Mexico, Guatemala; Fl. Guatemala 9:383. 1973.

17. MAZUS Loureiro

Herbs. Lower leaves opposite, upper alternate, toothed. Flowers in racemes without bracts or leaves. Calyx lobed 1/2 way, cup-shaped, lobes 5. Corolla tubular, 2-lipped. Stamens 4. Capsule globose or compressed.

1. Mazus japonicus (Thunb.) Kuntze, Rev. Gen. 462. 1891.
Mazus rugosus Lour., Fl. Cochinch. 385. 1790.
Costa Rica (US).
Nicaragua: Dept. Managua?, Sierra de Managua.
Garnier A286 (US).

18. GRATIOLA Linnaeus Hedge-hyssop

Herbs. Leaves opposite, linear or lanceolate, sessile, entire or nearly so. Flowers axillary, solitary, pedicels longer than calyx. Calyx-lobes 5, usually nearly equal, distinct to base. Corolla tubular, yellow. Stamens 4. Capsule globose or subglobose.

1. Gratiola oresbia Robinson, Proc. Am. Acad. 44:614. 1909. Pedicels at most 1.5 cm long. Calyx-lobes 3.5 mm long, linear-lanceolate, acute. Corolla 8-10 mm long, 2-lipped, tubular. Capsule globose, about 3.5 mm thick.
Guatemala; Fl. Guatemala 9:359. 1973.

19. STEMODIA Linnaeus

Herbs, glabrous or variously hairy. Leaves opposite or more than 2 at a node. Flowers in axils of leaves, upper ones sometimes in a spike. Calyx 5-lobed often nearly to base, lobes equal or unequal. Corolla tubular, 3-lobed. Stamens 4.

A. Flowers sessile or almost sessile; stem and leaves viscid-hairy B.
  B. Leaves sessile, acute or acuminate, 3-8 cm long . . . . . 6. Stemodia durantifolia (L.) Sw.
  B. Leaves on petioles, obtuse, 7-15 mm long . . . . . 4. Stemodia verticillata (Miller) Sprague
A. Flowers on long pedicels; pedicels often 2 cm long C.
  C. Blades acute or acuminate, glabrous when mature, pilose when young, 2-7 cm long; pedicels 2 cm long . . . . . 1. Stemodia fruticosa Lundell
  C. Blades obtuse at tip, rounded to wedge-shaped at base, 0.7-3.5 cm long D.
    D. Blades 2-3.5 cm long, dotted beneath; sepals 7-9 mm long . . . . . 3. Stemodia peduncularis Bth.
    D. Blades at most 2 cm long, villous; sepals 4-5 mm long, unequal E.
      E. Sepals 4-5 mm long, one slightly longer and wider than others; valves of capsule very obtuse; leaves glandular-dotted beneath . . . . . 5. Stemodia angulata Oersted
      E. Sepals 4 mm long, one linear, obtuse, the others shorter, awl-like; valves of capsule acuminate . . . . . 2. Stemodia jorulensis HBK.

1. Stemodia fruticosa Lundell, Contr. Univ. Mich, Herb. 4: 27. 1940. British Honduras, type, Gentle 2252. Honduras (US), Salvador (US). Nicaragua; Fl. Guatemala 9: 405. 1973.

2. Stemodia jorulensis HBK., Nov. Gen. & Sp. 2:358. 1817. Mexico, Guatemala, Salvador to Panama, Cuba; Fl. Guatemala 9:406. 1973. Nicaragua: Dept. Rivas, Ometepe Is. Shimek & Smith 112 (US).

3. Stemodia peduncularis Bth. in DC. Prodr. 10:382. 1846. Mexico (US), Guatemala (US), Honduras (US), Costa Rica (US), Panama (US).

4. Stemodia verticillata (Miller) Sprague, Kew Bull. 211. 1921. Erinus verticillatus Miller, Gard. Dict. ed. 8. no. 5. 1768. Stemodia parviflora (Miller) Aiton, Hort. Kew. ed. 2. 4:52. 1812. Lendneria humilis Minod., Bull. Soc. Bot. Geneve II. 10:240. 1918. Mexico (US), Honduras (US), Costa Rica (US). Nicaragua: Without definite locality. Wright (US)

as Lendneria parviflora Aiton.

5. Stemodia angulata Oersted, Vidensk. Meddel. Kjoeb. 1853: 22. 1854. Guatemala (US), Costa Rica (US). Mexico, British Honduras, Guatemala, Salvador, Honduras, Costa Rica, Panama; Fl. Guatemala 9:404. 1973.

6. Stemodia durantifolia (L.) Sw., Obs. Bot. 240. 1791. The only species in Central America with sessile leaves. Mexico (US), British Honduras (US), Guatemala (US), Honduras (US), Salvador (US), Costa Rica (US), Panama (FLAS).

20. SCHISTOPHRAGMA Bentham

Herbs. Leaves opposite, entire or deeply divided. Flowers solitary in axils of leaves. Calyx 5-lobed almost to base, lobes almost equal. Corolla tubular, 2-lipped. Stamens 4. Capsule linear.

1. Schistophragma pusilla Bth. in DC. Prodr. 10:392. 1846. Conobea pusilla (Bth.) Jackson, Index Kew. 1, fasc. 1:596. 1893. Mexico, Guatemala (US), Honduras, Nicaragua, Colombia; Fl. Guatemala 9:396. 1973.
Leaves or lobes linear, less than 1 cm long. Stem up to 20 cm tall, 4-angled, glabrous. Calyx 4 mm long. Corolla 5-6 mm long. Capsule 10-15 mm long.
Nicaragua:
Dept. Chinandega, Realejo. Oersted 9477 (US).
Dept. Masaya, Volcan Masaya. Atwood A333 (MSC).
Dept. Granada, Granada. Maxon, Harvey & Valentine 7581 (US).

21. LIMOSELLA Linnaeus Mudwort

Herbs, creeping, almost stemless except for stolons, rooting at nodes. Leaves linear, often widened at tip. Flowers in axils of leaves. Calyx 5-toothed, cup-shaped. Corolla-tube short; corolla 3-5-lobed. Stamens usually 4.

1. Limosella acaulis Sesse & Mocino, Fl. Mex. ed. 2:143. 1894. Plant glabrous. Blades commonly 2-3 cm long. Pedicels shorter than leaves. Flowers about 2 mm long. Mexico, Guatemala, Venezuela, Peru, Bolivia.

22. BACOPA Aublet

Reference: Pennell, F. W. Scrophulariaceae of Colombia. Proc. Phila. Acad. Nat. Sci. 72:136-188. 1920.

Herbs. Leaves opposite, mostly toothed or entire, in 1 species deeply lobed, in some species distinctly dotted (punctate). Flowers axillary or in terminal racemes, solitary or in clusters, sessile or on pedicels. Calyx deeply 5-lobed, lobes

sometimes very unequal. Corolla tubular, 2-lipped. Stamens 4. Capsule globose or ovoid. Distinguished from Lindernia and Micranthemum by having parallel anther cells.

A. Blades divided into many linear lobes; growing mostly or wholly under water . . . . . 14. Bacopa najas Standley
A. Blades entire or toothed, usually growing out of water B.
B. Outer sepals lanceolate or narrower, not conspicuously different from inner sepals; pedicels none or not over 1.5 mm long; calyx 2-2.5 mm long; leaves sessile; stem stout C.
C. Leaves acute at tip, 2-3 cm long; clasping at base; calyx densely dotted; stem erect, spongy, 4-6 mm thick at base . . . . . 12. Bacopa parviflora L. Wms.
C. Leaves rounded at tip, cuneate at base, 7-13 mm long; stem procumbent or prostrate . . . . . 13. Bacopa curtipes Standley & L. Wms.
B. Outer sepals ovate or elliptic, inner ones much narrower except in Bacopa axillaris D.
D. Leaves attenuate or acute at base E.
E. Pedicels mostly equaling or longer than leaves F.
F. Stems with spreading hairs; blades 7-9 mm long, hirsute (at least when young) over entire surface beneath; sepals ciliate, hairy, outer ones 4-5 mm long . . . 2. Bacopa humilis (Pennell) Standley
F. Stems glabrous or nearly so, at most 30-50 cm long; sepals 6-10 mm long; pedicels mostly longer than leaves G.
G. Leaves entire, attenuate at base, sessile, 6-20 mm long, dotted, rounded at tip; sepals 6-7 mm long . 3. Bacopa monnieri (L.) Wettstein
G. Leaves dentate, acute at base, on short petioles, 8-15 mm long, rounded to acute at tip; outer sepals 8-10 mm long . . . . . 4. Bacopa procumbens (Miller) Greenman
E. Pedicels much shorter than leaves or none; stem stout, erect, 4-6 mm thick at base; flowers 1-several in an axil; leaves dotted, at least beneath H.
H. Sepals 7-9 mm long, dotted; pedicels 3-10 mm long; leaves acute or attenuate at tip; stem glabrous (or hairy above) . . . . . 5. Bacopa lacertosa Standley
H. Sepals 3.5-4.5 mm long; pedicels almost none I.
I. Leaves acute; stem villous, spongy; sepals not dotted 1. Bacopa axillaris (Bth.) Standley

I. Leaves obtuse; stem glabrous, not spongy . . . . . 6. Bacopa sessiliflora (Bth.) Pulle

D. Leaves rounded or clasping or subcordate at base J.

J. Leaves lanceolate, acute at tip, 6 mm wide, 17-21 mm long, clasping at base, dotted; pedicels 6 mm long, shorter than leaves; calyx-lobes acuminate, 2-3 mm long; stem glabrous, erect . .7. Bacopa auriculata (Rob.) Greenman

J. Blades ovate or elliptic to orbicular; stem floating in water or creeping in wet soil K.

K. Leaves clasping at base; pedicels usually longer than leaves; outer calyx-lobes very obtuse, cordate, long-ciliate: stem with long, dense, spreading hairs . . . . . 7. Bacopa salzmannii (Bth.) Edwall

K. Leaves not clasping at base; pedicels usually shorter than leaves; sepals not cordate at base; stem glabrous or sparsely pilose L.

L. Longest sepals 5-7 mm long; capsule 3-4 mm long . . . . . 8. Bacopa violacea (Pennell) Standley

L. Longest sepals 2.5-3 mm long; pedicels reflexed in fruit M.

M. Capsule 3-4 mm long . . . . . 10. Bacopa repens (Sw.) Wettstein

M. Capsule 2.5 mm long . . . . . 9. Bacopa limosa (Pennell) Standley

1. Bacopa axillaris (Bth.) Standley, Journ. Wash. Acad. Sci. 15:460. 1925. Herpestes axillaris Bth. in DC. Prodr. 10:396. 1846. Panama, Colombia; Fl. Guatemala 9:330. 1973.

2. Bacopa humilis (Pennell) Standley, Journ. Wash. Acad. Sci. 15:460. 1925. Monocardia humilis Pennell, Proc. Phila. Acad. 72:157. 1920. Stems hairy with spreading hairs, 2-10 cm long. Leaves 3-8 mm wide, 7-9 mm long, hirsute (at least when young) over entire surface beneath. Pedicels 6-9 mm long. Sepals all ciliate, the 3 outer 4-5 mm long, hairy over entire outer surface. Panama, Colombia.

3. Bacopa monnieri (L.) Wettstein in Engler & Prantl, Pflanzenfam. IV. 3b:77. 1891.

SE United States, Mexico, British Honduras, Guatemala, Honduras, Salvador, Costa Rica, Panama (all US); W. I., S. A., Old World tropics; Fl. Guatemala 9:332. 1973.

Nicaragua:

Dept. Nueva Segovia, Jalapa. Seymour 5514 (MO, SEYM).

Dept. Leon, Leon Viejo. Atwood 1520 (BM, ENAG, F, GH, MO, SEYM, SMU).

Dept. Managua, Managua, Chaves 22 (US); Atwood 2612 (MO, SEYM).

Without definite locality. Chaves 288 (US).

4. Bacopa procumbens (Miller) Greenman, Field Mus. Bot. 2:261. 1907. Florida, Mexico (US), Honduras (US), British Honduras to Salvador and Panama, W. I., S. A.; Fl. Guatemala 9:333. 1973.

Nicaragua:
Dept. Zelaya, Bluefields. Seymour 4219a (SEYM).
Corn Is. Atwood 4395 (ENAG, MO, SEYM,SMU).
Dept. Boaco, Boaco. Seymour 3867 (VT).
Camoapa Seymour 3494 (VT).
Dept. Chontales, Acoyapa. Nichols 1743 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP); Seymour 1773a (ENAG, MSC, WIS).
San Francisco. Seymour 6081 (ENAG, GH, MO, SEYM, SMU).
Santo Tomas. Atwood 2733 (VT).
Dept. Rio San Juan, San Bartolo. Seymour 6249 (VT).

5. Bacopa lacertosa Standley, Field Mus. Bot. 11:140. 1932. Mexico (US), British Honduras (US), Guatemala (US).

Nicaragua:
Dept. Zelaya, Puerto Cabezas. Atwood 4528 (SEYM).
Siuna. Seymour 4981 (MO, SEYM).
Dept. Chontales, Acoyapa. Nichols 1744 (BM, ENAG, NY, SMU).
Seymour 1773 (MO, SEYM).

6. Bacopa sessiliflora (Bth.) Pulle, Enum. Pl. Surinam 415. 1906. British Honduras, Nicaragua, Panama, n. S. A.; Fl. Guatemala 9:334. 1973.

Nicaragua:
Dept. Zelaya, Bluefields. Atwood 4115 (SEYM).
El Bluff. Marshall & Neill 6516 (BM, DUKE, ENAG, FLAS, GH, MO, NY, SEYM, SMU, UC).
Puerto Isabel. Narvaez 2886 (US); Seymour 2946 (BM, DUKE, ENAG, FLAS, GH, MO, NY, SEYM, SMU, UC).

7. Bacopa auriculata (Robinson) Greenman, Filed Col. Mus. Bot. series 2:262. 1907. Herpestis auriculata Robinson, Proc. Am. Acad. 26:172. 1891. Canal Zone. Standley, P. C. Fl. Panama Canal Zone. Contr. U. S. Nat. Herb. 27:336-37. 1928.

8. Bacopa salzmannii (Bth.) Edwall, Bot. Comm. Geogr. Sao Paulo 13:176, 181. 1897.

Mexico, Guatemala, Honduras (US), Nicaragua, Costa Rica, Panama (US) to Brazil; Fl. Guatemala 9:334. 1973.

Nicaragua: Dept. Zelaya, Comarca del Cabo, Waspan. Seymour 4669 (SEYM).
Dept. Rio San Juan, San Juan del Norte. Seymour 5312 (SEYM).

9. Bacopa violacea (Pennell) Standley, Journ. Wash. Acad. Sci. 15:460. 1925. Monocardia violacea Pennell, Proc. Phila. Acad. Sci. 72:156. 1920. Standley writes: "probably not distinct from B. Salzmanni"; Fl. Costa Rica 1102. 1938. Costa Rica. Nicaragua: Dept. Zelaya, Comarca del Cabo, Waspan. Atwood 3620 (SEYM).

10. Bacopa limosa (Pennell) Standley, Journ. Wash. Acad. Sci. 15:460. 1925. Macuillamia limosa Pennell, Proc. Phila. Acad. Sci. 72:158. 1920. Doubtfully distinct from Bacopa repens. Costa Rica (US).

11. Bacopa repens (Sw.) Wettstein in Engler & Prantl, Pflanzenfam. IV. 3b:76. 1891. Mexico (US), British Honduras, Panama (US), W. I., S. A.; Fl. Guatemala 9:334. 1973. Nicaragua: Dept. Zelaya, Puerto Cabezas. Molina 14779 (US). Puerto Isabel. Seymour 2929 (ENAG, GH, MO, SEYM, SMU).

12. Bacopa parviflora L. Wms., Fieldiana, Bot. 34:118. 1972. Honduras (US), Nicaragua, Panama; Fl. Guatemala 9:333. 1973.

13. Bacopa curtipes Standley & L. Wms., Ceiba 3:129. 1952. Honduras (US).

14. Bacopa naias Standley, Field Mus. Bot. 11:141. 1932. British Honduras; Fl. Guatemala 9:332. 1973.

Excluded species. Bacopa bracteolata (Pennell) Standley, Contr. U. S. Nat. Herb. 27:336. 1928. I have been unable to ascertain what Standley meant by this species. I cannot find the place where Pennell first published it. Dr. William C. Burger of the Field Museum has very kindly informed me that it is unknown there also. It is listed in Standley's Fl. Canal Zone, Contr. U. S. Nat. Herb. 27 :336-37. 1928 as known in Panama only.

Bacopa rotundifolia (Mx.) Wettstein in Engler & Prantl, Pflanzenfam. 4. Abt. 3b:76. 1891. Monniera rotundifolia Mx., Fl. Bor. Am. 2:22. 1803, non Herpestis rotundifolia Gaertner f. This species has been reported in Mexico, Guatemala and Panama. However, Fl. Guat. 9:334. 1973, states that it is a "species of the United States.....". Therefore it is here considered not to occur in Central America.

23. TORENIA Linnaeus

Herbs. Leaves opposite. Flowers in racemes or axillary. Calyx tubular. Corolla cylindric, widened above, 2-lipped. Stamens 4. Capsule oblong.

A. Calyx 1.5-2 cm long, widely winged; corolla about 3 cm long, purple and black-purple . . . 1. Torenia fournieri Fourn.
A. Calyx 6 mm long; corolla white . . . . . 2. Torenia thouarsii (C. & S.) Kuntze

1. Torenia fournieri Linden ex Fourn. in Illustr. Hortic. 23: 129, t. 249. 1876. Honduras (US), Salvador (US), Nicaragua, Salas, 1966.

2. Torenia thouarsii (C. & S.) Kuntze, Rev. Gen. 468. 1891. Costa Rica (US).

24. MICRANTHEMUM Michaux

Herbs, prostrate, matted. Leaves opposite, entire. Flowers 1-2 in axils of leaves, almost sessile. Calyx 4-5-lobed or almost entire. Corolla 2-lipped, tube very short. Stamens 2. Capsule, in ours, globose.

A. Leaves 4-9 mm wide, suborbicular . . . . . 1. Micranthemum umbrosum (Walter) Blake
A. Leaves 1.2-2.5 mm wide, oval to elliptic . . . . . 2. Micranthemum standleyi L. Wms.

1. Micranthemum umbrosum (Walter) Blake

Nicaragua: Dept. Rio San Juan, San Juan del Norte. Seymour 5311 (GH, MO, SEYM).

2. Micranthemum standleyi L. Wms., Fieldiana, Bot. 34: 124. 1972. Type: Guatemala: Dept. San Marcos, damp thickets near Ayutla. Standley 68810. Endemic.

25. LINDERNIA Allioni False Pimpernel

Herbs, glabrous or slightly hairy. Leaves opposite, entire or nearly so, not dotted or only slightly so. Flowers solitary in axils of leaves or upper ones in a raceme. Pedicels longer than calyx, longer or shorter than leaves. Calyx-lobes 5, nearly or quite equal, tube short or none. Corolla short, tubular, 2-lipped, white to bluish. Stamens 2 or 4. Capsule ovoid or short-oblong or subglobose.

A. Leaves on short petioles; blades entire or crenate; calyx 2-4 mm long B.
  B. Pedicels usually longer than leaves; capsule scarcely exceeding calyx . . 1. Lindernia crustacea (L.) F. Muell.
  B. Pedicels very short; capsule about twice as long as calyx, 8-11 mm long . . . . . 2. Lindernia diffusa (L.) D. & J.

A. Leaves sessile, entire or nearly so, rounded or somewhat clasping at base; plant glabrous or nearly so; blades 3-7-nerved C.
C. Blades 4-10 mm long, usually longer than pedicels, rounded at tip, dotted; capsule subglobose . . . . . 3. Lindernia rotundifolia (L.) Standley & L. Wms.
C. Blades 10-30 mm long, rounded or acute at tip, not dotted; capsule ovoid-oblong D.
D. Lower pedicels shorter than leaves . . . . . 5. Lindernia dubia (L.) Pennell
D. Lower and upper pedicels longer than leaves . . . . . 4. Lindernia anagallidea (Mx.) Pennell

1. Lindernia crustacea (L.) F. Muell., Syst. Cens. Austral. Pl. 97. 1882. Capraria crustacea L., Mant. Pl. 87. 1767. Torenia crustacea (L.) C. & S., Linnaea 2:570. 1827. Vandellia crustacea (L.) Bth., Scroph. Ind. 35. 1835.
British Honduras (US), Guatemala (US), Honduras (US), Costa Rica (US), Panama, Old World tropics.
Nicaragua:
Dept. Zelaya, Comarca del Cabo, Waspan. Seymour 3590 (MO, SEYM).
Drenje de Rio Alaman. Shank & Molina 4858 (US).
Limbaika. Atwood 4889 (SEYM).
Dept. Chontales, Cuapa. Marshall & Neill 6674 (SEYM).

2. Lindernia diffusa (L.) Durand & Jackson, Index Kew. Suppl. 1:248. 1906. Vandellia diffusa L., Mant. Pl. 1:89. 1767.
The long capsules (8-11 mm) readily distinguish this species from some others. S. Mexico, Guatemala (US), Honduras (US), Costa Rica (US), as Vandellia diffusa L.; Old World tropics.
Nicaragua:
Dept. Zelaya, Puerto Isabel. Seymour 2984 (VT).
Dept. Rio San Juan, Castillo. Atwood 5184 (ENAG, MO, SEYM).
San Juan del Norte. Seymour 5312 (SEYM).

3. Lindernia rotundifolia (L.) Standley & L. Wms., Fieldiana, Bot. 34:122. 1972.
Guatemala, W. I., n. S. A., Old World tropics; Fl. Guatemala 9:374. 1973.

4. Lindernia anagallidea (Mx.) Pennell, Monogr. Acad. Sci. Phila. 1:152. 1935. Ilysanthes anagallidea (Mx.) Robinson, Rhodora 10:67. 1908.
United States, Mexico, British Honduras to Panama, W. I., S. A.; Fl. Guatemala 9:374. 1973.

5. Lindernia dubia (L.) Pennell, Monogr. Acad. Sci. Phila. 1:141. 1935. Ilysanthes dubia (L.) Barnhart, Bull. Torr. Bot. Club 26:376. 1899. S. Quebec to Ga., Gulf States, Mexico; Washington to California. Gray's Manual, ed. 8, 1279. 1950. See note, Fl. Guatemala 9:374. 1973.
Nicaragua: Dept. Zelaya, Rama. Proctor, Jones & Facey 27425 (US).
Costa Rica: Boca San Carlos, across Rio San Juan from Nicaragua. Seymour 5226 (SEYM).

26. SIBTHORPIA Linnaeus

Herbs, prostrate, hairy. Leaves alternate, on petioles, orbicular-reniform, crenate or pinnatifid. Flowers axillary, solitary or clustered. Calyx 4-8-lobed, cup-shaped, lobes about equal. Corolla-tube short, lobes spreading, almost equal. Stamens as many as corolla-lobes or 1 fewer. Capsule compressed.

1. Sibthorpia repens (L.) Kuntze, Rev. Gen. Pl. 3:239. 1898. Sibthorpia pichinensis HBK., Nov. Gen. & Sp. Pl. 2: 390, t. 176. 1817. Blades crenate, not pinnatifid, mostly shorter than petioles, cordate. Central and s. Mexico, Salvador, Honduras, Costa Rica; Fl. Guatemala 9:403. 1973.

27. CAPRARIA Linnaeus

Herbs. Stem much branched, somewhat woody at base. Leaves alternate, toothed. Flowers axillary, on pedicels. Calyx-lobes 5, almost equal, almost distinct. Corolla-lobes equal. Stamens usually 5. Capsule notched at tip, somewhat compressed.

1. Capraria biflora L., Sp. Pl. 628. 1753. Goatweed
Whole plant hairy or glabrous. Flowers 1-2 or several in an axil. Pedicels 1-2 cm long, longer than calyx, shorter than leaves. Corolla about 1 cm long. Sepals 4-6 mm long, ciliate, acute or acuminate. Capsule 4-6 mm long.

a. Plant glabrous . . . . . var. biflora
a. Plant pilose throughout . . . . . var. pilosa Griseb.

Var. biflora. S. Florida (FLAS), Mexico (FLAS), British Honduras, W. I., S. A. Uncertain which variety is in Honduras, Salvador, Costa Rica and Panama.
Var. pilosa Griseb., Fl. Brit. W. I. 427. 1864. Forma hirta Loes., Bull. Herb. Boiss. II. 3:284. 1903. Due to difference in range, the hairy specimens are treated here as a variety

See Fl. Guatemala 9:343. 1973, where the hairy specimens are treated as a form. They occur in s. Florida, Guatemala and Nicaragua. Var. pilosa is represented in FLAS from the following also: Tobago, San Salvador Island, Tortola, British Virgin Islands and Venezuela.

Nicaragua:

Dept. Chinandega, Ameya. Maxon, Harvey & Valentine 7118 (US).

Dept. Matagalpa, Calabazas. Seymour 2598 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP, WIS).

Sebaco. Seymour 2542 (MO, SEYM).

Dept. Boaco, Boaco. Seymour 5428 (ENAG, MO, NY, SEYM, UC).

Camoapa. Seymour 3538 (F, SEYM).

Dept. Leon, Nagarote. Seymour 2388 (VT).

Quezalguaque. Baker 2114 (US).

Dept. Managua, Managua. Bro. Artemio 54 (US).

Maxon, Harvey & Valentine 7255 (US).

Dept. Rivas, Belen. Seymour 1934 (VT).

Without definite locality. Wright (US); Chaves 5 (US).

28. SCOPARIA Linnaeus

Herbs or shrubs. Leaves opposite or more than 2 at a node, with resinous dots (punctate). Flowers axillary, solitary or in pairs. Calyx 4-lobed. Corolla-lobes 4, spreading, almost equal. Stamens 4.

A. Stem 10-15 cm tall; leaves at most 1.5 cm long, lower ones pinnatifid or toothed or almost entire; calyx 2.5 mm long . . . . . 1. Scoparia annua C. & S.

A. Stem 50-100 cm tall; largest leaves 2-3 cm long, serrate, uppermost entire; calyx 1.5-2 mm long 2. Scoparia dulcis L.

1. Scoparia annua C. & S., Linnaea 6:375. 1831.

Mexico (US), Guatemala (US), Honduras (US), Salvador (US).

Nicaragua: Dept. Nueva Segovia, Ocotal. Seymour 861 (SEYM).

2. Scoparia dulcis L., Sp. Pl. 116. 1753.

Mexico (US), British Honduras (US), Guatemala (US), Honduras (US), Salvador (US), Costa Rica (US), Panama (US).

Nicaragua:

Dept. Zelaya, Comarca del Cabo, Bihmona. Seymour 5742 (VT).

Corn Is. Atwood 4394 (GH, SEYM).

El Bluff. Narvaez 634 (BM, ENAG, F, FLAS, GH, MO, NY, SEYM, SMU, UC, WDP, YU).

Nueva Guinea. Nelson 5380 (BM, SEYM).

Dept. Zelaya, Punta Masaya. Seymour 691 (GH, SEYM).
Rama. Atwood & Moore 484 (VT).
Dept. Boaco, Camoapa. Seymour 3492 (VT).
Dept. Managua, Managua. Maxon, Harvey & Valentine 7253 (US); Dudey, Hamblett & Nichols 188 (F, MO, SEYM).
Dept. Carazo, Casa Colorada. Maxon, Harvey & Valentine 7455 (US); Seymour 565 (SEYM, UC).
Dept. Rio San Juan, Castillo. Nelson 5204 (FLAS), 5205 (DUKE).
Dept. Rivas, La Virgen. Narvaez 1206 (ENAG, NY, SEYM, WDP).
San Juan del Sur. Narvaez 1256 (ENAG, SEYM, SMU).
Without definite locality. Wright (US).

29. VERONICA Linnaeus Speedwell

Herbs. Leaves opposite, or upper ones alternate, sometimes reduced to bracts. Flowers terminal or axillary. Calyx 4-5-lobed. Corolla 4-5-lobed almost to base, lobes spreading. Stamens 2. Capsule compressed, usually notched.

A. Flowers almost sessile; stems glandular-hairy . . . . . 3. Veronica peregrina L. var. xalapensis HBK.
A. Flowers on pedicels B.
B. Pedicels usually equaling or exceeding leaves . . . . . 5. Veronica polita Fries
B. Pedicels shorter than leaves or bracts C.
C. Flowers axillary; pedicels shorter than calyx; capsule ciliate on margin . . . . . 4. Veronica arvensis L.
C. Flowers in terminal, bracted racemes; pedicels equaling or longer than calyx; capsule puberulent at tip D.
D. Hairs of axis and pedicels spreading, viscid or gland-tipped; corolla5-8 mm across; capsule 4-6 mm wide . . . . . 2. Veronica tenella All.
D. Hairs of axis and pedicels fine, incurved; corolla 2-4 mm across; capsule 3-4 mm wide . . . . . 1. Veronica serpyllifolia L.

1. Veronica serpyllifolia L., Sp. Pl. 12. 1753.
Costa Rica (US).

2. Veronica tenella All., Fl. Pedemont. 1:75. 1785.
N. No. Amer., southward through Mexico, Andes of S. A., Europe, Asia.

3. Veronica peregrina L., Sp. Pl. 14. 1753,
var. xalapensis HBK., Nov. Gen. & Sp. 2:389. 1817.
United States, Mexico (US), Guatemala (US), Panama (US).

4. Veronica arvensis L., Sp. Pl. 13. 1753.
No. Amer., Guatemala (US), Costa Rica (US), Europe.

5. Veronica polita Fries, Novit. Fl. Suec. 63. 1819.
United States, Mexico, Guatemala (US), Honduras (US), Costa Rica (FLAS, US), Europe, Asia.

30. DIGITALIS Linnaeus Foxglove

Herbs. Leaves alternate. Flowers in 1-sided racemes, turned downward. Calyx lobed almost to base, lobes 5. Corolla wide-tubular. Stamens 4.

1. Digitalis purpurea L., Sp. Pl. 621. 1753.
Plant with short, spreading hairs. Leaves toothed or almost entire. Calyx longer than pedicels, lobes obtuse. Corolla 4-5 cm long, usually purple. Costa Rica (US).

31. ESCOBEDIA Ruiz & Pavon

Herbs, simple or slightly branched. Leaves opposite, sessile, narrow. Flowers axillary, on pedicels. Calyx long-tubular, lobes 5, long. Corolla long-tubular. Capsule ellipsoid.

A. Calyx-teeth lance-linear, 10-18 mm long; peduncles 4-7 cm long; bractlets near middle of pedicel . . . . . 3. Escobedia laevis C. & S.

A. Calyx-teeth widely triangular, 2-6 mm long; pedicels 2-6 cm long B.

B. Bractlets near middle of pedicel C.

C. Blades 1 cm wide, linear to lanceolate . . . . . 2. Escobedia guatemalensis Loesner

C. Blades, widest ones, 3.5 cm wide, 7-15 cm long, oblong-lanceolate; calyx 2.5-4 cm long; corolla 10 cm long or longer 1. Escobedia grandiflora (L. f.) Kuntze

B. Bractlets near base of calyx D.

D. Veins not prominent beneath; calyx-tube 4-6 cm long; blades acute or obtuse . . . . . 4. Escobedia longiflora Pennell

D. Veins very prominent beneath; calyx-tube 3-4 cm long; blades acute, oblong-ovate . . . . . 5. Escobedia reticulata Pennell

1. Escobedia grandiflora (L. f.) Kuntze, Rev. Gen. 3, part 2, 231. 1898. Costa Rica (FLAS, US).

2. Escobedia guatemalensis Loesner, Vehr. Bot. Ver. Brandenb. 53:83. 1912. Mexico, British Honduras, Guatemala (US).

3. Escobedia laevis C. & S., Linnaea 5:108. 1830. Mexico, British Honduras, Honduras; Fl. Guatemala 9:352. 1973.

4. Escobedia longiflora Pennell, Proc. Acad. Nat. Sci. Phila. 83:423. 1931. Mexico, Guatemala (US).

5. Escobedia reticulata Pennell, Proc. Acad. Nat. Sci. Phila. 83:420, pl. 37, f. 7. 1931. Costa Rica (US).

Excluded species, Escobedia macrocalyx L. Wms. Dr. William C. Burger of the Field Museum has very kindly informed me that this species was never published and that Williams had annotated as type a specimen which he had previously annotated as E. guatemalensis Loes.

32. MELASMA Berg

Herbs, hairy. Leaves opposite, usually dentate, blackened in drying. Flowers in axillary or terminal spikes or racemes. Calyx 5-lobed less than 1/2 way, cup-shaped. Corolla-tube cup-shaped, short-tubular. Stamens 4. Capsule almost globose.

1. Melasma physalodes (D. Don) Melchior, Notizbl. Bot. Gart. Berlin 15:122. 1940. Flowers in axillary racemes. Calyx at flowering time about 2 cm long; in fruit, papery-inflated. Corolla about 3.5 cm long, white. Capsule 1-1.5 cm long. Central and s. Mexico, Guatemala, Honduras; Fl. Guatemala 9: 379. 1973.

33. ALECTRA Thunberg

Herbs with hirsute stem. Leaves opposite, hirsute, sessile or subsessile, toothed. Flowers sessile, axillary, solitary. Calyx 5-lobed about 1/2 way. Corolla 5-lobed. Stamens 4. Capsule depressed-globose.

1. Alectra aspera (C. & S.) L. Wms., Fieldiana, Bot. 34: 118. 1972. Leaves 2-5 cm long. Calyx 6-8 mm long. Corolla yellow, shorter or slightly longer than calyx. Capsule shorter than calyx. British Honduras to Panama, and W. I. to Brazil. Nicaragua:
Dept. Zelaya, Corn Is. Atwood 3737 (GH, MO, SEYM).

34. GERARDIA Linnaeus

Herbs, glabrous or hairy. Leaves usually opposite, linear, usually entire. Flowers axillary, solitary. Calyx cup-shaped, 5-toothed. Corolla wide-tubular, usually purple, 5-lobed. Sta-

mens 4. Capsule obtuse or barely acute.

A. Pedicels 1.5-2 mm long; calyx 3 mm long; leaves 1-2.5 cm long . . . . . 3. Gerardia spiciflora Engelm.
A. Pedicels 1.5-5 cm long or longer; calyx 4-6 mm long B.
B. Stems usually glabrous; corollas 2-3 cm long . . . . . 2. Gerardia peduncularis Bth.
B. Stems with short spreading hairs; corollas 12-15 mm long . . . . . 1. Gerardia hispidula Mart.

1. Gerardia hispidula Mart., Nov. Gen. & Sp. 3:13. 1829. Mexico, British Honduras, Guatemala, Honduras (US). Nicaragua;; Fl. Guatemala 9:354. 1973.

2. Gerardia peduncularis Bth. in Hook. Comp. Bot. Mag. 1: 209. 1836.
Mexico, Guatemala (US). Nicaragua; Fl. Guatemala 9:356. 1973.

3. Gerardia spiciflora Engelm., Bost. Jour. Nat. Hist. 5: 227. 1845. Gerardia harperi (Pennell) Pennell, Scrophulariaceae of Eastern Temperate No. Amer. 441. 1935.
United States, Mexico, British Honduras, W. I.
Nicaragua: Dept. Zelaya, Comarca del Cabo, Bihmona. Seymour 5743 (GH, MO, SEYM).
Waspan. Seymour 3700 (BM, ENAG, GH, MO, SEYM, SMU).
Puerto Cabezas. Atwood 4452 (ENAG, GH, MO, SEYM, SMU).
Tamla. Robbins 5942 (SEYM).

35. BUCHNERA Linnaeus

Herbs, black when dry, hispid or scabrous or puberulent or glabrous. Stem unbranched or slightly branched. Leaves alternate or opposite, linear or filiform. Flowers sessile, solitary in axils of upper leaves or bracts. Calyx tubular, 4-9 mm long in ours, lobes shorter than tube. Corolla-tube cylindric. Stamens 4. Capsule ovoid.

Reference: Philcox, D. Revision of the New World Species of Buchnera L. Kew Bull. 18:275-315. 1965.

A. Stem with white or rufous spreading hairs; calyx 7-9 mm long B.
B. Calyx hispidulous on and between nerves: leaves 20-40 mm long; perennial . . . . . 3. Buchnera obliqua Bth.
B. Calyx scabrous on nerves, glabrous between; leaves 5-25 mm long; annual . . . . . 5. Buchnera pusilla HBK.

A. Stem glabrous or slightly hairy especially near nodes and base C.
C. Calyx completely glabrous; leaves 3-nerved, 0.5-2 mm wide, 0.8-2.8 cm long; corolla glabrous . . . . . 6. Buchnera weberbaueri Diels
C. Calyx at least slightly hairy on or between nerves D.
D. Corolla glabrous outside except slightly hairy where covered by calyx; calyx not reticulate between nerves, hairy on nerves only; leaves 1.5-2.5 mm wide, 3.5-6 cm long . . . . . 2. Buchnera longifolia HBK.
D. Corolla hairy outside E.
E. Calyx reticulate between nerves, spreading-hispid or glabrescent between nerves; leaves prominently 3-5-nerved beneath, 4.5-8.5 mm wide, 5-9 cm long . . . . . 4. Buchnera rosea HBK.
E. Calyx not reticulate between nerves, hairy between nerves at least when young; leaves with obscure nerves, 3-13 mm wide, 3-6 cm long . . . . . 1. Buchnera floridana Gandoger

1. Buchnera floridana Gandoger, Bull. Soc. Bot. France 66: 217. 1919. SE United States, Mexico, British Honduras to Trinidad, W. I.

2. Buchnera longifolia HBK., Nov. Gen. & Sp. 2:340. 1818. Buchnera elongata Sw., Prod. Veg. Ind. Occ. 92. 1788, an earlier but illegitimate name. See Philcox, D. Kew Bull. 18: 300. 1965. For description, see also Sci. Survey of Porto Rico and the Virgin Islands 6:189. 1925.
Canal Zone, Honduras, W. I., S. A.

3. Buchnera obliqua Bth. in DC. Prodr. 10:498. 1846.
Arizona, Mexico, Guatemala, Ecuador.

4. Buchnera rosea HBK., Nov. Gen. & Sp. 2:342. 1818.
Panama, S. A.

5. Buchnera pusilla HBK., Nov. Gen. & Sp. 2:340. 1818.
S. Mexico (US), British Honduras (US), Guatemala (US), Honduras (US), Salvador (US), Costa Rica (FLAS, US), Panama (FLAS, US), nw. S. A.
Nicaragua:
Dept. Zelaya, Comarca del Cabo, Bihmona. Seymour 5745 (BM, SEYM, SMU).
Bilwaskarma. Seymour 4717 (SEYM).
Cororia Bush. Atwood 3736 (BM, SEYM, SMU).
Waspan. Atwood 3643 (VT).
Puerto Cabezas. Atwood 4453 (DUKE); Nelson 4535a (VT);

Marshall & Neill 6578 (BM, ENAG, GH, MO, SEYM, SMU, UC).

Tamla. Robbins 5943 (VT).

Dept. Chontales, Acoyapa. Hamblett 1697 (VT); Narvaez 1715 (ENAG, F, GH, MO, NY, SEYM, UC, WDP); Marshall & Neill 7073 (SEYM).

Santo Tomas. Seymour 2796 (VT); Atwood & Neill 7036a (BM, GH, MO, SEYM, SMU).

6. Buchnera weberbaueri Diels in Engl., Bot. Jahrb. 37:430. 1906. British Honduras, Panama to Peru, Venezuela, Trinidad.

Excluded species: Buchnera palustris (Aublet) Sprengel, Syst. 2:805. 1825. Reported in British Honduras and Panama, but Philcox, l. c. p. 282, maintains that it does not occur in Central America.

36. CASTILLEJA Linnaeus f.

Herbs, usually parasitic. Leaves alternate, many, lanceolate or linear, entire or lobed. Flowers in terminal bracted spikes or racemes; bracts leaf-like, usually colored. Calyx cylindric. Corolla 2-lipped, tubular. Stamens 4.

A. Longest leaves 4-8 cm long, entire E.
  B. Pedicels at least 5 mm long; stem without tubercles . . . . . 1. Castilleja integrifolia L. f.
  B. Pedicels none; stem at base covered with tubercles . . . . . 2. Castilleja arvensis C. & S.
A. Longest leaves 1-3.5 cm long; plants mostly or all perennial C.
  C. Leaves (lowest) narrowly lance-oblong, 2.5-5 mm wide, obtuse, entire or serrate or lobed; calyx 16-20 mm long . . . . . 3. Castilleja altorum St. & St.
  C. Leaves and bracts linear, 1-3 mm wide D.
    D. Calyx 20-25 mm long E.
      E. Calyx and bracts copiously hairy; leaves entire; bracts gradually narrowed to acute tip . . . . . 4. Castilleja tenuiflora Bth.
      E. Calyx and bracts glabrous or nearly so; bracts usually green, longer than leaves; pedicels not more than 3 mm long . . 5. Castilleja tapeinoclada Loes.
    D. Calyx 13-19 mm long F.
      F. Stem and leaves glabrous or nearly so; calyx 13-16 mm long; leaves lobed G.

G. Stem tufted, unbranched above base, 1.5-2.5 dm tall; corolla 20-21 mm long . . . .11. Castillja seibertii Pennell
G. Stem branched, up to 2 m tall; corolla 30 mm long; bracts rounded at tip . . . . . .6. Castilleja irazuensis Oersted
F. Stem and leaves finely or densely hairy H.
H. Leaves 2-2.5 cm long; bracts entire I.
I. Stem widely branched, more than 2 dm tall; corolla 12 mm long; leaves 3-ribbed; lobes of blades less than 1/4 length of blade . .7. Castilleja aurantiaca Pennell
I. Stem slightly branched, 1-2 dm tall; corolla 20-21 mm long; leaves obscurely 3-ribbed; lobes of blade more than 1/4 length of blade 8. Castilleja bicolor Pennell
H. Leaves 1-2 cm long; hairs reflexed or spreading; corolla 19-23 mm long J.
J. Stem widely branched; pedicels 2-4 mm long; bracts entire . . . . . 9. Castilleja chiriquensis Pennell
J. Stem slightly branched except more branched near summit; bracts lobed; corolla 20-23 mm long; lobes of leaves, if any, rounded at tip K.
K. Calyx 12 mm long; pedicels 4-6 mm long; stem 3-6 dm tall . . . . . 10. Castilleja quirosii Standley
K. Calyx 15-16 mm long; pedicels 2-5 mm long; stem 1.5-2.5 dm tall . . 11. Castilleja seibertii Pennell

1. Castilleja integrifolia L. f., Suppl. Pl. 293. 1781.
For description, see Fl. Guatemala 9:345. 1973.
a. Leaves entire . . . . . .var. integrifolia
a. Leaves, at least some of them, dentate or pinnatisect . . . . . var. alpigena L. Wms.
Var. integrifolia. Mexico, Guatemala, Honduras, Salvador, Costa Rica (US).
Var. alpigena L. Wms., Field Mus. Bot. 34:119. 1972. Guatemala (US).

2. Castilleja arvensis C. & S., Linnaea 5:103. 1830.
For description, see Fl. Guatemala 9:345. 1973 and Fl. Costa Rica 1104-5. 1938. Castilleja communis Bth. in DC. Prodr. 10:529. 1846. Mexico, Guatemala, Honduras, Salvador (US), Costa Rica (FLAS, US).
Nicaragua:
Dept. Madriz, Volcan Somoto. Williams & Molina 20238 (US).
Dept. Jinotega, Jinotega. Moore 2111 (MO, SEYM).
Dept. Matagalpa, Between Matagalpa and Jinotega. Williams, Molina & Williams 23332 (US).
Dept. Managua, El Crucero. Atwood & Neill 6765 (ENAG, GH, MO, SEYM, SMU).
Dept. Granada, Volcan Mombacho. Atwood A154 (MSC).

Dept. Granada, Niguumistomo [Niquinonomo], Baker 753 (US).

3. Castilleja altorum St. & St., Field Mus. Bot. 23:85. 1943. For description, see Fl. Guatemala 9:344. 1973. Guatemala.

4. Castilleja tenuiflora Bth., Pl. Hartweg. 22. 1840. For description, see Sanchez, O. S. La Flora del Valle de Mexico 362. 1969. Guatemala (US).

5. Castilleja seibertii Pennell, Ann. Mo. Bot. Gard. 27:339. 1940. See same for description.

6. Castilleja irazuensis Oersted, Vid. Meddel. Kjoeb. 27. 1853. For description, see Fl. Costa Rica 1104. 1938. Costa Rica (FLAS), Panama. Photo (US).

7. Castilleja aurantiaca Pennell, Ann. Mo. Bot. Gard. 27: 338. 1940. For description, see same. Panama.

8. Castilleja bicolor Pennell, Ann. Mo. Bot. Gard. 27:340. 1940. For description, see same. Panama (US).

9. Castilleja chiriquensis Pennell, Ann. Mo. Bot. Gard. 27: 338. 1940. For description, see same. Panama, Maxon 5307 (US).

10. Castilleja quirosii Standley, Fl. Costa Rica 1104-1105. 1938. For description, see same. Costa Rica.

11. Castilleja tapeinoclada Loesner, Bull. Herb. Boiss. II, 3:285. 1903. For description, see Fl. Guatemala 9:346. 1973. Guatemala (US).

37. PEDICULARIS Linnaeus

Herbs. Leaves alternate or more than 2 at a node, the upper smaller. Flowers in terminal spike or rarely raceme. Calyx tubular or cup-shaped, 2-5-toothed. Corolla 2-lipped, tubular. Stamens 4. Capsule compressed.

1. Pedicularis orizabae C. & S., Linnaea 5:103. 1830. Central and s. Mexico, Guatemala; Fl. Guatemala 9:385. 1973.

38. LAMOUROUXIA Humboldt, Bonpland & Kunth

Reference in addition to those in Bibliography:
Ernst, Wallace R. Floral Morphology and Systematics of Lamourouxia. Smithsonian Contribution to Botany #6. 1972.

Herbs or shrub-like plants. Leaves opposite, entire or dentate or dissected. Flowers terminal, in racemes or panicles or spikes. Calyx-lobes 4, linear, slightly longer than cup-shaped tube. Corolla tubular, much longer than calyx, 2-lipped, red (in our species) or orange. Fertile stamens 2; sterile stamens (staminodia) 2, or all fertile. Capsule ovoid.

A. Blades deeply divided pinnately; stem upright; branches ascending at acute angle; tips of inflorescence ascending . . . . . 7. Lamourouxia multifida HBK.

A. Blades not divided B.

B. Leaves sessile, heart-shaped and clasping at base . . . . . 5. Lamourouxia viscosa HBK.

B. Leaves on a petiole except sometimes the uppermost C.

C. Blades wide at base, heart-shaped or rounded or very obtuse at base D.

D. Stem erect; blades heart-shaped at base, widely ovate, at most 3 times as long as wide; peduncles 2-8 mm long . . . 3. Lamourouxia macrantha M. & G.

D. Stem climbing; blades not heart-shaped at base; calyx-lobes 7-15 mm long E.

E. Calyx densely villosulous, lobes often dentate . . . . . 4. Lamourouxia dependens Bth.

E. Calyx-lobes puberulent or glabrous, not dentate . . . . . 1. Lamourouxia xalapensis HBK.

C. Blades tapering to base F.

F. Calyx and leaves hairy; blades ovate, at most 25 mm long; calyx-lobes 2-5 mm long . . . . . .6. Lamourouxia gutierrezii Oersted

F. Calyx and leaves glabrous or nearly so or puberulent; calyx-lobes 6-15 mm long; blades 1.5-5.5 cm long G.

G. Pedicels 5-10 mm long; stamens 4; blades about 3 times as long as wide, 1-2 cm wide . . . . . 1. Lamourouxia xalapensis HBK.

G. Pedicels 2-5 mm long; fertile stamens 2; sterile stamens 2 (staminodia) . . . . . .2. Lamourouxia longiflora Bth.

1. Lamourouxia xalapensis HBK., Nov. Gen, & Sp. 2:338. 1818. Lamourouxia stenoglossa Hunnewell & Smith, Contr. Gray Herb. 124:4, t. 1, figs. 11-12. 1939.
Mexico (GH), Guatemala, as L. stenoglossa (GH).

2. Lamourouxia longiflora Bth., Pl. Hartweg. 22. 1839.

a. Blades serrulate or crenate; calyx-lobes lanceolate . . . . . var. lanceolata (Bth.) L. Wms.

a. Blades entire b.

b. Calyx-lobes linear-lanceolate . . . . . var. longiflora

b. Calyx-lobes mostly triangular . . . . . var. integerrima (Donn. Smith) L. Wms.

Var. integerrima (Donn. Smith) L. Wms., Fieldiana, Bot. 34: 121. 1972. Lamourouxia integerrima Donn. Smith, Bot. Gaz. 13:189. 1888. Guatemala (US).

Var. lanceolata (Bth.) L. Wms., Fieldiana, Bot. 34:121. 1972. Lamourouxia lanceolata Bth. in DC. Prodr. 10:542. 1846. S. Mexico, Salvador, Costa Rica (GH, US), Guatemala (US). Var. longiflora. S. Mexico; Fieldiana, Bot. 34:121. 1972.

3. Lamourouxia macrantha Martens & Galeotti, Bull. Acad. Sci. Bruxelles 12(2):32. 1845. Mexico (GH), Guatemala (GH).

4. Lamourouxia dependens Bth. in DC. Prodr. 10:539. 1846. Type specimen: Skinner (K). Lamourouxia montana Hunnewell & L. B. Smith, Contr. Gray Herb. 124:4. 1939. Guatemala (GH).

5. Lamourouxia viscosa HBK., Nov. Gen. 2:ed. folio 272, ed. quarto 338. 1817. 1818.
Mexico, Guatemala, Salvador, Honduras, Costa Rica, Panama; Smithsonian Contr. to Botany #6. 1972.
Nicaragua:
Dept. Nueva Segovia, Dipilto. Neill 6406 (ENAG, MO, SEYM).
Dept. Esteli, 43 miles toward Managua from Nicaragua-Honduras boundary by Inter American Highway. Morley 743 (US).
Dept. Chinandega, near Jinotega. Standley 9873 (F).
Volcan El Viejo. Baker 100 (GH), 881 (US), 2171 (GH).
Dept. Leon, Momotombo. Smith 121 (GH, US).
Without definite locality. Photo of Oersted 22719 (GH, US).

6. Lamourouxia gutierrezii Oersted in Bentham & Oersted, Videns-kabelige Meddelelser fra den Naturhistoriske Forening i Kjöbenhavn for Aaret 1853. 29. "1854".
Costa Rica (GH), Panama (GH).

7. Lamourouxia multifida HBK., Nov. Gen. & Sp. 2:339. 1818. Mexico (GH, US), Guatemala (GH, US).

ABBREVIATIONS in addition to those in common use.

Bth., Bentham
C. & S., Chamisso & Schlechtendal
D. & J., Durand & Jackson
GMS., Gaertner, Meyer & Schreber
M. & G., Martens & Galeotti
Mx., Michaux, Andre
N. Amer., North America
Rob., Robinson, Benjamin L.
R. & P., Ruiz & Pavon
R. & S., Roemer & Schultes
S. A., South America
St. & St., Standley & Steyermark
SEYM, Herbarium of Frank C. Seymour
WDP, Herbarium of St. Norbert College, West De Pere, Wis.
W. I., West Indies

BIBLIOGRAPHY of references most used. Others cited with their taxa.

Pennell, F. M. The Scrophulariaceae of Eastern Temperate North America. 1935.

Standley, P. C. Flora of Panama Canal Zone, Contr. U. S. Nat. Herb. 27. 1928.

Standley, P. C. Flora of Costa Rica. Fieldiana, Bot. 18. 1938.

Salas, Juan B. E. Lista de Especies de la Flora Nicaraguensis con especimenes en el Herbario de la Escuela Nacional de Agricultura y Ganaderia, Managua, Nicaragua. 1966.

Standley, P. C. & L. O. Williams. Flora of Guatemala. Fieldiana, Bot. 24, part 9, no. 4. 1973.

INDEX TO GENERA

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BOOK REVIEWS

Alma L. Moldenke

"THE CHEMICAL FORMULARY - Collection of Commercial Formulas for Making Thousands of Products in Many Fields", Volume XIX - H. Bennett, Editor-in-Chief, 418 pp., Chemical Publishing Company, Inc., New York, N. Y. 10011. 1976. $15.00.

In keeping with the pattern established by the many earlier volumes only the carefully explained and wisely repeated Introduction is not new material. This volume includes formulas with instructions and alternatives for Adhesives, Coatings, Cosmetics, Detergents, Drugs, Emulsions, Foods & Beverages, Metals, Polishes, Rubber, Resins, Waxes, Textiles, and a miscellany of herbicides, insect repellants, telephone disinfectants, etc. An appendix has a note about the Federal Food & Drug Law, lists the trademark chemicals mentioned throughout this volume and their suppliers, a warning list of incompatible chemicals and needed working tables. All this is followed by a good index.

In the days of interdisciplinary science development much in this volume (and the others) would interest practically and/or theoretically the botanist in the herbarium and/or in the field. This volume has 54 named contributors who have furnished this storehouse of well organized, easily accessible and widely useful information.

"THE VASCULAR PLANTS OF SOUTH DAKOTA" by Theodore Van Bruggen, xxvi & 538 pp., illus., Iowa State University Press, Ames, Iowa 50010. 1976. $7.95 paperbound.

Like so many carefully prepared floras this one has been "a seasoned time a-borning" (17 years) and is well worth all the author's field studies and collections, herbaria studies and preparations, and text composing. It gives access through practical, readily workable dichotomous keys to 38 pteridophyte, 8 gymnosperm, 429 monocot and 1110 dicot species. Two additions have been reported by H. N. Moldenke in various of his publications on Verbena, viz., V. ambrosifolia Rydb. from Washabaugh County and V. ciliata from Hughes County.

Throughout the book subspecific taxa are intentionally not included in the keys.

The illustrations are not "plant pictures" that would encourage "page thumbing" rather than "keying" for identifications, but, rather, they are plates indicating South Dakota counties, with generalized glacial locations which involve only the eastern half of the state and are mostly of Early and Late Wisconsin and Recent times, with the location and nature of the different Precambrian

and Pleistocene deposits, and with the major physiographic divisions (primarily composed of the Central Lowland in the east and the Great Plains from the valley of the Missouri River westward). A very carefully prepared introduction correlates these factors as well as altitude, water supply, seasonal temperature ranges, with the dominant floristic features.

Was the Glossary — which does not seem to have the honed precision of the text — prepared by someone else? N.B.: tepal, stamen, taxonomic synonym, hypogynous, frond, rootstock. Likewise the neat index? It has 15 entries from "common bladder fern" through "common yellow violet" but with none under "bladder fern" and none under "violet" and with 12 entries under "yellow", including the different "yellow prairie violet". Such indexing is useful only as extra cross-references.

"THE NATURALISTS' DIRECTORY — International, 42nd Edition, edited by Willard H. Baetzner, 259 pp., PCL Publications, Inc., South Orange, New Jersey 07079. 1975. $7.95 in U.S.A., $9.95 foreign, paperbound.

The following notation is actually just a postscript to the appreciative review which appeared in a previous issue: The editor has written me that "The Directory is available in most overseas United States Information Service Libraries."

"BIOLOGY DATA BOOK", Second Edition, Volume III compiled & edited by Philip L. Altman & Dorothy S. Dittmer for the Federation of American Societies for Experimental Biology, xvii & 690 pp., illus., Bethesda, Maryland 20014. 1974. $40.00 or $100.00 for the 3-volume set.

"This final volume is arranged in four sections, with the data organized in the form of 114 tables (quantitative and descriptive), graphs and diagrams" for the following major documented topics: X Nutrition, Digestion & Excretion with many chemical pathways shown, XI Metabolism with energy considerations illustrated in several pathways, XII Respiration & Circulation, and XIII Blood & Other Body Fluids including arthropod hemolymph, plasma electrolytes, coagulation, etc.

No reader new to this excellent set of these biological source materials (validated by 207 highly qualified researchers) should infer that accurate broader overlapping definitions of these topics might involve any wasteful repetition. No reader familiar with any part or all of this series would be concerned about careless errors in compilation, editing and indexing because of the very dependable skilled staff. All these folks involved in this F A S E B project have continually earned much appreciation from "BIOLOGY DATA BOOK" users even if they have never been so informed.

The only constructuve criticism here offered is the same as was

mentioned for Volume II — the incorporation of the common name and scientific name appendices into the Index since many of these names are indexed anyhow.

"ENERGY FOR SURVIVAL: The Alternative to Extinction, by Wilson Clark, xvi & 652 pp., illus., Anchor Books - Doubleday & Company, Inc., New York, N. Y. 10017. 1974. $12.50.

The author has been a consultant for the Environmental Policy Center in Washington, D. C. An associate, David Howell, is given the credit for much of the research involved in this book and James K. Page, Jr., for the few illustrations. Page's very simple sketch of a magnetohydrodynamic generator is particularly helpful because it shows coal in a hopper ready to be fed into the burner before reaching the superconducting magnet. So many other elaborate representations for the "general" reader minimize almost to oblivion the role played initially by conventional fuels in MHD.

The book deals logically with the concommitant growing role of energy in civilization, with American society in its homes and industries making the greatest demands and uses. It explains the limitations to our conventional fuels and the costs of prospective fuel sources from nuclear fusion and fission, solar, bioconversion, geothermal, tidal, wind, etc.

"We must find new sources of energy to carry us into the future; but at the same time, we must realize the limits to the present fuels and change our lives — and institutions — accordingly."

Therefore this book is a helpful study of the problem.

"THE BIOLOGICAL REVOLUTION — Social Good or Social Evil?" edited by Watson Fuller, xi & 345 pp., Anchor Books, Doubleday & Company, Inc., New York, N. Y. 10017. 1972. $2.50 paperbound.

These writings were first published a year earlier by Routledge & Kegan Paul Ltd. and entitled "The Social Impact of Modern Biology" for the British Society for Social Responsibility in Science. The text is composed of 20 papers, their bibliographies and interesting discussions as presented at an international conference in London in 1970 and also supported by the Council for Biology in Human Affairs, Salk Institute, San Diego, California.

Each paper is well worth cogitation, including M. H. F. Wilken's "Possible Ways to Rebuild Science", written after the conference. The sessions were oriented as follows: Parts I - Science, Technology & Values, II - Molecular Genetics, III - Human Genetics & Reproduction, IV - Immunology & Cancer, V - Agricultural Botany & the Environment, and VI - Science in Society.

"FLORA OF OKINAWA AND THE SOUTHERN RYUKYU ISLANDS" by Egbert H. Walker with the assistance and collaboration of many Okinawan, Japanese, Chinese, and western botanists, ix & 1159 pp., illus., Smithsonian Institution Press, Washington, D. C. 20560. Distributed in the U. S. A. and Canada by George Braziller, Inc., New York, N. Y. 10016 and in foreign countries by Feffer & Simons, Inc., New York, N. Y. 10017 or c/o Transatlantic Book Services Ltd., London W1N3LE. 1976. $36.75.

This superb production was sponsored by the Pacific Science Board of our National Academy of Sciences. The author has dedicated the publication "to the present and future botanists in this area with the hope that it will enrich the appreciation and understanding of their plants and that it will stimulate the collecting and publication of further information concerning them."

After the introduction, the author develops access to this descriptive flora through well seasoned and carefully constructed keys to the 218 families of pteridophytes, gymnosperms and angiosperms in 1008 genera with about 2100 species including some with subspecific categories. There is a beautiful full page color printed frontispiece showing a coral limestone bluff, the type locality for Portulaca okinawensis and additionally there are 209 black/white illustrations which as photographs or drawings definitely add to the value of this book.

The derivation of each scientific name is presented as well as some of the common ones.

The last hundred pages are devoted to very helpful, interesting and detailed glossary, abbreviations for authors of scientific names, collectors and collections cited, herbaria of deposition, selected bibliography, and separate indexes of Japanese, Okinawan, English and scientific plant names.

Dr. Walker's botanical experiences in Asia started with teaching biology in the Canton Christian College (later Lingnan University) from 1922 to 1926 and preparing a study of the trees on the large campus compound. His doctoral dissertation on the Myrsinaceae of Eastern Asia (1940) is still regarded as a classic. Serving as the botanist for the United States Program of Scientific Investigation in the Ryukyu Islands, he collected in the area June--September 1951, December 1953, October 1957 and June-July 1966. Dr. Walker has been a prodigious, hardworking, capable, dedicated scientist who has accomplished so much to date in his very quiet, honest, appreciative and considerate way.

Retired from the Smithsonian since 1958, he now holds Botanist Emeritus rank from there. He also holds Amicus Emeritus rank in the hearts of many throughout America and Asia.

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The variations of Alphitonia ponderosa (Rhamnaceae)
Hawaiian Plant Studies 59

Harold St. John
B. P. Bishop Museum, Honolulu, Hawaii 96818, USA.

Alphitonia ponderosa Hbd. was a tree highly esteemed by the Hawaiian people. Its wood is dark red, hard, strong, durable, and so heavy that it sinks in water. They used it in many ways, and especially to make hut beams, kapa beaters, spears, javelins, and the o'o or digging stick for spading cultivated fields. These uses are related by Degener (1930: 204, pl. 56).

The tree is semixerophytic, occurring in the lower dry forest or scrub on the leeward side of all the principal Hawaiian Islands. A number of the other denizens of these dry habitats are among the most widely distributed of the Hawaiian species, occurring as the same species on each of the principal islands. Among these are: Heteropogon contortus (L.) Beauv. ex R. & S., Panicum torridum Gaud., Argemone glauca Pope, Capparis sandwichiana DC., var. Zoharyi Deg. & Deg., Osteomeles anthyllidifolia (Sm.) Lindl., Cassia Gaudichaudii H. & A., Gossypium tomentosum Nutt. in Seem., Plumbago zeylanica L., Solanum Nelsoni Dunal in A. DC., Canthium odoratum (Forst. f.) Seem. Each of these occurs as a homogeneous species throughout its range, thus not showing island endemism.

Until now there has been no suggestion that there was variation evident in Alphitonia ponderosa. On Oahu it is rare and local in the Waianae Mountains. Recent good collections from there have induced the writer to study and revise this species. He finds numerous small differences in vesture, leaves, flowers, and fruit, and these are correlated with their occurrence on the several islands. No single character is a strong, positive one of major significance. Hence, these differences are judged to be ones indicative of a varietal status.

A. ponderosa was described by Hillebrand (1888: 81-82), and he recorded it from Kauai,

Oahu, Molokai, Maui, and Hawaii, without designating a type. His herbarium was finally placed in the Berlin Herbarium, but was there destroyed in 1944. Some duplicates from his herbarium were distributed, but it is not known how many there were of this species. There is one at Kew, but its data include merely Sandwich Islands. Fortunately, in the Bishop Museum there are two sheets with good flowering specimens, and one bears the data Molokai. In the diagnosis this was listed as "Molokai! Maunaloa;".This Molokai specimen in the Bishop Museum is here selected as the lectotype for the species.

There is a world monograph of the genus by Braid (1926: 168-186), and he maintains the Hawaiian species as distinct, though most previous botanists had merged it with A. excelsa Reissek ex Endl., described from Australia, but subsequently thought to occur from Borneo to Polynesia. Braid restricted A. excelsa to Australia, and described three other Australian species, and recognized as endemics the species of the various Pacific archipelagos.

Key to Varieties of Alphitonia ponderosa

A. Hypanthium in fruit 10-ribbed; blades 6-12 cm long, acuminate, below with veinlet reticulation flush, and secondaries glabrous on the backs; calyx lobes 2 mm long.
Oahu. 3. var. costata.

A. Hypanthium in fruit smooth,
B. Blade veinlet reticulation elevated on lower side,
C. Calyx lobes 1.3 mm wide; petioles downy; blades 6-10 cm long, acute or subacuminate.
Lanai. 6. var. lanaiensis.

C. Calyx lobes 1.3-1.8 mm wide; petioles pilosulous,
D. Calyx lobes 1.7-1.8 mm wide; blades 4-11 cm long, acute or subacuminate, the midrib and secondaries below pilose; blades 4-11 cm long.
Maui. 2. var. auwahiensis.

D. Calyx lobes 1.3-1.5 mm wide; midrib and secondaries below glabrous on the backs; blades 5-7 cm long, obtuse or subacute. Molokai. 1. var. ponderosa.

B. Blade veinlet reticulation flush below,

E. Midrib and secondaries below pilose; calyx lobes 2-2.2 mm long; blades (8-) 10-20 cm long, acuminate. Kauai. 4. var. grandifolia.

E. Midrib and secondaries below glabrous on the backs; calyx lobes 1.8 mm long; blades 5-15 cm long, subacuminate. Hawaii. 5. var. Kauila.

Alphitonia ponderosa Hbd., Fl. Haw. Is. 81-82, 1888; Drake, Ill. Fl. Ins. Mar. Pacif. 6: 140,1890; Heller, Minn. Bot. Stud. 1: 849-850, 1897; Skottsberg, Göteb. Bot. Trädg., Meddel. 2: 245, 1926; 15: 396, 1944; Fagerlund & Mitchell, Hawaii Natl. Park, Nat. Hist. Bull. 9: 45, 1949; Neal, In Gardens of Hawaii, Bishop Mus., Spec. Publ. 50: 541, 1965.

A. excelsa Reissek, in part, as to Hawaiian plants, sensu Mann, Am. Acad. Arts Sci., Proc. 7: 161-162, 1867; sensu Wawra, Flora 56: 176, 1873 (and in reprint p. 57); sensu Sinclair, Indig. Fl. Haw. Is., pl. 25, 1885; sensu Rock, Indig. Trees Haw. Is. 285, 287, pl. 112, 1913.

1. var. ponderosa

Diagnosis of Lectotype: Blades 5-7 cm long, obtuse or subacute, midrib and secondaries below glabrous on the backs, the veinlet reticulum elevated; petioles pilosulous; calyx lobes 1.3-1.5 mm wide, 1.4-1.7 mm long; hypanthium in fruit smooth.

Lectotype: Hawaiian Islands, Molokai Island, Maunaloa, W. Hillebrand (BISH).

In the Bishop Museum, there are only three other collections of it: Kawela Gulch, 1912, C. N. Forbes 182.Mo.; Kamolo, 1910, Faurie 297; and ravine n. w. of Puu Makaliilii, 1928, O. Degener & H. Wiebke 3,343.

Maunaloa is on the low, dry, west end, and

the other three are on the lower, leeward slopes of the central part of the island.

2. var. auwahiensis var. nov.

Illustration: Rock, Indig. Trees Haw. Is. pl. 112, 1913.

Diagnosis Holotypi: Laminis 4-11 cm longis acutis vel subacuminatis, midnervo et nervis secundariis infra pilosis, reticulis venularum infra elevatis, petiolis pilosulis, lobis calycis 1.7-1.8 mm latis, 1.7 mm longis, hypanthio in fructu laevi.

Diagnosis of Holotype: Blades 4-11 cm long, acute or subacuminate, the midrib and secondaries below pilose, the veinlet reticulum elevated below; petioles pilosulous; calyx lobes 1.7-1.8 mm wide, 1.7 mm long; hypanthium in fruit smooth.

Holotypus: Hawaiian Islands, Maui Island, Auwahi, 3,000 ft alt., June 30, 1972, H. St. John 26,873 (BISH).

In the Bishop Museum there are 10 other specimens of this variety from east Maui, all from the Auwahi region on the lee side of Haleakala.

3. var. costata var. nov.

Diagnosis Holotypi: Laminis 6-12 cm longis acuminatis, midnervo et nervis secundariis infra in dorsis glabris, reticulis venularum infra complanatis, petiolis pilosulis vel glabratis, lobis calycis 1.5-1.8 mm latis 2 mm longis, hypanthio in fructu 10-costato.

Diagnosis of Holotype: Blades 6-12 cm long, acuminate; midrib and secondaries below glabrous on their backs, the veinlet reticulum flush; petioles pilosulous to glabrate; calyx lobes 1.5-1.8 mm wide, 2 mm long; hypanthium in fruit 10-ribbed.

Holotypus: Hawaiian Islands, Oahu Island, Makua Valley, V-shaped gulch against backbone, among Metrosideros, Dodonaea, Diospyros, etc., 1,600 ft alt., Nov. 28, 1976, John Obata 76-305 (BISH).

In the Bishop Museum there are 5 other colections of this variety, all from the Waianae Mts. One is from Pohakea Pass, but the others are all

from the dry slopes of Mt. Kaala, in Makua, Makaleha, and Mokuleia Valleys.

4. var. grandifolia, var. nov.

Illustrations: Sinclair, F., Indig. Fl. Haw. Is. pl. 25, 1885.

Diagnosis Holotypi: Laminis (8-) 10-20 cm longis acuminatis, midnervo et nervis secundariis infra pilosis, reticulis venularum infra complanatis, petiolis pubentibus vel glabratis, lobis calycis 1.7 mm latis 2-2.2 mm longis, hypanthio in fructu laevi.

Diagnosis of Holotype: Blades (8-) 10-20 cm long, acuminate; midrib and secondary veins below pilose, the veinlet reticulum flush below; petioles downy or glabrate; calyx lobes 1.7 mm wide, 2-2.2 mm long; hypanthium in fruit smooth.

Holotypus: Hawaiian Islands, Kauai Island, Kokee Park, upper Waimea Canyon, 2 miles s. of Park Headquarters, moderately dry forest, 3,000 ft alt., July 10, 1966, S. Carlquist 1,956 (BISH).

Also in the Bishop Museum there are 27 additional specimens of this variety, all from Kauai. The variety ranges from Kokee to Kaholuamano, and the Hii Mountains.

5. var. Kauila var. nov.

Illustration: Degener, Pl. Hawaii Natl. Park, pl. 56, 1930.

Diagnosis Holotypi: Laminis 5-15 cm longis subacuminatis, midnervo et nervis secundariis infra in dorsis glabris, reticulis venularum infra complanatis, petiolis pilosulis, lobis calycis 1.5-1.7 mm latis 1.8 mm longis, hypanthio in fructu laevi.

Diagnosis of Holotype: Blades 5-15 cm long, subacuminate, the midrib and secondaries below glabrous on the backs, the veinlet reticulum flush; petioles pilosulous; calyx lobes 1.5-1.7 mm wide, 1.8 mm long; hypanthium in fruit smooth.

Holotypus: Hawaiian Islands, Hawaii Island, between Puuwaawaa and Huehue, Aug. 18, 1926, O. Degener 3,344 (BISH).

In the Bishop Museum there are 37 other sheets of this variety. It is abundant in the

Puuwaawaa region, North Kona District, and occurs from there south to the region of South Point, then northeast to Kilauea.

6. var. lanaiensis, var. nov.

Diagnosis Holotypi: Laminis 6-10 cm longis acutis vel subacuminatis, midnervo et nervis secundariis infra pilosis, reticulis venularum infra elevatis, petiolis pubentibus, lobis calycis 1.3 mm latis 1.5-1.6 mm longis, hypanthio in fructu laevi.

Diagnosis of Holotype: Blades 6-10 cm long, acute or subacuminate, the midrib and secondaries below pilose, the veinlet reticulum elevated; petioles downy; calyx lobes 1.3 mm wide, 1.5-1.6 mm long; hypanthium in fruit smooth.

Holotypus: Hawaiian Islands, Lanai Island, Maunalei, flowering 10/11/13, fruiting 2/24/15, G. C. Munro 472 (BISH).

In the Bishop Museum there are 13 other collections of this variety from Lanai. The range is at middle altitudes, encircling the uplands.

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STUDIES IN BIGNONIACEAE 26: NEW TAXA AND COMBINATIONS IN NORTHWESTERN SOUTH AMERICAN BIGNONIACEAE

Alwyn H. Gentry*
Missouri Botanical Garden

My on-going studies of neotropical Bignoniaceae have turned up five undescribed taxa of this family from western Ecuador and adjacent Peru. Several new combinations in the family are also proposed as a result of taxonomic insight gained from field work in northwestern South America.

AMPHILOPHIUM ECUADORENSE A. Gentry, sp. nov.

Frutex scandens; ramuli hexagoni, pilosi, sine consociebus glandularum in nodis inter petioles; pseudostipulae foliaceae; folia 2-foliolata, interdum cirrhis fissis, foliolis ovatis, membranaceis, subtus dense puberulis; inflorescentia floribus in panicula angusta, villosa; calyx duplex, pubescens; corolla rubra, tubulosa, valde bilabiata; stamina didynama, thecis divaricatis; ovarium ovato-cylindricum, dense puberulum; discus annulo-pulvinatus; capsula elliptica, rasilis, dense molliter tomentosa.

Liana; branchlets sharply hexagonal with ribbed angles, pilose, especially on the angles with simple or short-branched dendroid yellowish trichomes, these less than 1 mm long, interpetiolar glandular fields lacking; pseudostipules foliaceous, persistent, to 0.8 mm in diameter. Leaves 2-foliolate, sometimes with a trifid tendril, the leaflets ovate, acute, cordate at base, 4-12 cm long, 2.5-12 cm wide, membranaceous, palmately veined at base, densely and uniformly yellowish-puberulous beneath with short dendroid trichomes, above less densely puberulous with short simple and forked trichomes; petiolules 1-4 cm long, petioles 2-6 mm long, villous with short-branched dendroid trichomes. Inflorescence a rather narrow panicle, villous with yellowish mostly dendroid trichomes, bracteate with linear or lanceolate bracts 0.5-1 cm long. Flowers with calyx double, the inner calyx irregularly 2-labiate, outer calyx irregularly 5-lobed, lepidote and yellowish-pubescent with simple, forked and dendroid trichomes, the latter mostly branched only at tips, 9-11 cm long, 10-11 cm wide;

* This work was supported by National Science Foundation Grants GB-40103, OIP75-18202 and DEB 75-20325-A01.

corolla magenta, tubular, bilabiate, 2.5-3 cm long, ca. 1 cm wide, the upper 2 lobes thick, almost completely fused, the lower 3 fused, ca. 5 mm long, the tube split ca. half its length, viscid, glabrous; stamens didynamous, the anther thecae divaricate, 2 mm long; ovary ovate-cylindrical, slightly contracted at base, 2 mm long, 2 mm wide, densely pubescent with forked and branched trichomes, the ovules many-seriate in each locule; disc annular-pulvinate, 1 mm long, ca. 3 mm wide. Capsule elliptic, flattened, 9 cm long, 4.2 cm wide, the midline not evident, smooth-surfaced, densely and softly viscid tomentose with forked and stellate trichomes, also lepidote; seeds not seen.

Type: ECUADOR: Guayas: dry tropical forest, Cerro Bella Vista near Julio Moreno, 29 Aug 1965, Játiva & Epling 974 (holotype NY, isotype S).

Endemic to the coastal dry forest region of Ecuador and adjacent extreme northwestern Peru below 1500 m altitude.

Additional collections examined: ECUADOR: Manabi: near Jipijapa, 19 Jul 1942, Haught 3399 (F, K, US). El Oro: vicinity of Portovelo, 6-15 Oct 1918, Rose & Rose 23378 (US); Río Amarillo upstream from Portovelo, 640-760 m, 22 Aug 1943, Steyermark 54023 (NY); trail between Portovelo and Río Cabra passing Minas Nuevas, 640-1645 m, 23 Aug 1943, Steyermark 54078 (NY). PERU: Tumbez: entre Palamble y Faique, monte baja, 1400-1500 m, 2 May 1955, Ferreyra et al. 10896 (MO, USM).

This species is more densely pubescent than any of the forms of highly variable A. paniculatum (L.) HBK. It also differs from A. paniculatum in its persistent pseudostipules and especially the viscid yellowish-tomentose fruit. I have previously identified several flowering collections of A. ecuadorense with A. pannosum (DC.) Bur. & K. Schum. which is similar in its dense pubescence and persistent pseudostipules but has a very different rugose-tuberculate fruit and is also ecologically distinct in being restricted to wet forest habitats.

DELOSTOMA GRACILE A. Gentry, sp. nov. - Fig. 1.

Arbusto; ramuli subteretes; folia simplicia, obovata, apiculata, plus minusve integra, fere glabrata; inflorescentia floribus in racemo angusto gracili; calyx cupulatus, simplex; corolla carnea, peranguste tubulo-campanulata, extus sparsim minute puberula; stamina stigmaque exserta; capsula ignota.

Fig. 1. Delostoma gracile A. Gentry. A. Habit; B. Inflorescence with mature buds (part of largest bud removed to show position of anthers); C. Inflorescence with young buds; D. Flower (note exserted stigma; anthers broken off). (All x 1/3).

Shrub 6 m tall, branchlets subterete to somewhat angulate, puberulous, the nodes without interpetiolar glandular fields or pseudostipules. Leaves simple, obovate, apiculate, rounded at base, 3-9.5 cm long, 1.5-5.5 cm wide, the margin subentire or serrate towards apex, somewhat 3-veined from base, more or less glabrate above and below, membranaceous to chartaceous, sparsely puberulous along main veins below, with plate-shaped glands in axils of basal lateral nerves below, petiole 0.5-3 cm long, puberulous. Inflorescence an open few-flowered terminal raceme, slightly puberulous, pedicel pairs separated by about 2 cm, the pedicels ca. 1 cm long. Flowers with the calyx cupular, simple, evenly 5-dentate, 6-7 mm long, 6 mm wide, sparsely puberulous with scattered trichomes; corolla "flesh-color", very narrowly tubular-campanulate, 6 cm long, 0.9 cm wide at mouth of tube, the tube 4.5 cm long, the lobes long and narrow, 1-1.3 cm long, 5-6 mm wide, sparsely and minutely puberulous outside, the lobes inside glabrous but glandular-surfaced; stamens exserted, the anther thecae parallel, pendent, 3.5 mm long; pistil ca. 6 cm long, stigma long-exserted, style sparsely pilose, ovary and disc not seen. Fruit not seen.

Type: PERU: Tumbez: Prov. Tumbez, mountains SE of Hacienda La Choza, 900-1000 m, deciduous bushwood, 27-28 Feb 1927, Weberbauer 7683 (F, fragm. MO).

This plant differs from other species of the genus especially in its slender open inflorescence, narrow thin-textured corolla tube, long narrow corolla lobes, exserted stigma and anthers, and small simple unridged calyx. The flesh-colored flowers are unique if correctly reported. Its closest relative is D. lobbii Seem., the only other Delostoma with exserted anthers and a similar corolla shape. That species differs in the inflorescence reduced to one or two flowers, a larger (11-20 mm long) calyx with prominent submarginal lobes, red flower color, and different habitat (1550-3250 m). Delostoma gracile has the smallest calyx in the genus and is the only species occurring below 1500 m, and the only one with an open slender inflorescence.

PACHYPTERA ERYTHRAEA (Dugand) A. Gentry, stat. nov.

Pachyptera kerere var. erythraea Dugand. Caldasia 7: 16. 1955. Type: Colombia: Santander, Romero-Castañeda 4727 (COL).

Only a single specimen of this taxon was available to Dugand when he described it as merely a variety of widespread

P. kerere, distinguished mostly by its red (rather than white) flowers but also by the wider corollas. I have studied both species in the field and the numerous additional specimens now available confirm that the red-flowered plant endemic to the middle Madgalena Valley of Colombia merits species recognition. In addition to the different flower color and larger corolla dimensions noted by Dugand, its anthers are exserted or subexserted rather than included. The calyx of the Magdalena Valley plant is evenly truncate and cupular while that of P. kerere is irregularly sub-bilabiate to unevenly truncate and broadened gradually toward the apex. Moreover the corolla of P. erythraea is shaped quite differently from that of P. kerere. The former's corolla tube expands above the short basal constriction to become tubular campanulate from well below the middle, while the corolla tube of P. kerere expands relatively gradually near the middle above a much longer tubular base; diameter at middle of the tube in P. kerere is 3-7 mm, in P. erythraea (9-)11-15 mm (fig. 2). Vegetatively P. erythraea is distinguished from P. kerere by the (usually) densely puberulous leaf undersurfaces (of all specimens examined, only the type collection is glabrescent). The fruit of P. erythraea, like that of P. kerere var. incarnata (Aubl.) A. Gentry, is flat, without a visible midline and has thin, winged seeds. P. kerere var. incarnata, which sometimes has light magenta (but never red) corollas, has glabrous leaves and flowers of the size and shape of typical P. kerere, and is best maintained as a variant of P. kerere.

TABEBUIA BILLBERGII ssp. AMPLA A. Gentry, ssp. nov.

Differt ab T. billbergii ssp. billbergii calyce majore, corolla majore, ovario majore, et capsula latiore.

Similar to typical T. billbergii except in the markedly greater size of its calyx, corolla, and ovary and the wider capsule (see Table 1).

Shrub or tree 3-12 m tall, twigs terete, glabrate. Leaves palmately 5-foliolate, the leaflets narrowly ovate, acute to acuminate, the base rounded, the leaflets to 10 cm long and 5 cm wide, usually smaller, the terminal largest, laterals smallest, entire or subentire, chartaceous, inconspicuously scattered lepidote above, rather densely minutely lepidote below, above glabrate or simple puberulous along midvein, below mostly glabrate, usually with a few simple trichomes around margins of domatiate nerve axils, drying olive gray to black; petiolules to 2.5 cm long, laterals shorter, petiole to 6 cm long, thin,

inconspicuously lepidote and puberulous to glabrate. Inflorescence several (2-8) flowers clustered at the end of a branchlet, the pedicels to 1 cm long, densely tannish tomentose, the resting buds sessile, tannish mealy pubescent, bracts and bracteoles not apparent. Flowers with the calyx campanulate, 5-dentate, (8-)9-15 mm long, 7-12 mm wide, pubescent with pale tannish thick-stellate trichomes, these dense at base and along the 5 ribs, descending from the marginal teeth, the often contrasting brownish or blackish calyx surface visible toward margin between the ribs; corolla lemon yellow with reddish or brownish striations in throat, tubular-infundibuliform, 6-8 cm long, 1.4-2 cm wide at mouth of tube, the tube 3.5-4.5 cm long, the lobes 1.3-2.5 cm long, glabrous outside, inside pubescent with rather scattered long multicelled trichomes mostly along throat ridges; stamens inserted 5-6 mm from base of corolla tube, the filaments 1-1.8 cm long, the anther thecae divaricate, 2-3 mm long, the staminode 2-3 mm long; pistil 2.5-3 cm long, the ovary linear, 5-6 mm long, 1-1.5 mm wide, densely lepidote, the ovules 2-seriate in each locule; disc pulvinate, 0.5 mm long, 3 mm wide. Capsule linear-oblong, subterete, 17-29 cm long, 8-10 mm wide, scattered lepidote, sometimes also minutely and very inconspicuously puberulous, drying dark; the seeds thin, bialate, 0.5-0.6 cm long, 1.2-1.7 cm wide, the wings hyaline-membranaceous, sharply demarcated from body of seed.

Type: ECUADOR: Guayas: 1 km E of turnoff to Julio Moreno on Guayaquil-Salinas toll road, 30 Oct. 1974, Gentry 12243 (holotype MO, isotypes QCA, S)

Dry forest of coastal Ecuador and adjacent Tumbez, Peru.

Additional collections examined: ECUADOR: Guayas: Isidro Ayora, 12 Sep 1955, Asplund 17607 (NY, S); W. of Guayaquil, 18 Oct 1955, Asplund 18194 (S); outskirts of Pedro Carbo, 29 Oct 1974, Gentry 12236, 12237 (both MO); 1 km E of Isidro Ayora, 29 Oct 1974, Gentry 12239, 12240 (both MO); 32 km E of Cerecita on toll road to Guayaquil, 29 Oct 1974, Gentry 12241 (MO); 20 km of Cerecita ca. 7 km E of Changón, 30 Oct 1974, Gentry 12252 (MO); 3 km N of Guayaquil, Little 6568 (F); between Guayaquil and Salinas, Mexia 6758 (F); near Guayaquil, Mille 86 (F); coastal plain SE of Guayaquil, Rimbac 62 (F); Guayaquil, Nov. 1963, Valverde 931 (MO). PERU: Tumbez: Prov. Tumbez, Ricaplaya, valley of Tumbez river, 100-150 m deciduous bushwood, 4-5 Mar, 1927, Weberbauer 7734 (MO, NY). Prov. Zarumilla, 80-100 m alt, 18 Feb 1960, Ferreyra 14158 (MO, USM); Papayal, 105 m alt., open thickets, 19 Feb 1976, Plowman 5503 (MO).

As currently understood T. billbergii has a remarkably disjunct range, occurring along the Caribbean coast of Venezuela and Colombia and in the dry coastal forest of southwestern Ecuador and adjacent Peru. In the process of preparing treatments of Bignoniaceae for both the Flora of Venezuela and the Flora of Ecuador, I have examined numerous herbarium specimens of T. billbergii and studied it in the field in both parts of its range. Numerous constant but rather minor differences prove to exist between the two populations. These differences, correlated with a large range disjunction, support taxonomic recognition for the Ecuadorian plant. However none of these differences, mostly related to the greater flower size of the Ecuadorian taxon, seem especially significant and subspecific recognition seems appropriate.

Table 1--Differences between T. billbergii ssp. billbergii and ssp. ampla

	ssp. billbergii	ssp. ampla
range	northern Colombia and Venezuela	southwestern Ecuador and adjacent Peru
calyx length	5-8 mm	(8-)9-13 mm
calyx width	4-9 mm	7-12 mm
corolla length	3-5.5(-7) cm	7-12 cm
tube width	1-1.4 cm	1.4-2 cm
pistil length	1.7-2.3 cm	2.5-3 cm
ovary length	3-5 cm	5-6 cm
ovary width	0.7-0.8 mm	1-1.5 mm
leaf indumentum	slightly lepidote	densely impressed-lepidote
leaflet margin	mostly serrate	always entire
capsule length	14-23 cm	17-29 cm
capsule width	5-7 mm	8-10 mm

TABEBUIA CHRYSANTHA ssp. PLUVICOLA A. Gentry, ssp. nov.

Tecoma grandis Appun, Behand. Samereien und Pflanzen 39. (1858), nom. nud.

Differt ab T. chrysantha ssp. chrysantha calyce majore minus puberulo et capsula majore plus minusve glabrescenti.

Tree to 30 m tall, small buttresses to 2 ft tall, the bark rather smooth; branchlets subtetragonal, stellate rufescent when young, more or less glabrescent. Leaves palmately 5(-7) foliolate, the leaflets elliptic to oblong obovate, acute to short-acuminate, obtuse to truncate at base, the terminal leaflet to 25 cm long and 14 cm wide, in laterals progressively smaller, entire at maturity, membranaceous, more or less glabrescent above, usually more or less stellate puberulous along main veins and often sparsely lepidote, below more or less persistently stellate pubescent at least along main veins and usually sparsely over surface; terminal petiolule 3-8 cm long, laterals shorter, petiole 6-30 cm long, stellate-rufescent to glabrescent. Inflorescence a contracted terminal panicle, often almost fasciculate, stellate-rufescent, bracts and bracteoles usually 3-4 mm long. Flowers with the calyx campanulate, 5-lobed, the lobes usually more or less reflexed, (12-)14-19 mm long, 9-19 mm wide, shortly reddish brown stellate pubescent, the tomentum denser toward base; corolla tubular-infundibuliform, 6-11.5 cm long, yellow with reddish penciling in throat, the venation (dried) reticulate to margins of lobes, the dried tube and lobes indistinguishable in color, the tube 4-8 cm long, 1.8-3 cm wide at mouth of tube, the lobes 1.5-3 cm long, glabrous outside except a few stellate trichomes along main veins of lobes and upper part of tube, the sinuses and floor of throat rather densely pilose with long simple trichomes inside; stamens didynamous, inserted 5-6 mm from base of corolla tube, the anther thecae divaricate, 2-3 mm long, the filaments 1.5-2.5 cm long, the staminode 8-11 cm long; pistil 3-3.9 cm long, the ovary linear-oblong, 4-8 mm long, 1.5-2 mm wide, densely minutely lepidote to apparently glabrous; disc annular-pulvinate, 1 mm long, 3-5 mm wide. Capsule linear-cylindric, 30-80 cm long, 1.5-2.4 cm wide, usually almost completely glabrescent; seeds thin, bialate, 0.6-0.9 cm long, 2.5-3.4 cm wide, the hyaline-membranaceous wings well-demarcated from seed body.

Type: ECUADOR: Pichincha: 17 km E of Santo Domingo de los Colorados, 800 m, 1 Feb 1974, Gentry 9505 (holotype MO, isotypes QCA, S, GB).

Mostly restricted to Holdridge-system wet forest from Costa Rica to the coastal cordillera of northern Venezuela and south along both sides of the Andes to Ecuador.

Additional collections examined: COSTA RICA: Alajuela: near Villa Quesada, Gentry 470 (MO, WIS); Seibert 1602 (MO, US). Heredia: La Selva, Opler 484, 893 (both MO); near La Virgen, Gentry 525, 526 (both MO, WIS); near Puerto Viejo, Gentry 529 (MO, WIS), Gentry 1031, 1173, 1181 (all MO), Little & Budowski 20386 (CR). PANAMA: Canal Zone: Pipeline road, premontane wet forest area, Gentry 1795 (MO). Coclé: above El Valle de Antón, 1000 m, Gentry 5681 (MO). Colón: ca. 20 miles E of Canal Zone on Santa Rita Ridge road, Gentry 456 (MO). Darien: Cerro Pavarando, Gentry 4211 (MO); Cerro Pirre, 500-1000 m, Gentry 4584, 4611 (both MO); Cerro Mali, 1400 m, Gentry & Mori 13825 (MO). Panama: El Llano-Carti Road 4.8 miles N of Pan-Am Highway, Gentry 5074 (MO). Veraguas: 3.5-4.5 mi above Santa Fé, Gentry 3082 (MO). VENEZUELA: Aragua: Rancho Grande, 800-1100 m, Pittier 15284 (US, VEN); Maracay-Choroni, 1200 m, Tamayo 1619 (VEN, not US); Rancho Grande, 1080 m, Williams 10334 (F, VEN). Lara: San Isidro, Guarico, selvas nubladas, Tamayo 3358 (VEN). Merida: abajo del Trampa, 2000 m, Bernardi 2168 (K, NY); 20 km W of Merida, 1700 m, Breteler 3239 (NY, U, US, VEN); 35 km NW of Merida 1150 m, Breteler 3493 (MER, NY, U); 10 km O de Ejido, Little 15235 (VEN); between Merida and La Punta, 1520-1820 m, Steyermark 55926 (F, K, VEN). COLOMBIA: Choco: Panama border near Cerro Tacarcuna, 1200 m, Gentry & Mori 13751 (MO); Alto de Buey, ca. 1200 m, Gentry & Forero 7308 (COL, MO). Boyaca: E of Chapón, 100 mi NW of Bogota, 4000 ft, Lawrence 124 (F). Cundinamarca: cercanias de San Bernardo, 1800-1600 m, Cuatrecasas 9620 (F). Valle: Tulua, 1024 m, Moreno & Gonzalez 7 (COL, MO). ECUADOR: Esmeraldas: 2 km N of Quinindé, Gentry 9568 (MO), 2 mi W of Río Quinindé from Quinindé, Little 6211 (NY, US). Pichincha: 17 km E of Santo Domingo de los Colorados, 800 m, Gentry 10222 (MO, fruits of same tree as type). Manabi: 21 km S of Jipijapa on road to Guayaquil, 23 km N of Cascol, 370 m, Gentry 12214, 12219 (both MO). Bolivar: Valle de Limón, Cordillera Occidental, 800 m, Acosta Solis 6451 (F). Guayas: 2-4 km W of Bucay, 170 m, Oct 1974, Gentry 12319 (MO). Napo: 44 km E of El Chaco, 1400 m, Nov 1974, Gentry 12408 (MO).

Tabebuia chrysantha is a widespread and variable species. I have realized for some time that two forms of this species are readily distinguishable in the herbarium--one with short calyces pubescent with longer trichomes, in part barbate, the other with large calyces having a less dense shorter-stellate tomentum. While these two forms

are clearly distinct any attempt at taxonomic recognition has seemed inadvisable due to the absence of type material of Jacquin's Bignonia chrysantha and the problem of definitely assigning the type illustration to either of them. However recent study of this complex in Venezuela shows that only forms with shorter more pubescent calyces reach Caracas, the type locality of Bignonia chrysantha. In Venezuela the large calyxed form is restricted to montane cloud forest habitats from Rancho Grande (Aragua) west. It is thus undescribed except for the nomen nudum listed above. Interestingly Pittier (in herb.) considered the cloud forest plant specifically distinct but failed to validate a name for it.

Calyx size is not the only differentiating characteristic of this plant: its fruit is smooth and almost completely glabrescent as well as being larger than the distinctly stellate tomentose often striate or rough-surfaced one of typical T. chrysantha. Moreover typical T. chrysantha is restricted to lowland moist and dry forest habitats and is thus ecologically isolated from the wet forest plant. For example at Rancho Grande National Park, Venezuela, ssp. chrysantha occurs in moist forest up to 700 m while ssp. pluvicola occurs only in cloud forest over 800 m. Similarly in Ecuador ssp. chrysantha occurs only in the coastal dry forest while ssp. pluvicola occurs in lowland wet and moist forest; only in Esmeraldas Province do their distributions overlap and there ssp. chrysantha is restricted to a small dry forest enclave near the coast while ssp. pluvicola is widespread in moist and wet forest regions. The correlated differences in fruit, calyx, and ecology between these two forms of T. chrysantha suggests their taxonomic separation at least at subspecific rank.

Additional collections of the complex from throughout its range are needed and might well lead to elevation of ssp. pluvicola to specific rank. Although a widespread well-known locally common and commercially important tree which is exceedingly conspicuous when in flower, it is amazingly poorly represented in herbaria. The situation in Panama may be cited to support this point (as well as to emphasize the general lack of adequate herbarium representation of neotropical tree species, especially wet forest ones). Tabebuia chrysantha ssp. pluvicola occurs throughout Panama's wet forest regions (including such easily accessible ones as El Valle, Santa Fe, El Llano-Carti, Pipeline Road, and Santa Rita Ridge) but I am the only one who has ever collected it anywhere in the country. More fruiting specimens especially are needed before the relationship of ssp. pluvicola and ssp. chrysantha can be thoroughly understood.

TABEBUIA CHRYSANTHA ssp. MERIDIONALIS A. Gentry, ssp. nov.

Differt ab T. chrysantha ssp. chrysantha calyce majore et foliolis plus dense pubescentibus, ab T. chrysantha ssp. pluvicola calycis trichomatibus longioribus et foliolorum tomento.

Tree to 20 m tall and 50 cm dbh, bark very pale, smooth with longitudinal cracks. Branchlets subtetragonal, densely tannish-stellate pubescent when young, glabrescent. Leaves palmately 5-foliolate, the leaflets elliptic, acute, obtuse at base, entire, densely stellate and dendroid pubescent beneath, with tufts of similar but longer trichomes in nerve axils beneath, partially glabrescent above, drying tannish below (cf. T. ochracea), petioles and petiolules lepidote and stellate and dendroid pubescent. Inflorescence a contracted terminal panicle, the branches stellate pubescent, the bracts conspicuous, linear, 5-12 mm long. Flowers with the calyx campanulate, irregularly 5-lobed, 15-20 mm long and 9-12 mm wide, pubescent with reddish-tan stellate and dendroid trichomes; corolla tubular-infundibuliform, ca. 6 cm long and 2 cm wide at mouth of tube, glabrous outside except for a few long lax simple trichomes on and just below the lobes, inside with the sinuses pilose, densely pilose in floor of throat and at stamen insertion; stamens didynamous, the thecae 3-4 mm long; ovary linear-oblong, glabrous, 5 mm long, 1.5 mm wide; disc annular-pulvinate, 1 mm long, 2.5 mm wide. Fruit unknown.

Type: ECUADOR: Chimborazo: Canyon of the Río Chanchan, 5 km N of Huigra, 5000-6500 ft., moist forest valley in the afternoon fog belt; trees to 20 m high, 0.5 m diameter, this species is exceedingly floriferous and easily the showiest of the forest trees of the region at this season, 19-28 May, 1945, Camp E-3458 (holotype MO, isotypes F, K, NY, U).

Apparently restricted to isolated patches of Holdridge system premontane humid forest from 1200-2000 m on the slopes of the western Andes in southern Ecuador.

Additional collections examined: ECUADOR: El Oro: Camino de Zaruma a Malvas, 1200 m, 13 Sep 1947, Espinosa 2241 (K); between Portovelo and El Tambo, 2 Sep 1923, Hitchcock 21290 (NY); vicinity of Portovelo, 6-15 Oct 1918, Rose & Rose 23443 (NY); loc. ignon., Steyermark 54007 (K).

This is the southernmost representative of the widespread and polymorphic T. chrysantha complex. Vegetatively ssp. meridionalis is more like T. ochracea (Cham.) Standl.

(especially T. ochracea ssp. neochrysantha) than like typical T. chrysantha in the dense tannish tomentum of the leaf undersurface. However, flowering collections are very similar to T. chrysantha ssp. pluvicola and prove the affinity of this taxon with T. chrysantha. The leaves of some collections of T. chrysantha ssp. chrysantha from coastal Ecuador approach ssp. meridionalis in density of pubescence, but calyces of these lowland plants are much smaller than in ssp. meridionalis.

As is so often the case in Tabebuia, there are problems in determining which flowering collections are conspecific with which vegetative or fruiting collections. Sandwith (in herb.) identified flowering collections of ssp. meridionalis as T. spectabilis (Pl. & Lind. ex Pl.) Nichols. and vegetative material (doubtfully) as T. heteropoda (DC.) Sandw. (i.e. T. ochracea sensu lato). However I strongly suspect that all the upland material from southwestern Ecuador represents a single taxon with a unique combination of vegetative and floral characters. Flowering material of ssp. meridionalis is intermediate between ssp. pluviatilis and poorly known T. spectabilis of the northern Cordillera Oriental of Colombia which suggests that T. spectabilis itself may also prove an extreme variant of T. chrysantha. Alternatively it is possible that additional collections, especially of flowers, fruits and leaves from the same plant, would justify elevation of some or all of these geographical segregates to specific rank.

SPATHICALYX DUCKEI (A. Samp.) A. Gentry, comb. nov.

Tanaecium duckei A. Samp., Ann. Acad. Bras. Sc. 7: 125. 1935. Type: Brazil, Para, Obidos, Ducke s.n. (MG 17137) (K, MO, RB, US).

Spathicalyx kuhlmannii J. C. Gomes, Mus. Nat. Hist. Nat. Paris 15: 222. 1956. Type: Brazil, Rio de Janeiro, Sumare, Kuhlmann s.n. (RB 77623) (K, MO, RB).

Examination of the types of Tanaecium duckei and Spathicalyx kuhlmannii, two (presumably) hawk moth-pollinated Brazilian species shows that they are not only congeneric but apparently conspecific as well. Sampaio's original description of this plant in Tanaecium was tentative and I regard such major differences as long membranaceous subspathaceous calyx, gland-tipped, sometimes forked vegetative trichomes, trifid tendrils, very finely reticulate pollen, and cordate (to truncate) more or less palmately veined leaflets as outweighing the similarity

of the elongate tubular white corolla with that of Tanaecium. The only other genus of Bignonieae with a similar corolla is monotypic Leucocalantha which seems no more closely related to this plant than does Tanaecium. Gomes's monotypic genus is justified and the new combination proposed above is unavoidable.

In addition to the two types cited above I have seen recent collections of this species from Amazonian Colombia (Amazonas: Leticia, Gentry 12705A (MO)) and Brazil (Amazonas: Km. 130-150, Manaus-Caracarai Road, Gentry 12986 (INPA, MO); Tapuruquara, Prance et al. 15830 (MO); Para: Campus of IPEAN, Belem, Gentry 13085 (MO)). Spathicalyx duckei turns out to be a widespread species occurring through most of lowland Amazonia.

SPATHICALYX XANTHOPHYLLA (DC.) A. Gentry, comb. nov.

Tabebuia xanthophylla DC., Prodr. 9: 214. 1845. Type: Brazil, Amazonas, Martius 2967 (M (7 sheets), G-DC).

Phryganocydia xanthophylla Mart. ex DC., Prodr. 9: 214. 1845. nom. nud., pro syn.

Arrabidaea xanthophylla (DC.) Bur. & K. Schum., in Mart., Fl. Bras. 8(2): 70. 1896.

Xylophragma xanthophylla ("Bur. & K. Schum.") Macbride, Field Mus. Nat. Hist., Bot. Ser. 13(95): 65. 1961.

Generic affinity of this remarkable plant, which differs from all other species of Bignoniaceae in its bright yellow upper leaves, has never been satisfactorily established. Originally placed in Tabebuia, a then heterogeneous hodgepodge defined by a bilabiate calyx, it is now known to be a member of the predominantly lianous Bignonieae. Following Bureau & K. Schumann (1896-97), it is generally placed in Arrabidaea from which it differs in such important features as trifid tendrils, yellow flowers, 4-many-seriate ovules, palmately 5-7-veined leaflets and the presence of peculiar orangish glands on the leaves and outside of the corolla tube. Other somewhat unusual features for Arrabidaea include a membranaceous bilabiate calyx, subulate (though small) pseudostipules, dendroid vegetative trichomes, complete absence of 3-foliolate leaves, and a dendroid-pubescent fruit lacking a visible midline. Macbride's placement in Xylophragma is no improvement as that genus shares such characteristics of Arrabidaea as simple tendrils, purple flowers, a cupular, 5-denticulate calyx and blunt pseudostipules; the fruit of

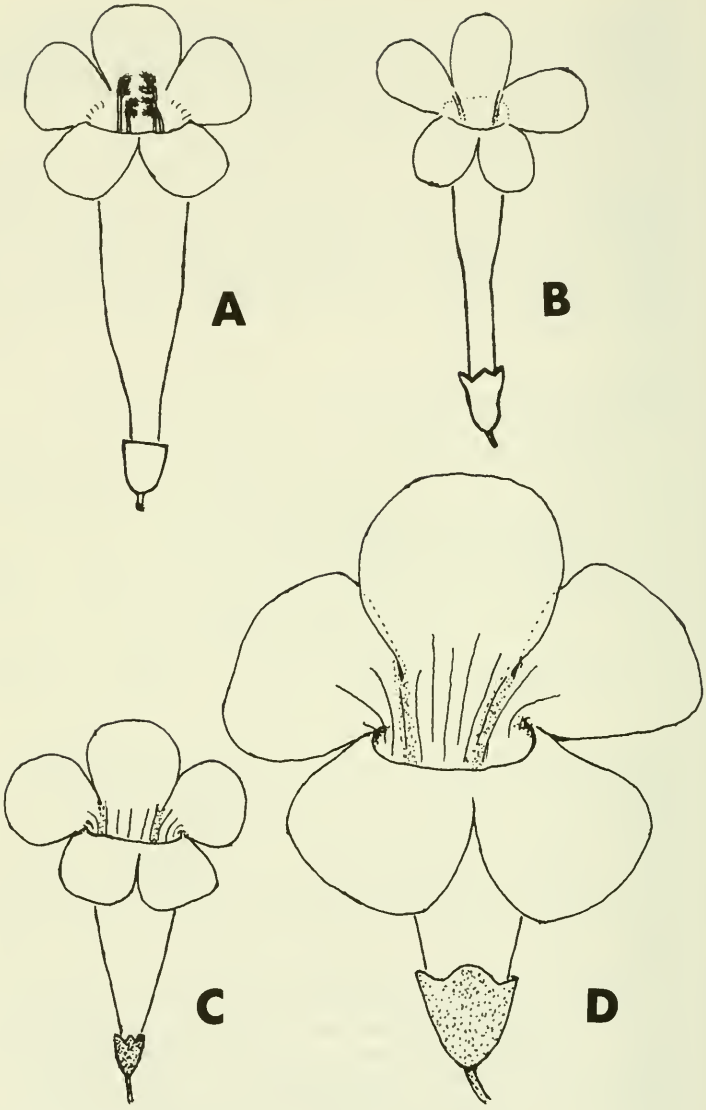
A
B
C
D

Fig. 2. (opposite). Pachyptera and Tabebuia. A. Flower of P. erythraea (Dugand) A. Gentry--bright red with truncate cupular calyx, broad corolla tube, exserted anthers; B. Flower of P. kerere (Aubl.) Sandw.--white with campanulate shallowly lobed calyx, narrow corolla tube, included anthers. C-D. Tabebuia chrysantha (Jacq.) Nichols. C. Flower of T. chrysantha ssp. chrysantha from coastal dry forest in Ecuador (Gentry et al. 12193); D. Flower of T. chrysantha ssp. pluvicola A. Gentry from Ecuadorian wet forest (Gentry 9505 (MO, type)) (All x 2/3).

Xylophragma is woody and oblong, quite unlike the thin linear fruit of this species. Vegetatively this species is very like Spathicalyx duckei (cf. above) which has similar trifid tendrils, subulate pseudostipules, cordate, more or less palmately-veined never 3-foliolate leaflets, and especially the frequent presence of glands similar to those of "A." xanthophylla except for being stalked. The calyx of both species is membranaceous but that of Spathicalyx is subspathaceously rather than bilabiately split. Both species have very finely reticulate 3-colporate pollen (Tomb and Gentry, in prep.), and 4 phloem arms in stem cross section. Certainly Spathicalyx duckei seems to be the closest relative of "A." xanthophylla. On the other hand the presumably hawk-moth pollinated, elongate tubular flower of S. duckei is white and much longer than that of "A." xanthophylla. Whether this difference justifies segregation of "A." xanthophylla as a monotypic genus is unclear, especially since the fruit of S. duckei is not yet known. In view of the generally too-narrow generic limits and plethora of monotypic genera which traditionally have plagued Bignoniaceae taxonomy (Gentry, 1972), I opt for placement of A. xanthophylla in Spathicalyx with its closest relative despite the major floral differences between the two species. Several other genera (e.g. Arrabidaea, Tabebuia) include both hawk-moth pollinated and bee-pollinated species and the floral differences within such genera are greater than those between S. xanthophylla and S. duckei. It now seems probably that the floral similarities between most species of Bignoniaceae adapted for hawk-moth pollination reflect evolutionary convergence rather than common ancestry. Conversely, the corolla differences associated with different modes of polination, such as those between S. duckei and S. xanthophylla, may be of less taxonomic significance than generally supposed.

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STUDIES IN THE LIABEAE (ASTERACEAE). IX

ADDITIONS TO MUNNOZIA AND OLIGACTIS.

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Studies in the Liabeae have revealed one new species and one new combination to be added in the genus Munnozia and one new species in Oligactis.

Munnozia chimboracensis H.Robinson, sp. nov.

Plantae grosse herbaceae usque ad 2 m altae superne ramosae. Caules teretes laeves subtiliter purpurascentes sparse grosse pilosi. Folia opposita, petiolis 1-6 cm longis anguste alatis base anguste connatis non auriculatis; laminae late deltoideae 6-13 cm longae et 4-13 cm latae base cordato-hastatae margine 8-15-crenato-dentatae apice argute acutae vel breviter acuminatae supra pilosae subtus albo-tomentosae in nervis et nervulis sordido-tomentosae fere ad basem trinervatae. Inflorescentiae late pyramidaliter paniculatae, pedicellis plerumque 1.0-3.5 cm longis dense breviter pilosis. Capitula 8-11 mm alta et 10-14 mm lata. Squamae involucri 32-40 oblongae vel lineares inaequales ca. 4-seriatae 2-8 mm longae et 0.7-1.5 mm latae pallide virides 3-striatae in apice acutae vel minute mucronatae interdum purpurascentes extus sparse breviter pilosae margine anguste scariosae superne vix fimbriatae; receptacula minute fimbrillifera, fimbriis ca. 0.5 mm longis. Flores radii ca. 20; corollae flavae, tubis ca. 4 mm longis puberulis, limbis ca. 5 mm longis inferne pilosis superne glanduliferis. Flores disci ca. 20; corollae flavae, tubis 3.0-3.5 mm longis puberulis, faucis ca. 1.5 mm longis inferne sparse puberulis, lobis ca. 2 mm longis glandulo-punctatis; filamenta in parte superiore 0.25 mm longa, cellulis exothecialibus solum in parietibus transversalibus noduliferis; appendices oblongo-ovatae ca. 0.35 mm longae et 0.25 mm latae. Achaenia 1.5-2.5 mm longa 8-10-costata hispidula; setae pappi ca. 30-35 plerumque 4.5-5.5 mm longae apice non incrassatae setae breviores paucae. Grana pollinis ca. 35μ diam.

TYPE: ECUADOR: Chimborazo: Cañon of the río Chanchan, about 5 km north of Huigra; 5000-6500 ft. elev. (Moist forested valleys in the afternoon fog-belt.). Plant single-stemmed, 2 meters, branched above. Lvs dark green above; white pubesc. below.

Bracts pale green, tipped with nigrescent purple. Ray and disc fls yellow. Anthers nigrescent. Styles yellow. May 19-28, 1945. W.H.Camp E-3293 (Holotype K). PARATYPES: ECUADOR?: Bolivar? S.José. Andre K1240 (K); Region Pasto?. Andre K1244 (K).

Munnozia chimboracensis seems to be most closely related to M. hastifolia with which there is a superficial resemblance. The new species is thoroughly distinct, however, in the narrowly winged petioles, the somewhat longer pedicels of the inflorescence, the crowded short stout hairs of the pedicels, the more evenly graduated bracts of the involucre, the three rather than 6 or 8 veins of the involucral bracts and the blackened anthers. Munnozia hastifolia and two closely related species are unusual in the genus Munnozia by their anthers that do not turn black.

Munnozia maronii (Andre) H.Robinson, comb. nov.
Andromachia maronii Andre, Revue Horticole 1887 (21): 496. 1887. (maroni). The type of the species was part of a loan received through the kindness of C. Jeffrey at Kew. The species was described on the basis of material grown from seed that was obtained from Brasil. No members of the Liabeae are presently known from Brasil, however, and the type is identifiable with the species known as Liabum corymbosum Sch.Bip. ex Klatt of Bolivia. Since the combination Munnozia corymbosa is preoccupied a new name, M. klattii H.Robinson & R.D.Brettell has been provided for the species, but the Andre name has priority.

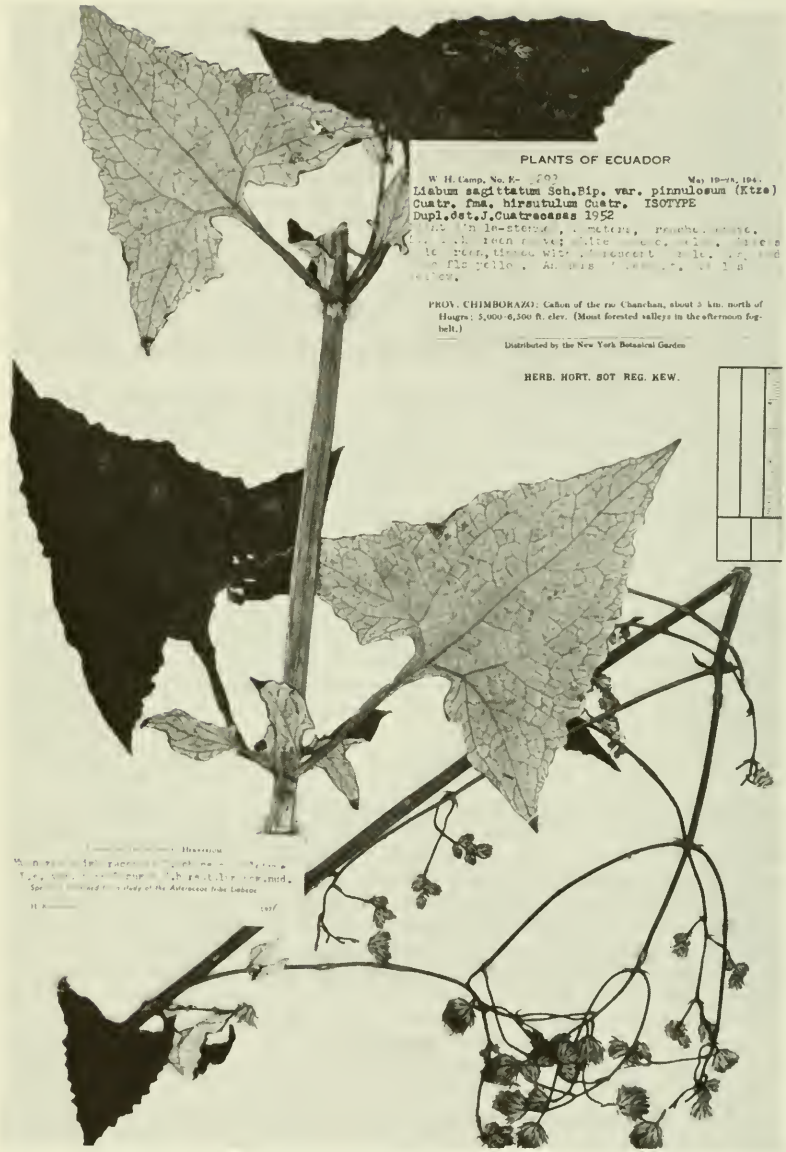
Oligactis asplundii H.Robinson, sp. nov.
Plantae suffrutescentes subscandentes 2 m vel ultra longae pauce ramosae. Caules subtiliter hexagonales evanescentiter appresse albo-arachnoideo-tomentosi, nodis plerumque disciferis, discis utrinque ca. 5 mm longis e petiolis discretis. Folia opposita, petiolis 2.5-4.5 cm longis non alatis; laminae lanceolatae 8-16 cm longae et 2-6 cm latae base rotundatae margine remote minute serrulatae apice anguste acuminatae supra laeves glabrescentes subtus albo-tomentosae, nervis secundariis pinnatis sensim valde ascendentibus. Inflorescentiae in ramis terminales late corymboso-paniculatae, pedicellis 1.2-4.0 cm longis appresse albo-arachnoideo-tomentosae. Capitula 8-9 mm alta et 10-11 mm lata. Squamae involucri ca. 50-55 ca. 4-5-seriatae anguste ovatae vel anguste lanceolatae 1-5 mm longae ca. 1 mm latae plerumque virides apice interdum purpurascentes anguste acutae extus albo-puberul-

ae; cristae receptaculorum breviter laciniatae. Flores radii 16-18; corollae flavae, tubis 2-3 mm longis glabris, limbis 7-10 mm longis et ca. 1.5 mm latis inferne sparse puberulis subapice sparse minute spiculiferis. Flores disci 21-25; corollae flavae, tubis 2.0-2.5 mm longis glabris, faucis 1.5 mm longis inferne sparse puberulis leniter inflatis, lobis 2.0-2.5 mm longis et 0.8 mm latis apice minute sed distincte cristiferis vel incrassatis subapice interdum pauce spiculiferis; thecae antherarum ca. 2 mm longae; appendices antherarum oblongae 0.5 mm longae et 0.2 mm latae laeves. Achaenia ca. 1.5 mm longa ca. 5-costata breviter setifera et superne glandulifera; setae pappi biseriatae exteriores 7-10 plerumque 1-2 mm longae interiores 25-30 ca. 4.5 mm longae apice leniter latiores. Grana pollinis 30-35μ diam.

TYPE: ECUADOR: Pichincha: Los Dos Rios on road between Chiriboga and Santo Domingo de los Colorados (km 90), roadside, alt. c. 1200 m. Suffrutescent, flowers golden yellow. 2 VII 1955. Asplund 16752 (Holotype S). Paratype: ECUADOR: Pichincha: Valley of Rio Saloya, Las Palmeras. alt. 1900 m. Subscandent shrub, flowers dark yellow. 28 VI 1939. Asplund 7372 (S).

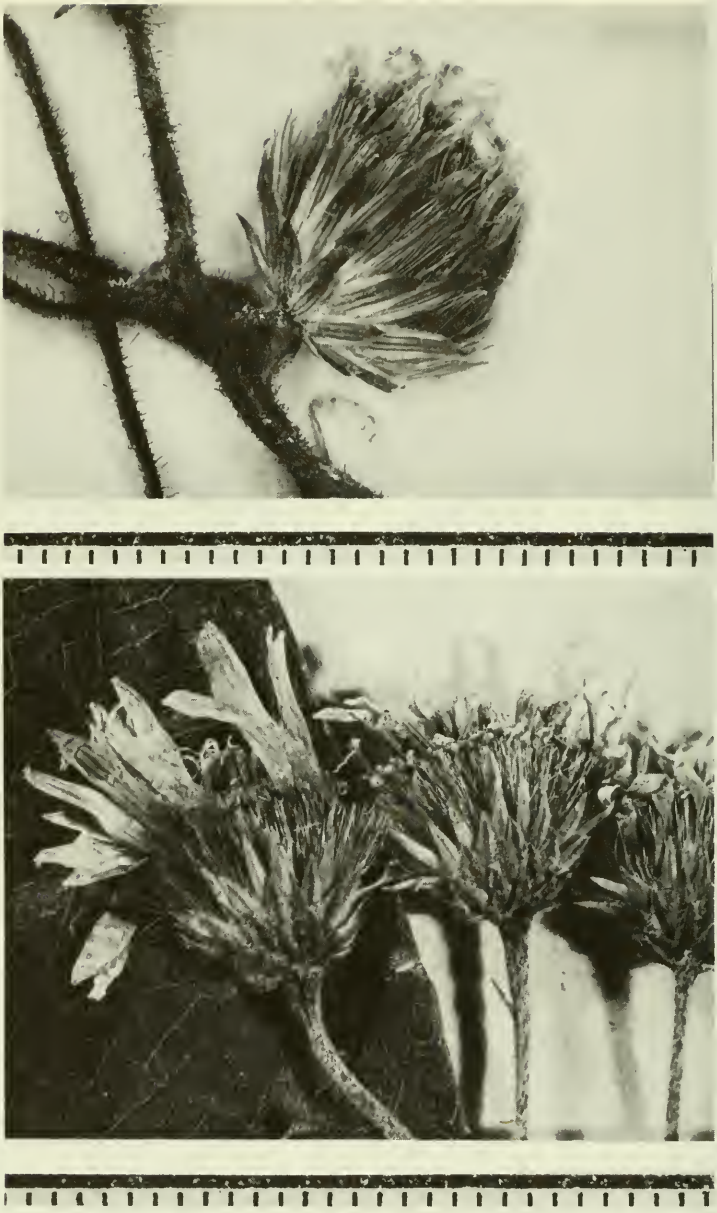
The new species seems most closely related to Oligactis pichinchensis (Hieron.) H.Robinson & Brettell which has the same size heads with 14-18 ray flowers. The new species differs by the lanceolate leaf blades and by the pedicels with appressed arachnoid tomentum. Oligactis asplundii is also notable for the occurrance at lower elevations. Related species are all restricted to elevations above 2500 m.

Oligactis coriacea var. granatensis (Cuatrecasas) H.Robinson, comb. nov. Liabum granatense Cuatr., Fedde, Rep. Sp. Nov. 55: 128. 1953. The variety seems to differ only by the fine arachnoid appressed tomentum rather than coarse floccose tomentum on the pedicels. The distinction is not as clear as the words would suggest and the difference cannot be fully appreciated without comparison of specimens.



Munnozia chimboracensis H.Robinson, Holotype, Kew. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Erik Asplund



Enlargements of heads. Top: Munnozia chimboracensis. Bottom: Oligactis asplundii.

PLANT NOTES FROM THE SIERRA JUAREZ OF BAJA CALIFORNIA, MEXICO

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The Sierra Juárez is a range extending from the United States boundary about 160 km (100 miles) south-southeast in Baja California, to San Matias Pass. It is fairly uniform in height, with several scattered summits at between 1900 and 2000 meters; it has a nearly straight eastern escarpment, dropping away to the desert just above sea level; and it slopes more gently to the west, where there is no obvious lower limit.

In the northern two-thirds of the range, higher parts are largely granitic and largely forested with Pinus jeffreyi Grev. & Balf. and Quercus peninsularis Trel., with P. quadrifolia Parl., P. monophylla Torr. & Frem., and Juniperus californicus Carr. in slightly lower and drier areas, and with chaparral below on the west slope. This northern part has ranches and mines and hence roads and so has been fairly accessible. It was visited in 1875 by Edward Palmer and George W. Dunn, in 1882 by C. G. Pringle, in 1888 by J. G. and Sara Lemmon, and more recently by various botanists. However, it was explored especially by Charles Russell Orcutt, who made at least nine trips at various seasons between 1882 and 1890 and perhaps some later. His personal herbarium, still unmounted, is with the Dudley Herbarium, now at the California Academy of Sciences; and his duplicates, to judge from cited specimens, were widely distributed and are especially well represented at the Gray Herbarium, the Missouri Botanical Garden, and the U. S. National Herbarium. He evidently was a sharp-eyed collector, for several species still are known from Baja California from his collections and few or no others.

The southern third of the Sierra, largely capped with volcanics, is comparatively dry, the upper slopes with piñons, junipers, and chaparral, but with no large trees southward much beyond Santa Catarina. There are few ranches except well west of the crest and few roads. Of the early botanists, apparently only Orcutt got as far south as Santa Catarina (Santa Catalina). In June 1905 E. W. Nelson and E. A. Goldman collected from Ensenada to Ojos Negros, Alamo, and Valle Trinidad, and on south; but no botanist got high in the southern part of the mountains.

At various seasons from 1960 to 1962, Richard E. Broder collected over 500 numbers about Santa Catarina at elevations between 1000 and 1600 meters. He compiled an annotated list of 301 species of vascular plants, with notes on the topography, climate, and vegetation (Broder, 1963); but this was not published. His collections include several species for which I find no published records from Baja California. I have since

visited the area and re-collected some of these; and I have examined those of Broder's specimens cited below (UCSB).

Portezuelo de Jamau is a 1300-meter pass about 21 km (13 miles) east-southeast of Santa Catarina, crossed by a road built during World War II but now little used (Gerhard and Gulick, 1970). This pass is the best place from which to reach some of the higher peaks in the southern part of the Sierra. I went there in May 1963, October 1966, May 1967, October 1971, May 1973, April 1974, and May 1976, on the last four trips climbing well up to the south and southeast, twice to Cerro Jamau, shown on one map at 1905 meters.

There is no published flora for the Sierra Juárez or for any other part of northwest Baja California. Standley (1920-1926) covered the woody plants then known from Baja California. Shreve and (especially) Wiggins (1964) treated the desert plants of the peninsula, and Hastings, Turner, and Warren (1972) mapped in detail the ranges of 238 of the desert plants; but much of the Sierra Juárez is above the limits of the Sonoran Desert as defined by these authors. Otherwise, records for the Sierra Juárez are widely scattered, in travel accounts, monographs, and descriptions of new species. The Californian floras often include Baja California in statements of extralimital range but of course rarely give information more specific than "northern Lower California".

This paper reports collections made mainly about Portezuelo de Jamau but also elsewhere in the Sierra, including several by Broder and others. Plants listed are mostly those whose occurrence in the Sierra is little known or previously unknown. Twenty of these seem not to have been reported from Baja California and seven not from Mexico, though some were known so close to the boundary that the extension is scarcely surprising. One of them, when published recently, was a new record for the universe, though this again is scarcely surprising. A few records are included as the southernmost, northernmost, or highest known to me.

Of the 40 plants listed, Broder included 8 in his unpublished report (1963), some under different names; and Hastings et al. (1972) have already mapped three, for which the specimens are first cited here. Otherwise, I have found no records except as noted. Also, I have looked for most of these species in the herbaria at the California Academy of Sciences, the Rancho Santa Ana Botanic Garden, Stanford University, and the University of California at Berkeley. However, it is quite probable that other herbaria include some collections of some species listed.

Southward in Baja California one finds more and more plants that occur also in Arizona but not in Alta California. This pattern may be seen in the maps for various desert plants (Hastings et al., 1972): it may result in part from greater summer rainfall southward, as in Arizona deserts, compared to

practically none in the deserts of Alta California. Eight of these plants are included here; four of them are not known farther south and so are known in Baja California only in the Sierra Juárez.

In the following list, collections are arranged generally from north to south and from west to east. "M" preceding field numbers is for mine; the first set of my specimens is at San Diego (SD). The first set of Broder's specimens is at the University of California at Santa Barbara (UCSB). A few other specimens in these two herbaria are cited with these abbreviations.

Noteworthy Collections

PINUS COULTERI D. Don. Common with P. jeffreyi at 1700 m, La Sierrita, NW of Laguna Hanson, M23707; in chaparral near south edge of Mesa Huicual, 1650 m, M23583; one seedling and one cone in arroyo, south rim of Cañada el Rincón, 1450 m, M23630 (trees seen higher and farther west along south rim presumably the same species).

Critchfield and Little (1966: map 55) showed three areas for P. coulteri in Baja California: (1) a dot for the large stand on Cerro Blanco or Guadalupe Mountain, (2) three marks for isolated occurrences in the northern Sierra San Pedro Mártir, and (3) a solid area ca. 30 km long in the vicinity of Laguna Hanson in the Sierra Juárez. Dr. Critchfield writes that he knows no basis for this third record beyond Nelson and Goldman. Goldman (1916) mentioned P. coulteri as occurring with P. jeffreyi on the top of the Sierra del Pinal; Nelson (1921) substituted the name "Sierra Juárez", saying that the northern half of this range was known locally as Sierra del Pinal. Since their camp was at Laguna Hanson, quite possibly they saw P. coulteri near where I did. I have not seen it elsewhere in the northern part of the Sierra, and local foresters seem to know of no other stands. I therefore doubt that the large area on Critchfield and Little's map is justified.

My other two localities are on the north and south rims of Cañada el Rincón, 8-10 km ENE of Santa Catarina, and thus well south of the area shown by Critchfield and Little. At Mesa Huicual the cones are small for the species, many being less than 20 cm and some less than 15 cm long. Here P. jeffreyi occurs only in the bottom of the Cañada, straggling down to the vicinity of El Rincón, at about 1200 meters.

CUPRESSUS ARIZONICA var. STEPHENSONII (C.B. Wolf) Little. Mesa Huicual, 1650 m, M23585; dry wash 3.6 miles NE of Santa Catarina, 4000 feet, Broder 352A; Mesa Laguna Seca, 1450 m, M23624; scattered along arroyo from 2 km below to 5 km above El Rincón, 1175-1300 m, M21153, 21155, 21249, 21251, 23580; arroyo 2 miles east of Santa Catarina, R.& I.Marin M72-3a (SD) Previously

reported only from the type area, on the west slope of Cuyamaca Peak, San Diego County, California, at ca. 1000-1750 m. A vaquero from Santa Catarina told me the cypress occurs also in the next cañada south of El Rincón.

Broder (1963) reported two young trees 30 feet tall below El Rincón, at 3800 feet, and two mature trees 40 feet tall and 4 feet in trunk diameter in a canyon above El Rincón, at 4800 feet. On Mesa Huicual, where the cypress grows in chaparral and so is subject to occasional fires, I noted only small trees. In flat silty valleys with Artemisia tridentata, both in the north fork of Cañada el Rincón and on Mesa Laguna Seca, it becomes a larger tree: I noted several about 10 m tall, with trunks ca. 1 m thick at the base, though tapering rapidly with the departure of the thick and rather close-set lower branches. The largest tree I saw is in the arroyo 3 km above El Rincón: it is about 10 m tall and 15 m wide, with a trunk 5.4 m in girth (M21251).

Trees in the type area are described as to 16 m tall and 10 m wide but with a trunk diameter only up to 7 dm. However, in 1958 I measured a burned stump there about 1 by 2 m thick. The trees in the forest at Cuyamaca are doubtless more subject to fire damage than are those of the flat valleys and those scattered along the arroyo in rather open scrubby vegetation, near El Rincón.

MIRABILIS PUMILUS (Standl.) Standl. Occasional on metamorphics ca. 4 and 6 km E of Rancho San Pedro, ca. 1600 m, M13459, 18526. No report seen for Mexico; otherwise, southern California to Utah and New Mexico.

STEGNOSPERMA HALIMIFOLIUM Benth. Arroyo Grande, 535 m, M21488. No report seen for the Sierra Juárez; otherwise Sonora and NE Baja California to southern Baja California.

LEWISIA BRACHYCALYX Engelm. Ca. 10 miles N of Laguna Hanson, E.B.Higgins in 1951 (SD); Laguna Hanson, E.Sprague in 1938 (SD). No report seen for Mexico; otherwise, southern California to Utah and New Mexico.

PORTULACA SUFFRUTESCENS Engelm. Locally common ca. 2 km W of Portezuelo de Jamau, 1275 m, M18636. No record seen for northern Baja California; otherwise, Arizona to Arkansas, Sonora, and the Cape region of Baja California.

Flowers and capsules in this collection are small: sepals 2.5-3 mm long at anthesis and petals 5 mm long; capsules 2-3 mm wide. They are rarely as small in individual specimens from elsewhere; but there is reason to wonder if they are uniformly so in other known populations.

ANEMONE TUBEROSA Rydb. Rocky canyon walls above 4500 feet, Broder 743; scarce on open north slope 5 km NE of El Rincón, 1250 m, M21255; fairly common locally on rocky slope, Cerro el Saiz, 1750 m, M20962. No report seen for Mexico; otherwise, southern California to Utah and Texas. However, the species is represented (SD) also from eight other localities in Baja California, scattered south to Volcán las Tres Vírgenes, at elevations of 875 to 1675 m.

MYOSURUS CUPULATUS S.Wats. West-facing rocky canyon wall 2-3 miles upstream from El Rincón, 4300 feet, Broder 745; north slope 5 km NE of El Rincón, 1375 m, M21262. No report seen for Baja California; otherwise, SE California to New Mexico and northern Sonora.

CORYDALIS AUREA Willd. Scarce and local on gravelly N slope just below summit of Cerro Jamau, 1890 m, M23253. No report seen for Baja California; otherwise, Alaska to Quebec, NE California, Texas, and northern Mexico.

PHILADELPHUS MICROPHYLLUS ssp. STRAMINEUS (Rydb.) C.L. Hitchc. E and N slopes of Cerro Jamau, 1875 m, M21229, 23255. Known at ca. 2000 to 2800 m in the Sierra San Pedro Mártir, but no report seen for the Sierra Juárez.

HOLODISCUS DUMOSUS (Nutt.) Heller, sens. lat. Few seen, on north-facing volcanic cliff, N. slope of Cerro la Parra, 1740 m, M23659; not seen elsewhere.

Authors differ widely as to the species of Holodiscus. Ley (1943) recognized five for western North America to northern Mexico and three others farther south. She separated H. microphyllus Rydb. as a montane shrub having obovate to spatulate leaves rarely 2 cm long and mostly toothed only above the middle, with a variety sericeus Ley having the leaves villous above and densely white silky beneath. To this variety she referred two collections from the high Sierra San Pedro Mártir, the only ones she cited from Baja California. Recent collections show that in the San Pedro Mártir, where the plant grows mostly above 2400 m, leafblades may be elliptic to ovate and toothed to below the middle, they may be 4 cm long, and they vary in degree of silkiness beneath. On the assumption that all collections belong in one entity, H. microphyllus does not seem separable in Baja California; and I return to a more conservative treatment, as others have done elsewhere (e.g. Hitchcock and Cronquist, 1961).

The lone collection from the Sierra Juárez is from a much lower elevation. Leafblades are mostly elliptic and toothed to below the middle, they may be 3 cm long, and they are villous but not densely silky beneath.

ACACIA CONSTRICTA Benth. 3 miles SE of Vinato Romero, 3500 feet, Broder 356, 357; locally common 3 km NE of El Alamito, 1150 m, M18638 (Hastings et al., 1972: 5); upper SE drainage of Arroyo Grande, 1100 m, M21475. No previous report seen for northern Baja California; otherwise, Arizona to South Carolina and South America.

ACACIA sp. aff. A. NEOVERNICOSA Isely. With A. constricta Benth. on gravelly flat in upper SE drainage of Arroyo Grande, 1100 m, M21473. This plant is similar in most respects to A. neovernicosa but is hirtellous and has pods about twice as wide and covered with stout subsessile to short-stipitate glands. Dr. Velva Rudd has this group under study.

ASTRAGALUS MORANII Barneby. Rather scarce, granitic soil in opening in chaparral, steep N slope of Cerro la Parra, 1600 m, M23655; fairly common in semi-shade, edge of flat silty valley with Pinus jeffreyi and Artemisia tridentata, north fork of Cañada el Rincón, 1440 m, M23598; scarce on open volcanic N slope of Cerro Saiz, 1600 m, M23252; few in barren gravelly arroyo bed 2 1/2 km NW of Cerro Jamau, 1450 m, M23275; near summit of Cerro Jamau, 1900 m, M21231 (type), 23268; common in open areas, chaparral with scattered Juniperus californica and Pinus quadrifolia, Cerro Taraizo, 1650 m, M22987.

In the original publication, Barneby (1976) cited only the type collection. More recent collections show a range of some 50 km in the southernmost part of the Sierra Juárez.

MIMOSA BIUNCIFERA Benth. SE slope of Cerro Prieto, 1650 m, M18114; in open chaparral at N base of Cerro la Parra, 1500 m, M23674; along dry arroyo, Cañada el Rincón, 1300 m, M23582; Portezuelo de Jamau, 1300 m, and 2 km W, M13676, 18631; El Alamito, 1175 m, M18646 (Hastings et al., 1972: 142). No previous record seen for Baja California; otherwise, Arizona to Texas and northern Mexico.

PSORALEA CALIFORNICA S.Wats. 5 km SSW of La Rumerosa, 1285 m, M21295; SE of El Progreso, 1450 m, M21280; Pino Solo, 1150 m, M20976; NW of El Rodeo, 1100 m, M21220; 2 km E of El Alamo, 1090 m, M17741; 3 km SW of La Poza, 1075 m, M17740; 2 km NE of Rancho el Florido, 1240 m, M17723. Reported by Vail (1894) from Japá, 20 km S of the U.S. boundary. Also in the foothills of the Sierra San Pedro Mártir: Llano el Conejo, 1275 m, M23067; SW of San Isidoro, 1190 m, M22346.

EUPHORBIA HYSSOPIFOLIA L. Scarce, in arroyo SW of El Alamito, 1075 m, M18594. No report seen for Baja California; otherwise, Arizona to South Carolina and South America.

EUPHORBIA REVOLUTA Engelm. Portezuelo de Jamau, 1300 m, M13666; peak 3 km SE of Portezuelo de Jamau, 1750 m, M18603. No report seen for Baja California; otherwise, SE California to Colorado, New Mexico, and Chihuahua.

EUPHORBIA TOMENTULOSA Benth. East side of range 9 km S of Guadalupe Canyon, 400 m, M19242. Farther N than shown by Hastings et al. (1972: 106).

ABUTILON PARVULUM A. Gray. 8 km SE of Las Filipenas, 1620 m, M9839; Portezuelo de Jamau, 1300 m, M13641; Rancho Alamito, 1175 m, M13695, 23249. No report seen for Baja California; otherwise, SE California to Colorado and Sonora. Three specimens of this and one of the following species were checked by Paul A. Fryxell.

ABUTILON PRINGLEI Hochr. East side of range 9 km S of Guadalupe Canyon, 400 m, M19233; foot of grade E of Portezuelo de Jamau, 1000 m, M18626. No report seen for northern Baja California; otherwise, Arizona to southern Baja California and Oaxaca. Also Arroyo el Cajón, Sierra San Pedro Mártir, 800 m, M21563.

FREMONTODENDRON CALIFORNICUM (Torr.) Cov. ssp. CALIFORNICUM. Several on lower slope of pluton SE of El Progreso, 1450 m, M21279. Known at ca. 1100 to 1600 m in the Sierra San Pedro Mártir, but no report seen for the Sierra Juárez.

LOPHOCEREUS SCHOTTII (Engelm.) Britt. & Rose. Cañón de los Torrentos, 34 km S of U.S. boundary, 300 m, R.Vinton in 1972 (SD); B.& B.Mackintosh, A.Kuebler in 1973 (SD). Northernmost known station (Hastings et al., 1972: 135). Henderson (1947) illustrated this plant and mentioned the occurrence of "senita (old man) cactus" in this canyon; and friends collected it for me.

CYMOPTERUS MULTINERVATUS (Coult. & Rose) Tidestrom. 38 miles E of Tecate, 4450 feet, B.Haines 160 (UCSB); El Topo, 1500 m, P.E.Popejoy in 1952 (det. by M.Mathias & L.Constance; SD); Jeffrey pine forest 5 km SE of San Pedro, 1700 m, M22054; NE of Santa Catarina, 3700 feet, Broder 614; 3 miles W of Santa Catarina, 3755 feet, Broder 644. Also, rocky E slope of Cerro Matomí, 1400 m, M20816. No report seen for Baja California; otherwise, SE California to Idaho, Arizona, and northern Sonora.

LOMATIUM MOHAVENSE ssp. LONGILOBUM Theobald. 5 km SSE of Portezuelo de Jamau, 1600 m, M20951, 21242 (det. L. Constance); W ridge of Cerro Jamau, 1850 m, M23271. Reported by Theobald (1966) only as far south as the vicinity of La Rumerosa. Although he described the fruit as pubescent to glabrate, here even the young ovary is glabrous.

SANICULA DESERTICOLA C.R.Bell. Rocky E slope 3.5 km NE of El Rincón, 1225 m, M21252; gentle open N slope 5 km NE of El Rincón, 1250 m, M21254; volcanic rocky S slope, La Vinata Romero, 3725 feet, Broder 808; gentle S slope 1 km W of Portezuelo de Jamau, 1250 m, M20929 (det. by L. Constance), 21222; Portezuelo de Jamau, 1300 m, M23283; 1 km W of El Alamito, 1120 m, M23250; 2 km S of Portezuelo de Jamau, 1450 m, M21244; 2.5 km NW of Cerro Jamau, 1325 m, M23279. No report seen for the Sierra Juárez; otherwise, north central Baja California, from near El Ciprés to Las Palomas.

The plant of the southern Sierra Juárez, well isolated from typical S. deserticola, may be considered a weakly distinguished northern subspecies, differing in flower color and leaf texture. So far as seen, the flowers are yellow in the northern plant, purplish red in the southern—though Shan and Constance (1950) found flower color inconstant in the closely related S. bipinnatifida Dougl. The difference in leaf texture is evident in all my herbarium specimens: the leaves of the typical form press out beautifully flat, whereas the slightly thicker ones of the northern form always look a little crumpled. The two show about the same range of variation in leaf form, though with perhaps a slight tendency for broader petiole and rachis in the northern plant.

Typical S. deserticola is chiefly a plant of the central desert, at ca. 100 to 700 m (Raven and Mathias, 1960); but the northernmost collection (E of El Ciprés, 600 m, M19436) is from chaparral. The Sierra Juárez plant occurs at the lower levels of Pinus quadrifolia Parl., at ca. 1100 to 1450 m. The areas of the two, as now known, are about 135 km apart.

GARRYA GRISEA Wiggins. S of El Progreso, 1550 m, M21274; Arroyo Calabozo, 1600 m, M13488½; S base of Cerro Prieto, 1600 m, M18122; Cerro el Saiz, 1775 m, M20957. Previously reported only from the Sierra San Pedro Mártir but occurring also southward: Cerro Chato, M11107; Cerro Matomí, M20772, 20781; Cerro la Sandía, M11531; Cerro Azufre, M11639 &c.; Volcán las Tres Vírgenes, M11665 &c.

EVOLVULUS SERICEUS Benth. (var. discolor [Benth.] A.Gray). Open rocky ground at S base of Cerro Prieto, 1600 m, M18119; edge of Jeffrey pine forest 6.5 km N of Rancho Viejo, 1550 m, M18904. No clear record seen for Baja California; otherwise, Arizona to Florida and Argentina.

Shreve and Wiggins (1964: 1140) noted that van Oostroom cited a collection by Orcutt from "California, Colorado Desert, San Diego County, Santa Catarina Mission, Sept. 1889". However, there is no such place in San Diego County, and the plant is otherwise unknown from Alta California. Since Orcutt (1889) mentioned spending most of September in Baja California, and

since the last cited collection shows the plant to occur in the Sierra Juárez within 20 km of ex-Misión Santa Catarina, Orcutt's collection would seem to be from (near) this Santa Catarina.

ALLOPHYLLUM GILIOIDES (Benth.) A. & V. Grant. Along dry stream bed with occasional seep areas, 1.5-2.5 miles upstream from El Rincón, 4100 feet, Broder 725 (det. by Alva Day); a few depauperate plants on steep N slope at foot of volcanic cliffs 5 km NE of El Rincón, 1375 m, M21260; one in sandy arroyo bed, Mesa Laguna Seca, 1450 m, M23629. No report seen for peninsular Baja California; otherwise, southern and central California, Guadalupe Island, and Arizona.

TURRICULA PARRYI (A.Gray) Macbr. A few seedlings in dry sandy soil of burn (no old plants seen), flat silty valley with Artemisia tridentata, Mesa Laguna Seca, 1450 m, M23626. No report seen for the Sierra Juárez; otherwise, southern California and Sierra San Pedro Mártir (Brandegee, 1893). This is the first I have seen of this plant in Baja California.

CRYPTANTHA DECIPIENS (M.E.Jones) Heller. Alluvium at Agua Colorada, 1 mile NE of Santa Catarina, Broder 696 (det. by E.R.Chandler). No report seen for Mexico; otherwise, San Diego County, California, to Nevada and Arizona.

CRYPTANTHA HOLOPTERA (A.Gray) Macbr. Arroyo bed, Toruno Canyon, 400 m, M14847 (det. by Francia Hommersand). No report seen for Mexico; otherwise, SE California and W Arizona.

CUCURBITA DIGITATA A. Gray. Near La Huerta, 950-1000 m, M13538, 16634; 3 km S of La Cienega, 1200 m, M18081; Rancho Viejo, 1025 m, M18656; El Alamito, 1175 m, M13688. Also, Broder (1963) cited a specimen from near Santa Catarina. No other report seen for Baja California; otherwise, southern California to New Mexico and Sonora.

BIDENS LEPTOCEPHALA Sherff. Large colony under junipers ca. 2 km W of Portezuelo de Jamau, 1275 m, M18637; not seen elsewhere. No report seen for northern Baja California; otherwise, Arizona and New Mexico to Chihuahua and southern Baja California.

BRICKELLIA OBLONGIFOLIA Nutt. sens. lat. Locally common on schist, Agua Flores, 1125 m, M18660. No report seen for Mexico; otherwise, British Columbia and Montana to SE California and New Mexico. This collection agrees well with var. linifolia (D.C. Eaton) A.Gray and var. oblongifolia, except that the achenes are glabrous. The var. linifolia occurs as far south as Riverside County, California, about 200 km N of Agua Flores.

DYSSODIA PENTACHAETA var. BELENIDIUM (DC.) Strother. Scarce, 1 km W of Portezuelo de Jamau, 1250 m, M21223. No report seen for the Sierra Juárez; otherwise, Nevada to Coahuila, SE California, and north-central Baja California; also Argentina.

HAPLOPAPPUS JUAREZENSIS Moran. This species still is known only from the southern half of the Sierra Juárez, but the known range is extended to Cerro Taraizo, southernmost peak of the Sierra (M22986), and upward to 1900 m at Cerro Jamau (M21230).

SANVITALIA ABERTII A.Gray. Portezuelo de Jamau, 1300 m, M13667; peak 3 km SE of Portezuelo de Jamau, 1600 m, M18615; El Alamito, 1175 m, M18643; seen about from 1150 to 1750 m. No report seen for Baja California; otherwise, SE California to Texas, Sonora, and Chihuahua.

VERBESINA PALMERI S. Wats. Arroyo Grande, 1200 feet, Jaeger in 1960 (SD), 610 m, M21486. No record seen for the Sierra Juárez; otherwise, the Sierra San Pedro Mártir (Chambers, 1955) to east central Baja California.

VIGUIERA ANNUA (M.E.Jones) S.F.Blake. Portezuelo de Jamau, 1300 m, M13645, 18634. No report seen for Baja California; otherwise, Arizona to Texas, Sonora, and Chihuahua.

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NOTES ON NEW AND NOTEWORTHY PLANTS. XCVI

Harold N. Moldenke

CLERODENDRUM SERRATUM var. OBOVATUM Moldenke, var. nov.

Haec varietas a forma typica speciei laminis foliorum adultis valde obovatis recedit.

This variety differs from the typical form and all other described forms and varieties of the species in having its adult leaf-blades very conspicuously and widely obovate, narrowing abruptly into a long-attenuate, cuneate, sessile base.

The type of the variety was collected by Gen Murata, Kunio Iwatsuki, and Chamlong Pengklai (no. T.15251) on a rocky mountain ridge of limestone near the summit of the higher elevation of Doi Chiang Dao, altitude 1900—2100 m., Chiang Mai, northern Thailand, on September 26, 1971, and is deposited in the Herbarium Jutlandicum at Aarhus University. The collectors describe the plant as a shrub, 1 m. tall, with lilac-colored flowers.

CLERODENDRUM SERRATUM var. PILOSUM Moldenke, var. nov.

Haec varietas a forma typica speciei laminis foliorum supra plusminusve brunneo-pilosis subtus densiore brunneo-pilosis pilis dispersis contortis recedit.

This variety differs from the typical form and all other described forms and varieties of the species in having its leaf-blades more or less pilose above and more densely so beneath (especially along the larger venation), the hairs brownish, contorted, and scattered on the lamina. The leaves are sessile or subsessile, long-attenuate at the base, elliptic-oblanceolate, to 30 cm. long and 9 cm. wide.

The type of this variety was collected by T. Shimizu, H. Koyama, and A. Nalampoon (no. T.10053) on an open limestone ridge in light forest below the summit of Doi Chiang Dao, 1900—2100 m. altitude, Chiang Mai, northern Thailand, on September 14, 1967, and is deposited in the Herbarium Jutlandicum at Aarhus University.

A KEY TO THE PRINCIPAL GLABRATE SPECIES OF TILIA

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ARTIFICIAL KEY TO THE PRINCIPAL GLABRATE SPECIES OF TILIA

I. Branchlets and petioles pubescent..... *caroliniana* var. *rhoophila*

II. Branchlets and petioles glabrous

A. Petioles 2.2-2.4 cm long.....*floridana*

B. Petioles longer than 3 cm.

a. Angle with midrib of lowest primary veins 27°-31°; leaf blades obliquely truncate at base *caroliniana* var. *caroliniana*

b. Angle with midrib of lowest primary veins more than 34°; leaf blades cordate.

1. Leaf blades usually 9-16 cm wide, often lustrous beneath; flowers 8-16 mm wide; end winter buds 6-7 mm long with 2 scales; fruit ripening Sep.-Oct.; bark furrowed; northern species..*americana*

2. Leaf blades usually 5-9 cm wide, dull beneath; flowers 6-7 mm wide; end winter buds averaging 3.7 mm long with 1 scale; fruit ripening in July; bark fissured; southern species..... *relicta*

- -

My article in PHYTOLOGIA 24:302-332. 1972. describing *Tilia relicta* sp.n. also contained in Table 1 a tabulated list of the characters of the four species shown in the above Key.

The above Key is presented as a tool for use in identifying specimens. If the specimen material reveals all the organs shown in the Key and if the mesurements of the flowers and winter buds were taken from fresh field material and not herbarium specimens, the use of the Key should result in correct identification in nearly every case. But to arrive at a precise identification, the specimen should be subjected to analysis under Table 1 of my previous article in the manner described on pages 314-315.

It may be noted that pubescence of leaf blades is not mentioned in the above Key. From the earliest times it was noted that the American Basswoods fell

into two classes: those having leaf blades densely hairy beneath, known as heterophylla; and those having leaf blades with scattered or no hairs beneath. The pubescence of the undersurface of these glabrate species is very variable on the same tree and has no significant diagnostic value. The use of this character by most botanists to distinguish the glabrate species shows an amazing misconception of the genus.

Study of the end winter buds of T. relicta has disclosed differences between it and T. americana.[1]

The length of the end winter buds of specimens of americana that I have collected is 6-7 mm. The average length of the end winter buds of 13 specimens of relicta is 3.7 mm. These figures, shown in Table 1 of my previous article, demonstrate a distinct difference between the species.

In relicta there is only one scale protecting the bud. This one red scale is broadly ovate or nearly round, 2-5.5 mm high.

The following authorities state that the buds of americana have two scales:

Wm. Trelease Winter Botany:228.
Wm. M. Harlow Twig Key:38.
Dean & Chadwick Ohio Trees:110. (3 scales)

Since relicta grows in a warmer climate than americana, there is not so much need of protecting the winter buds from cold.

There is a problem connected with the winter buds of species of Tilia. All the authorities state that the genus has no terminal bud; but they do not state that the buds are pseudoterminal. In Harlow & Harrar's Textbook of Dendrology:28 and Dean & Chadwick's Ohio Trees:13 it is stated that a pseudoterminal bud has a leaf scar directly below it and a terminal bud does not reveal it; and the end of the twig with a pseudoterminal bud dies and sloughs off after the beginning of the season and the lateral bud continues the growth of the twig.

In T. relicta the "terminal" winter buds are on one side of the leaf scar; and in the spring they unfold their leaves and growth progresses in the same way as a terminal winter bud. A permanent leaf scar

remains behind. No tissue (except the bud scale) dies or drops off.

Whether or not "A starveling tip of each branch is cut off cleanly by a self-healed scar" early in the season in other American species of Tilia, as stated on page 118 of William Trelease's Winter Botany, this feature is a minor character in Tilia.

As stated on pages 2, 3, 34 of my Manual of the Hawthorns of Cook and Du Page Counties of Illinois, the species of the Tenuifoliae series of Crataegus are distinguished by their twiggy appearance, resulting from the fact that the ends of the branchlets die during the winter and new growth starts the next spring at a point about 7 or 8 mm below the end of the previous season's branchlet and the dead stubs persist for many years. These are true pseudoterminal buds.

Because of the question of the terminology of the winter buds of Tilia, I have used the term "end winter buds" in the above Key. I shall be glad to receive advice from a plant morphologist for the proper term to apply to winter buds that produce growth from the tip of the twig but are placed on one side of the twig and leave a permanent leaf scar.

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[1]The number of winter buds "1-6" of T. relicta shown in the original description is erroneous. There is only one end winter bud.

BOOK REVIEW

Otto & Isa Degener

"HAWAIIAN FOREST PLANTS" by M.D. Merlin. 68 pp., Priental Publishing Co., P.O. Box 5115, Honolulu, Hi. 1976. $3.50.

One way to check the speed of extermination of Hawaii's endemic plants is to change the intellectual attitude of youngsters. Too many still tend to follow that of oldsters, raised under plantation and ranching conditions, who ignore as "weeds" plants lacking value as food for man or beast, as fiber or timber, and as medicine. Mark David Merlin's "Hawaiian Forest Plants," "dedicated to all Hawaii's children," is an excellent booklet of descriptions accompanying original, colored photographs. It draws attention to the intellectual value of the plants which younger hikers and even the more sedentary tourists can see about them. The species are "arranged according to their general distribution along a gradient of elevation and rainfall." First come plants common to the drier lowlands followed by those of lower mountain slopes, of moderately humid regions, and finally of the rainforest. Vernacular, generic and family names; descriptions; distributions and uses accompany the photographs. As few native species are found on more than one island, this concise booklet wisely avoids listing most of their specific names.

We recommend this booklet not only for the hiker of the many trails for whom it has been written, but to local grammar and high schools as a supplementary text for the teaching of Biology, and to the tourist as a guide. Its lasting value is conservational, helping stem the tide of extermination of Hawaii's botanical treasures. - Otto & Isa Degener

NOTEWORTHY GRASSES FROM MEXICO IV[1]

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For previous papers see Phytologia 27 (6):441-444, Jan. 1974; Phytologia 28(4):313-318, Aug. 1974; Phytologia 30(5):344-348, March 1975.

ARISTIDA FLORIDANA (Chapman) Vasey

This species was recognized as distinct from Aristida ternipes Cav. by Henrard, J. 1926. A critical revision of the genus Aristida. Mededeelingen Van's Rijks Herbarium No. 54, Vol. I. Subsequently, it was accepted for Florida (apparently the type locality) but was said to be known only from Key West. Plants which fit the description of this species from Florida are common in the states of Yucatan, Campeche and Quintana Roo in Mexico. These plants occupy the same habitat as A. ternipes but mature earlier and are easily recognized in the field as distinct. This is, apparently, the first recognition that A. floridana is a Mexican grass. Campeche: between Chencolly and Tenabo, Beetle M - 4202, Isla del Carmen, Beetle M - 4177; Quintana Roo: Cosumel Island, Beetle M - 4248; Yucatan: Merida, Beetle M - 795, Izamal, Beetle M - 806, Chichen-Itza, Beetle M - 888.

PANICUM DECOLORANS HBK

Panicum decolorans HBK (1815) and P. parcum Hitchcock and Chase (1910) are synonymous. The best case for separation has been made by Hitchcock in North American Flora 17(3):220-221. Here P. decolorans is described as branching from the base, ligule hardly 1 mm. long, blades 7 - 10 mm. wide, 8 - 14 cm. long, the spikelets 4.5 - 5.2 mm. long approximate on short pedicels. On the other hand P. parcum Hitchc. is sparingly branched from the middle or upper nodes, the ligule is 1 - 2 mm. long, the blades 2 - 6 mm. wide, 10 - 30 cm. long, the spikelets ca. 6 mm. long, rather long-pedicelled on flexuous branches. None of these characters have been found to show any consistency. Gould (1966. Canadian Jour. Bot. 44:1683) has reported the chromosome number for each as 2 n equals 36. Panicum parcum Hitchcock and Chase should be treated as a synonym of P. decolorans HBK. This grass has been reported from the Mexican states of Sinaloa, San Luis Potosi, Colima, Queretaro, Michoacan, Guerrero, Puebla, Oaxaca and Chiapas.

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[1]Published with approval of the director, Wyoming Agricultural Experiment Station as Journal Article No. 895.

Paspalum guayanerum sp. nov.

The subgenus Ceresia (Pers.) Reichenb (Consp. Veg. 49. 1828) is characterized by Chase (Contrib. U. S. National Herbarium 28:15. 1929) as "erect or clambering perennials; blades firm, narrow, racemes 1 to several; rachis membranaceous, mostly broadly winged **** to nearly wingless ****; spikelets clothed with long silky hairs or conspicuously fringed with long hairs; fruit pale. Plants of upland savannas."

A new species somewhat allied to this subgenus but differing sharply both in being annual and in having glabrous spikelets has been discovered in the state of Sinaloa, Mexico: Paspalum guayanerum.

Annual, culms branched at base, up to 4 dm. tall; sheaths split nearly to the base, hirsute with long white hairs; blades 1 - 2 dm. long, flat, 2 - 3 mm. wide, variably hirsute; ligule 1 - 15 mm. long, membranaceous; inflorescence of 2 - 9 racemes, exserted, the rachis foliaceous, 5 - 8 mm. long, recurved 0.5 mm. broad, densely hirsute below, the margins conspicuously fimbriate with long white hairs; spikelets in a single row, ca. 1 mm. long, glabrous, plano-convex, brown at maturity.

Gramen annuum, caespitosum; culmi erecti, simplices, usque ad 4 dm. alti; vaginae scissurae prope ad basae, pilosae; foliorum laminae lineares, usque ad 2 dm. longae, 2 - 3 mm. latae, pilosae; ligule membranaceae, 1 - 1.5 mm. longae; spicae 2 - 9, 5 - 8 mm. longae, 0.5 mm. latae, hirsutae; spiculae planoconvexae, ca. 1 mm. longae; gluma glabra, lemma glabra. Type collection: Mexico, state of Sinaloa, between Mazatlan and Durango, rocky cliff face near La Guayanera, January 6, 1975, A. A. Beetle M - 3669. Also collected near La Capilla del Taxte, Sinaloa, Mexico, January 6, 1975, A. A. Beetle M - 3690.

Mesosetum

Of 37 species described, mostly by Swallen (Brittonia 2:363-392. 1932), for Mesosetum, twenty-nine occur in northern Brazil. Three (M. blaki, M. filifolium and M. stoloniferum) have been reported for Guate mala (Swallen, 1955, Grasses of Guatemala, Fieldiana vol. 24). Only one species, an annual, M. pittieri, has been reported for Mexico. Now a perennial species needs to be reported:

Mesosetum tabascoense sp. nov.

Perenne; culmi caespitosi, erecti, glabri, nodis pubescentibus; vaginae quam internodia multo longiores glabrae, ligula membranacea 0.2 - 0.3 mm. longa, ciliata; nodis pubescentibus; racemus 5 - 10 cm. longus, spiculae 4 - 5 mm. longae, ascendentes; gluma prima 4 mm. longa; gluma secunda 4 mm. longa, ad apicem hispida.

Tufted perennial in large clumps, blades flat, up to 4 mm. broad, sheaths shorter than the internodes; sheaths, blades and culms glabrous except for a short (0.3 mm. long) membranaceous ligule fringed with hairs at the collar; nodes conspicuously white-hairy. Racemes solitary, 5 - 10 cm. long, inconspicuously hairy, the glumes and sterile lemma nearly equal, the hairs on the upper part of the second glume much longer than the others, forming a prominent tuft (Section Penicillata Swallen); spike lets 4 - 5 mm. long, the first glume 4 mm. long, sparingly pilose, usually a tuft at the base, the tip blunt; second glume 4 mm. long, hairy over the entire back, the hairs at the middle much longer than the rest, spreading; sterile lemma 3.5 mm. long, the fruit shorter than the lemma, glabrous. Type: Mexico, state of Tabasco, Rancho Estrella Blanca, Huimanguilla, grasslands on laterite soils; April 27, 1971, R. Almeida 10.80.

Elyonurus

The identification of Elyonurus barbiculmis Hack. by the use of most keys is very difficult. If reliance is based on such key characters as (first glume of the sessile floret toothed or acuminate, (2) hairy or glabrous below the nodes, (3) hairy or glabrous below the inflorescence, (4) bases bulbous or not bulbous, for the separation of E. barbiculmis an E. tripsacoides it is surprising they have not been combined. Roberty, G (1960) in his "Monographie systématique de Andropogonées du globe" (Boissiera 9:1-455) has separated the two species into different sections as follows:

Margins of the glume of the lower fertile floret abruptly "pectinées-ciliées"

#Elionurus - one species E. tripsacoides with geographical varieties in both the New World and the Old World.

Margins of the glume of the lower fertile floret "longuement ciliées-velues"

#Lecurus - one species E. candidus with geographical varieties in both the New World and the Old World.

These key characters seem to work with the exception that Elyonurus muticus (Spreng.) O. Ktze, Rev. Gen. Plant 3(2):350. 1898, based on Lycurus muticus Sprengel, Syst. Veget. 4(2) Curae Posteriores 32. 1827, is a valid name of earlier date than E. candidus (Trin.) Hack. based on Andropogon candidus Trin. (1832). To bring E. barbinodis into line with this treatment the following combination becomes necessary:

Elyonurus muticus (Spreng.) O. Ktze, var. barbiculmis (Hack.) comb. nov.
Elyonurus barbiculmis Hack. in DC. Monogr. Phan. 6:339. 1889.

ARTIFICIAL KEY TO THE COMMON SHRUBS OF THE RIVERINE FORESTS, ROYAL CHITWAN NATIONAL PARK, NEPAL

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INTRODUCTION

The usual method employed by botanists when publishing schemes for others to use in identifying species is a key providing choices between paired groupings, finally resulting in a specific determination. The usual format emphasizes taxonomic groupings, first separating the families from each other, then the genera, and then the species. This is extremely valuable in the laboratory, but is not necessarily efficient in the field. An alternative to keying taxonomic groupings is to prepare field identification keys for the species of a given life-form in a given habitat. Such ecologically based keys are rarely prepared (Allen, P. H. The Rain Forests of Golfo Dulce. University of Florida Press. 1956), but the method provides a powerful and efficient tool for field workers. In view of the ecological work being done in Royal Chitwan National Park, Nepal, by the Smithsonian Tiger Ecology Project it seems appropriate to publish this as an example of a tool for ecologists working in the Nepalese lowlands. It would be desirable to include photos of habitats and line drawings of the species. In their absence identifications should be confirmed by consultation with a named reference collection (herbarium) in the Park or at a botanical research center such as the Department of Medicinal Plants in Kathmandu.

The Park is a matrix of four basic habitats: grassland, savanna, riverine forest, and upland forest. The riverine forest, at least in the NE corner of the Park, is divided into two types: Bombax-Trewia and Mixed (composed of species often associated with Shorea robusta).

The shrub layer in the riverine forests was chosen for this initial treatment because of its importance to herbivores. These shrubs create the physiognomic structure that herbivores frequenting the forest depend on. The shrubs provide cover, camouflage for adult and young, and browse. The habitats characteristically frequented by a species are typified by their shrub layers. The needs of any one species differ, of course, diurnally and seasonally. In the study of herbivore ecology, no simple statement can be made about the utilization of shrub communities, but the identification of the shrubs in those communities is an important first step. Positive identification

and ability to distinguish between species allows for greater efficiency in field observations and, later, for correlation with research done in other locations. The importance carries over, of course, to predator research.

This key is a preliminary treatment based on field work in the Park between March and July 1976. Specimens were collected in the riverine forests south of the Rapti River in the NE corner of the Park. All the species notes are taken from observations in those forests. More field work and more collections are needed to effect a conclusive treatment. This work is intended to provide efficient identification at any season; floral or fruiting characters are used only as reinforcement for the vegetative characters. The key should be of interest to some tourists as well as foresters, wildlife researchers and botanists.

KEY

1 Leaves alternate and compound (trifoliolate or leaflets alternate).
2 Leaflets 3, clustered at end of petiole, not glandular-punctate . . . . . 1. Crateva religiosa
2 Leaflets usually 5 or more, typically alternate along petiole, glandular-punctate.
3 Leaflets typically 10 or more cm long; inflorescence about 10 cm long and broad . . . . . 2. Micromelum integerrimum
3 Leaflets not exceeding 7 cm in length; inflorescence about 2 cm long.
4 Leaflets 7 or less, typically 5 cm long; inflorescence few-flowered . . . . . 3. Murraya paniculata
4 Leaflets 13 or more, typically 3 cm long; inflorescence dense and many-flowered. . . . . 4. Murraya koenigii
1 Leaves opposite and simple.
5 Midribs sunken, mature leaves leathery.
6 Leaves sessile, subcordate at base.
7 Leaves lanceolate, acute, black-punctate below . . . . . 5. Woodfordia fruticosa
7 Leaves elliptic, obtuse, not punctate . . . . . 6. Calotropis gigantea
6 Leaves petiolate, obtuse to acute at base.
8 Leaves less than 10 cm long, lightly pubescent below with tiny glandular dots . . . . . .7. Caryopteris odorata
8 Leaves more than 10 cm long, densely pubescent below, without glandular dots.
9 Leaf margins ciliate; inflorescence branches spicate, dense, terminal . . . . . 8. Colebrookea oppositifolia
9 Leaf margins not ciliate; inflorescence branches cymose, loose, axillary . . . . . 9. Callicarpa macrophylla
5 Midribs raised, mature leaves membraneous (sometimes leathery).
10 Leaf margin serrate.
11 Leaf margins ciliate, teeth about 1 cm apart; leaf blades more than 10 cm long; flowers loosely arranged . . . . . .

. . . . . 10. Clerodendrum infortunatum
11 Leaf margins not ciliate, teeth about 0.5 cm apart; leaf blades less than 10 cm long; flowers compacted in bracteate "heads" . . . . . 11. Pogostemon benghalensis
10 Leaf margins entire.
12 Stipules absent between opposite leaves.
13 Stem terete, strongly jointed at nodes; sap clear; inflorescence spicate . . . . . 12. Asystasia macrocarpa
13 Stem flattened, not strongly jointed; sap milky; inflorescence corymbose . . . . . 13. Holarrhena antidysenterica
12 Stipules present between opposite leaves, persistent.
14 Leaves less than 5 cm long; flowers solitary . . . . . 14. Coffea bengalensis
14 Leaves more than 5 cm long; flowers in compound inflorescences.
15 Leaves glabrous; stipules united, erect . . . . . 15. Pavetta indica
15 Leaves pubescent; stipules lateral, deflexed . . . . . 16. Wendlandia heynei

NOTES

1. Crateva religiosa Forster f.
Occasional tall shrub in Bombax-Trewia Forest. Leaflets three, thin in texture. Flowers white and yellow-cream; petals clawed; stamens and style exserted. Flowers collected in March (RGT 683).

2. Micromelum integerrimum (Roxb.) Wight et Arn. ex M. Roemer (incl. M. pubescens J. Hooker)
Occasional tall shrub in Mixed Forest. Rind of fruits glandular-punctate, orange-red, collected in May (RGT 714).

3. Murraya paniculata (L.) Jack (incl. M. exotica L.)
Tall, evergreen, dense shrub, dominant in Mixed Forest. Flowers sub-solitary, white, fragrant; fruits red. Flowering and fruiting for many months of the year (RGT 698, 699).

4. Murraya koenigii Sprengel
Common tall shrub in both Bombax-Trewia Forest and Mixed Forest. Flowers white, small, collected in March; fruits collected in May (RGT 685, 748, 831).

5. Woodfordia fruticosa (L.) Kurz
Occasional shrub on edges of Bombax-Trewia Forest on moist sites. Flowers borne along drooping, unbranched twigs, collected in March (RGT 687).

6. Calotropis gigantea (L.) Dryander
Occasional shrub in open areas of Bombax-Trewia Forest. Leaves and stem fleshy. Sap white, sticky. Flowers firm, sculptured, lavender to rose, collected in March (RGT 691).

7. Caryopteris odorata (D. Don) B. L. Robinson (incl. C. wallichiana Schauer)
Common tall, slight shrub in Bombax-Trewia Forest. Flowers blue, lateral and terminal, collected in March and May (RGT 684; 716 may be distinct).

8. Colebrookea* oppositifolia J. E. Smith
Tall, spreading shrub, dominant in Bombax-Trewia Forest, forming thick undergrowth. Inflorescence drab but noticeable because of erect habit, functionally unisexual. Flowers and fruits collected in March (RGT 695, 741).

9. Callicarpa macrophylla Vahl
At time of flowering moderately low shrub; common in Bombax-Trewia Forest. Young growth extremely villous; hairs stellate. Flowers collected in July (RGT 887, 892).

10. Clerodendrum* infortunatum L.
Tall bushy shrub, dominant in Bombax-Trewia Forest. Flowers whitish, stamens and style strongly exserted, collected in March; fruits with red, accrescent calyx in May (RGT 686, 745, 830).

11. Pogostemon benghalensis (N. Burm.) O. Kuntze (incl. P. plectranthoides Desf.)
Tall shrub, dominant in Bombax-Trewia Forest. Flowers blue-lavender, collected in March (RGT 677, 750).

12. Asystasia macrocarpa Nees
Occasional shrub in Bombax-Trewia Forest. Flowers blue-lavender, collected in March (RGT 696).

13. Holarrhena antidysenterica Wall. ex DC.
Occasional tall shrub in open areas of Bombax-Trewia Forest. Sap white. Flowers white with yellow toward center, contorted, collected in May (RGT 715, 757).

14. Coffea bengalensis Roxb.
Common low shrub in Bombax-Trewia Forest. Flowers white, striking (noticeable from a distance), collected in March; fruit in July (RGT 682, 754, 888).

* Correct generic spelling as used by original author.

15. Pavetta indica L.
Occasional tall shrub in Mixed Forest. Leaf thin in texture. Flowers white, small, collected in May (RGT 717).

16. Wendlandia heynei (Schultes) Santapau and Merchant (incl. W. exserta (Roxb.) DC.)
Occasional shrub in Mixed Forest. Flowers white, very small, collected in May (RGT 707).

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXI.

A NEW SPECIES OF STEVIA FROM COSTA RICA.

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Stevia, one of the largest genera in the tribe has recently been monographed for North America by the late Jerold L. Grashoff[1] (1972). During the course of his study Grashoff (1974) added 16 new species for the area. However, continued plant exploration in Costa Rica has yielded yet another unnamed species which we describe below.

Stevia westonii R.M.King & H.Robinson, sp. nov. Plantae minutae herbaceae rhizomatosae 2-5 cm altae mediocriter ramosae. Caules graciles, internodiis brevibus 2-5 mm longis albo-puberulis. Folia opposita sessilia; laminae anguste ellipticae vel anguste oblongae base cuneatae margine integrae vel subintegrae apice anguste rotundatae subtus glandulo-punctatae supra in nervis sparse puberulae subtus in nervis sparse pilosae. Inflorescentiae minutae dense corymbosae. Capitula ca. 12 mm alta. Squamae involucri 5 purpureae ca. 7 mm longae et 1.5 mm latae anguste oblongae margine non scariosae apice acutae extus minute albo-pilosae et minute glandulo-punctatae. Flores 5; corollae ca. 8 mm longae plerumque purpureae in lobis pallidae, tubis ca. 1 mm longis glabris, faucis 4.5 mm longis cylindricis extus sparse glandulo-punctatis superne pilosis intus hirsutis, lobis ovatis vel ellipticis ca. 2 mm longis 1.0-1.4 mm latis extus sparse glandulo-punctatis et albo-pilosis; filamenta antherarum in parte superiore 0.25 mm longa; thecae 1.8 mm longae; appendices antherarum obovatae ca. 0.5 mm longae et 0.25 mm latae, margine et extus papilloso-crenulatae apice irregulariter lobatae; basi stylorum nodiformes glabri. Achaenia uniformia ca. 4 mm longa glabra ad apicem interdum minute spiculifera; aristae pappi 5 ca. 7 mm longae rubrae ad basem vix alatae, squamis intermediis minutis ca. 0.15 mm altae. Grana pollinis ca. 25-27 μ diam (Type 1).

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[1] 1945-1976

TYPE: COSTA RICA: Rio Talari, Chirripo massif, 3,350 m. 26 January 1976. Arthur S. Weston 10077 (Holotype US).

References

Grashoff, J. L. 1972. A systematic study of the north and central american species of Stevia. Ph. D. dissertation, University of Texas, 609 pages.

_____ 1974. Novelties in Stevia (Compositae-Eupatorieae). Brittonia 26:347-384.

Acknowledgement

This study was supported in part by the National Science Foundation Grant BMS 70-00537 to the senior author.

Stevia westonii R.M.King & H.Robinson, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Stevia westonii R.M.King & H.Robinson, enlargement of head.

STUDIES IN THE LIABEAE (ASTERACEAE). X.

ADDITIONS TO THE GENUS *PARANEPHELIUS*

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The genus *Paranephelius* has been represented in the literature by five species ranging from northern Peru to southern Bolivia (Robinson & Brettell, 1974). The genus is distinct among the Liabeae by the basal rosette of leaves surrounding a single sessile head or a group of 2-3 heads. The habit is shared by other genera of Compositae in the Andes including *Werneria* and a few species of *Senecio* in the tribe Senecioneae and some species of *Hypochaeris* of the Lactuceae, Specimens of the latter two genera have been encountered in collections annotated to species of *Paranephelius* and the most obvious differences are worth mentioning. *Werneria* and *Senecio* can be distinguished by the valvate involucre and by the glabrous short-lobed disk corollas. *Hypochaeris* can be distinguished by the ligulate corollas but perhaps even more readily in most specimens by the plumose pappus setae. The four genera are sometimes mixed in collections.

The present range of *Paranephelius* excludes Ecuador but the proximity of known sites indicates that the genus will probably be found on the botanically nearly unknown southernmost mountains of Loja and Zamora.

Attempts to determine specimens on loan from other herbaria have shown the need to clarify some species limits in the genus, and two species, *P. ferreyrii* and *P. wurdackii* are described here as new.

The value of some characters is in question. As in other genera of the Liabeae the pubescence of the upper leaf surface has been found almost totally unreliable. Tomentum on the outer surfaces of the ray flowers has been mentioned as a species character by Weddell (1855), being dense in *P. bullatus* A.Gray ex Wedd., sparse in *P. uniflorus* P.& E., and supposedly lacking in *P. ovatus* Wedd. The latter species does show only slight tomentum on the rays of most specimens, but tomentum is apparently present in all the species of the genus. On younger rays the tomentum is usually dense, but tomentum may not be

obvious on the fully expanded mature corollas. Such tomentum is not found on the rays of other genera in the Liabeae. Many species show dense clusters of fusiform lateral roots. These are common in simple-leaved specimens of P. uniflorus, in specimens seen of P. bullatus, in P. wurdackii, and in one specimen of P. asperifolius (Muschl.) R.& B. Fusiform lateral roots seem comparatively sparse or lacking in P. ovatus, P. jelskii (Hieron.) R.& B., and in dissected-leaved P. uniflorus. No such roots have been seen in P. ferreyrii. These differences in roots might reflect differences in collecting techniques. It seems likely that fusiform roots are common to all members of the genus, but specimens should be carefully examined in the field.

A problem has been noted in the distinction of two species with obtuse or blunt-tipped outer involucral bracts. The type species, P. uniflorus, was described and illustrated with pinnately lobed leaves while P. ovatus was described with simple ovate to rhomboid leaf blades having a smooth upper surface. Collections with simple leaf blades have generally been placed in P. ovatus even if the upper surface was rough. A review of specimens shows a distinction of P. ovatus on the basis of the smooth leaf with veins often prominulous, being depressed only in distorted material. The upper surface is usually glabrous but some Bolivian specimens are pilose above. Secondary veins of the leaves seem particularly close and straight.

Specimens called P. ovatus with rough upper leaf surfaces cannot be distinquished satisfactorily from a series of specimens of P. uniflorus showing leaf blades lobed only at the base, and they are here regarded as representatives of that species. Within the expanded concept of P. uniflorus there is some tomentum or even some setae on the achenes in specimens from northern Peru with lobed leaves, but achenes of other lobed specimens and all unlobed specimens seem glabrous.

A species with lobed leaves in Bolivia. P. asperifolius, seems to account for early reports of P. uniflorus in that country. The name has been used for some specimens of P. ovatus with pilose upper leaf surfaces, but the latter character varies in both species. The leaf shape of P. asperifolius is consistently lobed in all specimens seen and correlates with the involucre having all bracts narrow and acute.

Species of Paranephelius having acute outer involucral bracts are most common in northern Peru.

These include the following two previously undescribed species.

Paranephelius ferreyrii H.Robinson, new species

Plantae herbaceae acaulescentes; radices fusiformes non visa. Folia rosulata basalia oblanceolata pinnatifida usque ad 6 cm longa et 2 cm lata base anguste petioliformia apice obtusa vel rotundata margine obtuse serrata vel duplo-serrata supra valde bullata sparse pilosa et evanescentiter sparse arachnoideo-tomentosa subtus albo-tomentosa in nervis interdum fulvo-pilosa, lobis utrinque 2-4 ovatis vel oblongis. Capitula sessilia plerumque solitaria 17-18 mm alta et 13-15 mm lata; squamae involucri 40-50 ca. 4-seriatae ovato-lanceolatae vel lineari-lanceolatae 5-9 mm longae et 1-2 mm latae margine vix scariosae superne dense puberulae apice anguste argute acutae extus distincte pilosae et evanescentiter tomentosae. Flores radii 19-29; corollae flavae, tubis ca. 8 mm longis superne hirsutis, limbis ca. 15 mm longis et 2.5 mm latis inferne hirsutis extus distincte tomentosis et sparse glandulo-hirsutis. Flores disci ca. 20-35; corollae flavae, tubis 9-10 mm longis superne minute puberulis, faucis ca. 1.5 mm longis extus puberulis, lobis ca. 2.5 mm longis ad apicem stipitato-glandulosis; filamenta antherarum in parte superiore ca. 0.4 mm longa; thecae ca. 2.5 mm longae; appendices antherarum ca. 1.2 mm longae. Achaenia immatura 3.5 mm longa sparse tomentosa et sparse setifera; setae pappi 2-3-seriatae 45-50 interiores usque ad 10 mm longae, setae longiores apice aliquantum latiores, setae exteriores breviores ca. 10-15 plerumque 1.5-4.0 mm longae. Grana pollinis plerumque 35-42μ diam.

TYPE: PERU: Cajamarca: Cajamarca; Cumbre el Gavilan, Carretera Cajamarca-Chilete. Alt. 3200 m. Habitat arcilloso. Hierba, flores amarillas. Marzo 31, 1948. R.Ferreyra 3311 (Holotype, US). PARATYPE: PERU: Cajamarca: Banos. V 1958. J.Soukup 4642 (US).

Paranephelius ferreyrii is most closely related to P. bullatus which it closely resembles in the size of the head, the bullate upper surface of the leaves, and the achenes with setae as well as tomentum. The new species differs most obviously by the pinnately lobed leaves and less obviously by the slightly but more distinctly enlarged tips of the longer pappus setae. Two specimens seen that apparently represent P. bullatus (Mito, Macbride & Featherstone 1656; 15 mi. SE of Huanuco, Macbride & Featherstone 2131) have simple leaf blades with rather strongly ascending secondary veins. Paranephelius bullatus was originally

described with obtuse outer involucral bracts but the two specimens seen show outermost bracts with digitately lobed tips and some short-acute to obtuse bracts in the next series. The new species has the bracts all narrowed to acute tips. The bracts in P. bullatus seem to differ also by the lack of coarse hairs on the outer surface.

Setae on the achenes have been noted thus far in the genus only in P. ferreyrii, P. bullatus, and in some specimens of P. uniflorus.

Paranephelius wurdackii H.Robinson, new species

Plantae herbaceae acaulescentes; radices fusiformes fasciculatae distinctae. Folia rosulata basalia obovata base petioliformia; laminae late ellipticae inferne subtiliter lobatae apice obtusae vel late acutae margine grosso-serratae vel duplo-serratae supra leaves pilosae subtus albo-tomentosae in nervis non tomentosae et sparse pilosae. Capitula sessilia solitaria ca. 3 cm alta et 3.5 cm lata base in zona brevi dense hirsuta; squamae involucri ca. 45 ca. 3-4-seriatae 15-23 mm longae et 1.5-5.0 mm latae margine distincte anguste scariosae, exteriores anguste subtiliter obpanduriformes apice acutae extus pilosae interiores lineari-oblongae vel lineari-lanceolatae apice anguste acutae vel longe attenuatae extus glabrae vel subglabrae solum in squamis exteriissimis pauce tomentosae. Flores radii ca. 35; corollae flavae, tubis 15-20 mm longis superne hirsutis, limbis ca. 40 mm longis et 4 mm latis inferne hirsutis extus tomentosis et glandulo-hirsutis et sparse glandulo-punctatis. Flores disci ca. 35; corollae flavae, tubis ca. 17 mm longis superne puberulis, faucis 2 mm longis indistinctis puberulis, lobis 3 mm longis glabris apice minute appendiculatis; filamenta antherarum in parte superiore ca. 0.8 mm longa; theca ca. 3 mm longa; appendices 0.4-0.5 mm longae. Achaenia immatura ca. 3 mm longa sparse tomentosa; setae pappi ca. 75-80 plerumque 15-20 mm longae apice non latiores, setae exteriores breviores paucae. Grana pollinis ca. 40-42 μ diam.

TYPE: PERU: Amazonas: Prov. Chachapoyas; open cold swamp on summit of Cerros de Calla-Calla, between Leimebamba-Balsas road pass and the camino de herradura (2 hours walk south), elev. 3500-3750 m. 8 July 1962. J.J.Wurdack 1240 (Holotype, US).

A series of specimens collected in 1962 by J.J. Wurdack from near Chachapoyas in Amazonas, Peru consists mostly of material identified as Paranephelius jelskii. One of the collections contains one

specimen of a closely related but distinct species named here as P. wurdackii. The distinctions of the new species include a slight but distinct lobing of the basal part of the lamina, some pilosity and no tomentum below on the main veins of the leaves, no evident tomentum on the main bracts of the involucre, and no glands on the tips of the disk corolla lobes. There is a distinctive cluster of short-stalked glands near the tips of the disk corolla lobes of specimens seen of P. jelskii. There are a few long-stalked glands on the lobes in most specimens seen of P. uniflorus and P. ovatus. The type of P. jelskii from Cutervo in Dept. Cajamarca, Peru has not been seen, but a photograph is available showing the leaf shape and complete tomentosity of the leaf undersurface as in the Wurdack collections under that name. The involucres of the Wurdack collections are almost completely covered with dense tomentum but the type apparently has tomentum less dense. Vestiture of the disk corolla lobes cannot be seen and was not mentioned in the original description.

Paranephelius wurdackii seems distinctive in the large size of the head and the floral parts. The lobes of the disk corollas are more pointed than in other species partly due to the small but distinct appendage on the tip.

Both species collected by Wurdack share a rather distinctive form of hair on the achene. The long hairs consist of a short basal flexible zone with thin-walled cells followed by a straight portion of 2-3 elongate firm-walled cells. The apex of the hair is attenuated into an indefinitely elongate contorted arachnoid portion forming at least part of the tomentum of the achene.

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Paranephelius ferreyrii H.Robinson, Holotype, United States National Herbarium. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Paranephelius wurdackii H.Robinson, Holotype, United States National Herbarium.

Enlargements of heads: Top, *Paranephelius ferreyrii*. Bottom, *P. wurdackii*.

CERTAMEN MELASTOMATACEIS XXVI.

John J. Wurdack
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The current assemblage of melastome notes, mostly culled from research in and loans from European herbaria, continues the final adjustments for the Flora of Ecuador. The data were gathered during a 1975 trip sponsored by the Smithsonian Research Foundation.

TIBOUCHINA GLEASONIANA Wurdack, nom. et stat. nov.
Tibouchina lepidota (Bonpl.) Baill. var. intermedia Gleason, Bull. Torrey Club 52: 328. 1925.

The pubescence on the leaves beneath is quite distinctive, the secondary nerves being covered with lanceate strongly flattened ciliolate hairs 0.25-0.3 mm wide and the venules with terete simple or few-barbellate setulae; in T. lepidota, all the hairs on the leaves beneath are flattened scales and in T. paleacea (Triana) Cogn. sens. strict. the secondary vein trichomes are narrow (0.1-0.15 mm wide) and not ciliolate. The margins of the hypanthial hairs in T. gleasoniana, like those in T. lepidota, are conspicuously appressed-ciliolate; in T. paleacea (except for one population near the Huila-Cauca boundary in Colombia, Maguire & Maguire 44204, Uribe 3868), the hypanthial scales have essentially entire margins. Tibouchina gleasoniana is known from Imbabura, Pichincha, and Bolívar in Ecuador; of these collections, Jameson 419 was cited by Cogniaux as T. lepidota. Two recent excellent matches for the Triana and Linden syntypes of T. paleacea are Killip & Varela 34651 (Tolima) and von Sneidern 3086 bis (Caldas). Within the currently available collections of T. lepidota are several local pubescence variants.

TIBOUCHINA NARINOENSIS Wurdack, sp. nov.
T. paleaceae (Triana) Cogn. in foliorum pubescentia affinis, bracteis floribusque minoribus hypanthii paleis parvis differt.

Ramuli sicut petioli foliorum subtus venae primariae inflorescentiaque dense pilis paleaceis plerumque 1-2(-3) X 0.3-0.6 mm appressis integris vel obscure erosulo-ciliolatis induti. Petioli 0.5-1.3 cm longi; lamina (4-)7-10 X (2-)3-3.5 cm elliptico-lanceata apice acuto basi late acuta vel obtusa, rigidiuscula et paleaceo-ciliolata, supra modice bullato-setulosa bullis ad basim ca. 0.7-1 mm latis setula terminali 0.4-0.7 mm longa, subtus in venis secundariis pilis ca. 1-1.5 X 0.1-0.2 mm compressis modice appresso-setulosa in venulis sparse setulosa pilis plerumque 0.2-0.4 X ca. 0.05-0.1 mm, 5-nervata (pari exteriore inframarginali incluso) nervulis subtus paulo elevatis. Panicula 6-12 cm longa laxe subpauciflora; flores 5-meri, pedicellis plerumque 5-8 mm longis, bracteolis ca. 3 X 0.6-1 mm

caducis interdum non evolutis. Hypanthium (ad torum) 4-5 mm longum extus sparsiuscule paleis appressis 1-1.5 X 0.3-0.4 mm indutum; calycis tubus 0.3-0.5 mm longus, lobis 1.5-2 mm longis triangularibus appresso-ciliolatis ciliis 0.1 mm longis. Petala 14-20 X 10-15 mm asymmetrice obovata ciliolata (ciliis ca. 0.1 mm longis) alioqui glabra. Stamina essentialiter isomorphica glabra; filamenta 5.5-6.5 mm longa; antherarum thecae 6-7 X 0.6 mm subulatae poro 0.15-0.2 mm diam. ventraliter inclinato; connectivum 0.2-0.8 mm prolongatum lobis ventralibus 0.2-0.4 mm longis hebetibus. Stigma non expansum; stylus 12-13 X 0.4 mm glaber; ovarium apicem versus dense strigulosum pilis ca. 1 mm longis teretibus laevibus.

Type Collection: Reinaldo Espinosa 2954 (holotype NY), collected between Ricaurte and Diviso along the Pasto-Tumaco road, Depto. Nariño, Colombia, 11/6/1950. "Arbolito muy florido que se ve a los bordos de los bosques de altura. Flores color lila rosado, muy vistosas."

Paratypes (both Nariño, Colombia): H. Garcia-Barriga 13164 (US), from near the Río Telembí between Santander (Buenavista) and Barbacoas, elev. 840-200 m, 3-5 August 1948. "Arbusto 3 m; flores azules"; Idrobo & Kyburz 2357 (US), from Cuyambe between Altaquer and Junín, elev. 1200 m, 1 January 1957. "Arbol. Flores moradas con anteras amarillas, muy vistosas. Abundante al lado de la carretera cerca de Junín."

While showing the same vegetative pubescence, T. paleacea has floral bracts 9-12 X 4-6 mm, hypanthia 6-8 mm long completely covered with scales 2-3 X 0.6-0.9 mm, and calyx lobes 7-9 mm long. Tibouchina narinoensis seems to be a low-elevation variant of T. paleacea, the latter known only from altitudes of (2000-) 2800-3100 m. The four other species of Sect. Lepidotae are quite different in vegetative and/or hypanthial features.

BRACHYOTUM AZUAYENSE Wurdack, sp. nov.

B. tyrianthino Macbride affinis, trichomatibus magis asperis floribus ternatis differt.

Trichomata (foliorum lamina supra excepta) densiuscule aspera. Ramuli sicut petioli pedicellique dense strigulosi pilis ca. 1 mm longis. Petioli 0.3-0.6 cm longi; lamina 0.8-1.4(-1.7) X 0.5-1.1 cm ovato-elliptica vel oblongo-elliptica apice obtuso vel rotundato basi late obtusa, rigidiuscula, supra modice strigulosa pilorum parte libera 0.4-0.8 mm longa minutissime aspera, subtus in venis primariis dense et in superficie modice setulosa, trinervata. Flores 4-meri terni ut videtur nutantes, pedicellis ca. 5 mm longis, bracteolis angustis 5-9 X 0.8-1.5 mm et 1-4 mm infra hypanthii basim insertis demum deciduis. Hypanthium (ad torum) 5-6.2 mm longum modice appresso-setosum vel laxe strigosum pilis 1-1.5 mm longis; calycis tubus 0.5-0.7 mm longus, lobis 4.3-4.7 X 3.5-4.5 mm oblongis apice acuto intus plerumque parte 1-2 mm apicali sparse strigulosis. Petala 13.5-13.8 X 11.1-11.5 mm obovata apice rotundato-truncato breviter glanduloso-ciliolata alioqui glabra. Filamenta 4.5 mm longa; antherarum thecae 5-5.5 X 0.9 mm, poro

0.25-0.3 mm diam. ventraliter inclinato; connectivum a thecis ventraliter 0.7-0.8 mm liberum vix bilobulatum. Stylus 17 X 0.5 mm glaber per 3-8 mm exsertus; ovarium apicem versus modice strigulosum pilis eglandulosis, lobis apicalibus ca. 0.4 mm longis.

Type Collection: L. Holm-Nielsen, S. Jeppesen, B. Lojtnant, & B. Ollgaard 5034 (holotype US 2728745; isotype AAU), collected in dry scrub near Km 91 on Pan American Highway north of Loja, 79° 10' W, 3° 25' S, Prov. Azuay, Ecuador, elev. 2900 m, 5 May 1973. "Small shrub to less than 1 m. Hypanthium and sepals red; petals dark violet to black."

Paratype: Holm-Nielsen, Jeppesen, Lojtnant, & Ollgaard 4810 (AAU, US), from Km 85 on Pan American Highway, 79° 11' W, 3° 35' S, Prov. Azuay, Ecuador, elev. 2850-2950 m, 3 May 1973. "Shrub to 1 m. Flowers deep purple to black."

Brachyotum tyrianthinum has trichomes only moderately scabrid, leaf blades relatively somewhat narrower, and flowers solitary on the branchlets. In the generic revision (Mem. N. Y. Bot. Gard. 8. 1953), B. azuayense would key to near B. maximowiczii Cogn., which has leaf blades tuberculate-strigulose above and completely covered by the pubescence beneath, hypanthial pubescence somewhat denser, sepals always glabrous within, and apical ovary lobes longer.

TRIOLENA OBLIQUA (Triana) Wurdack, comb. nov.

Diolena obliqua Triana, Trans. Linn. Soc. Bot. 28: 81. 1871.

The holotype (Triana 3873, BM) has been compared with recent collections from eastern Colombia (Putumayo, Cuatrecasas 10952), Ecuador, and Peru (Amazonas, Wurdack 2106). The pubescence length on the upper leaf surface varies considerably, but only one species seems involved. Diolena purpurea Gleason is perhaps dubiously distinct, but shows strongly reflexed scarcely compressed cauline pubescence.

TRIOLENA PEDEMONTANA Wurdack, sp. nov.

T. allardii (Wurdack) Wurdack in staminum forma affinis, foliis magnis distincte plinervatis foliis parvis minoribus differt.

Humilis usque ad 0.3 m alta; ramuli novelli petiolique dense vel modice strigosi pilis ca. 2(-3) mm longis praecipue ad caulis nodis compressis. Folia in quoque pari disparilia (12-15:1) membranacea et distanter ciliolato-serrulata, supra primum sparsissime strigulosa glabrata, subtus in venis primariis modice strigulosa (pilis ca. 1 mm longis) in venis secundariis sparse strigulosa (pilis 0.1-0.3 mm longis) in venulis superficieque glabra. Folia maiora: lamina anguste elliptica apice paullo (usque ad 1.5 cm) gradatimque acuminato basi ca. 0.5-0.7 cm asymmetrice obtusa vel rotundata, 11-16 cm longa, 3.5-7 cm lata, 7(-9)-plinervata (pari interiore subalternatim 2-4 cm supra basim divergenti) nervulis subtus planis areolis ca. 1-1.5 mm latis; petioli liberi 1-1.5 cm longi.

Folia minora: lamina ovata apice acuto basi 0.1-0.2 cm cordulata, 0.5-1.5 cm longa, 0.4-1 cm lata, 3-5-nervata; petioli 0-0.2 cm longi. Inflorescentia demum 5-10 cm longa, floribus 5-meris unilateralibus 10-20, pedicellis 1-1.5 mm longis. Hypanthium (ad torum) 2.6-2.9 mm longum praecipue basim versus sparse vel modice strigulosum pilis plerumque 0.5-0.7 mm longis; calycis tubus 0.3-0.4 mm longus, lobis interioribus 0.2-0.3 mm longis, dentibus exterioribus ca. 0.2-0.3 mm eminentibus setula terminali 0.4-0.6 mm longa. Petala glabra 4-4.7 mm longa 2-2.9 mm lata obovato-oblonga apice rotundato. Stamina dimorphica, filamentis 2-2.5 mm vel 1.5-2 mm longis, antherarum thecis 0.7-0.9 X 0.2-0.25 mm oblongis, connectivis 0.15-0.3 mm prolongatis dorsaliter ad basim ca. 0.1 mm corniculatis, appendicibus duabus ventralibus 1.5-2 vel 0.4 X 0.1 mm. Stigma paulo expansum 0.4-0.45 mm diam.; stylus 3 X 0.3-0.4 mm glaber in ovarii apicem 0.5-0.6 mm immersus; ovarium 3-loculare glabrum; capsula ca. 0.5 X 0.8 cm triquetra.

Type Collection: P. C. D. Cazalet & T. D. Pennington 5195 (holotype K; isotypes NY, US), collected in rain forest 20 km west of Santo Domingo de los Colorados, Prov. Pichincha, Ecuador, elev. 300 m, 29 October 1961. "Herb to 1 ft. Flowers cream."

Paratypes (all Ecuador): Pichincha: Cazalet & Pennington 5228 (K, NY, US), topotypical; Sparre 14093 (S), from 10 km northwest of Santo Domingo de los Colorados, alt. 400 m, 21 January 1967. Cotopaxi: Sparre 17125 (S), from Río Guapara 20 km northwest of El Corazon, elev. 250 m, 19 June 1967.

Triolena allardii has the larger of each leaf pair with essentially basal primary veins and the oblong-lanceate smaller one 2.5-4.5 X 1.2-2 cm; T. obliqua (vide supra) has generally narrower large leaves with only 3(-5) primary veins, looser hypanthial pubescence, and smaller inflorescences, as well as larger petals and anther thecae. Other relatives, both with shorter (0.1-0.2 mm) ventral appendages on the small stamens and lacking the prominent flattened cauline hairs at the nodes, are T. spicata (Triana) L. Wms. and T. pluvialis (Wurdack) Wurdack (the latter having the large leaves with longer petioles and relatively broader blades). A good match for the Triana holotype of T. spicata is Alston 8619, from near Buenaventura, El Valle, Colombia. The proper disposition of Panamanian collections presently referred to T. spicata remains somewhat uncertain.

MICONIA KRAENZLINII Cogn. subsp. AEQUATORIALIS Wurdack, subsp. nov.

Petalis staminibusque maioribus filamentis sparse glanduloso-puberulis differt.

Type Collection: P. R. Bell 471 (holotype BM), collected at Chaupi-Sagcha, Pululagua, Prov. Pichincha, Ecuador, elev. ca. 1800 m, 15 April 1951. "Flowers white."

The typical subspecies, still known only from the original collection from Cali, El Valle, Colombia, has the hypanthium plus calyx 5 mm long (rather than ca. 3.8-4 mm), petals 6-6.5 mm long (rather than 8.5-10 mm), filaments glabrous, large and small

anther thecae 4.5 and 3.3 mm long (rather than 5.7-5.8 and 4-4.2 mm), a distinct dorsal calcar at the connective base, and the stylar puberulence sparse and confined to the basal 0.5 mm (rather than moderate and on the basal 1/2). The two subspecies are the same in vegetative and other reproductive features (including a few glands edging the connective base, and externally densely puberulent petals). In the typical subspecies, all of the 18 examinable flower buds were 5-merous (although Cogniaux apparently saw some 6-merous flowers) and in the Ecuadorian specimen each of 9 buds was also 5-merous. The general aspect of M. kraenzlinii is somewhat like that of M. versicolor Naud. (which is also known from the type localities of M. kraenzlinii), but the floral details are quite different and the species affinities seem distant.

MICONIA CERCOPHORA Wurdack subsp. ESETULOSA Wurdack, subsp. nov.

Foliis ubique esetulosis differt.

Type Collection: G. Harling & L. Andersson 13959 (holotype GB; isotype US), collected in riverine woods at Namírez ca. 5 km north of Cumbaraza, Prov. Zamora-Chinchipe, Ecuador, elev. ca. 900 m, 24 April 1974. "Tree ca. 5 m. Corolla white. Anthers reddish violet."

In both other subspecies, the leaf blades are sparsely setulose above. The floral dimensions in the Namírez collection are like those of subsp. canelosana Wurdack; however, the connective glands are less abundant in the large anthers and absent or sporadically 1-2 in the small anthers. Vegetatively the new subspecies is like M. donaeana Naud. and M. littlei Wurdack, but the filaments and style are glabrous. A fruiting collection (Holm-Nielsen & Jeppesen 499) from 2 km north of Mera, Pastaza, elev. 1050 m, has leaves above exceedingly sparsely and caducously setulose, but probably represents the typical subspecies.

MICONIA SPARREI Wurdack, sp. nov.

M. paleaceae Cogn. in aspectu affinis, ramulorum inflorescentiarumque pilis barbellatis foliis breviter plinervatis calycis lobis interioribus prominentibus filamentis glabris antherarum connectivis ad basim glandulosis ovarii apicibus stellulato-puberulis differt.

Ramuli (dense, ca. 4-7 mm) petioli (modice, ca. 3-5 mm) foliorum subtus venae primariae basim versus (sparsiuscule, 1-4 mm) et inflorescentia (densiuscule, ca. 2-4 mm) setosi pilis basim versus robustis 0.1-0.25 mm diam. sparse barbellatis et modice pilis subpinoideis 0.1-0.2 mm longis furfuracei. Petioli 3-5 cm longi; lamina ca. 30 cm longa et 15 cm lata, oblongo-elliptica apice breviter (ca. 1.5 cm) subabrupteque acuminato basi obtusa, firme membranacea et serrulata (dentibus ca. 0.5-1 mm profundis et 1.5-3 mm inter se distantibus), supra margines versus sparse pilis gracilibus 1.5-2 mm longis (caducis ?) induta, subtus in venis secundariis sparse caduceque puberula pilis subpinoideis ca. 0.1 mm longis in superficie glabra,

breviter (1-1.5 cm) 7-plinervata (pari debili inframarginali incluso) nervis secundariis ca. 5-7 mm inter se distantibus nervulis subtus planis obscuris areolis 0.3-0.5 mm latis. Panicula ca. 17 cm longa multiflora ramis primariis oppositis; flores 5-meri glomerati subsessiles (pedicellis obscuris ca. 0.3 mm longis), bracteolis ca. 1 mm longis lanceatis persistentibus puberulis. Hypanthium (ad torum) 2.4 mm longum subsparse stellulato-puberulum pilis 0.1(-0.2) mm altis; calycis tubus ca. 0.3 mm altus, lobis interioribus ca. 0.5 mm altis ovatis dentibus exterioribus minutis non eminentibus pinoideo-puberulis (pilis 0.1-0.2 mm longis); torus intus glaber. Petala 3.9-4 X 1.7-1.8 mm obovato-oblonga extus minute granulosa. Stamina paulo dimorphica; filamenta 3.2 vel 2.9 mm longa glabra; antherarum thecae 2.3-2.4 vel 2 X 0.35 X 0.4 mm anguste oblongae apice paulo emarginato poro ca. 0.3 mm diam. terminali vel paulo dorsaliter inclinato; connectivum non prolongatum ad basim paulo expansum glandulis 6-8 vel 2-4 et ca. 0.1 mm diam. ornatum. Stigma expansum 0.8-0.9 mm diam.; stylus 7 X 0.4 mm glaber in ovarii apicem 0.3 mm immersus; ovarium 3-loculare et ca. 1/2 inferum apice modice stellulato-puberulo et glandulis paucis inconspicuis induto.

Type Collection: B. Sparre 19290 (holotype S), collected in tropical rain forest near the Misión Salesiana at Gualaquiza, Prov. Morono-Santiago, Ecuador, 3 October 1967.

Miconia paleacea has the branchlets and inflorescence setose with smooth hairs, basally nerved leaf blades, an essentially truncate calyx with setulose external teeth, torus within gland-edged, filaments basally sparsely glandular-puberulous, larger anthers with the connective not prominently glandular basally, stigma only 0.4-0.45 mm diam., and ovary merely glandular at the apex. Despite the somewhat similar vegetative aspect, I do not believe that M. sparrei is really closely related to M. mazanana Macbride (known from Napo in Ecuador, as well as Peru and Brazil) which has the leaf blades glabrous above, obviously pedicellate and larger flowers (petals 6.5-6.8 X 2.5-2.7 mm), glandular-puberulous filaments, style, and ovary apex, and a 5-celled ovary. J. Schunke 6949 (Puerto Pizana, San Martín, Peru), lacking floral details, represents a taxon closely related to M. sparrei (similar vegetative pubescence), but with long-attenuate leaf blade bases, 4(-5)-merous fruit, and longer trichomes on the external calyx teeth.

MICONIA PROCUMBENS (Gleason) Wurdack, comb. nov.

Clidemia procumbens Gleason, Bull. Torrey Club 58: 255. 1931.

The species is closely related to M. lamprophylla Triana, differing in the predominantly 5-nerved leaf blades which are obtuse to rounded at the base and with laxer venule reticulation, flowering hypanthia more-or-less glandular-setose, and torus within glabrous. The inflorescence in M. procumbens is truly terminal, rather than lateral; the flowers are

predominantly 5-merous, the original placement in Sect. Sagraea thus erroneous.

MICONIA CAZALETII Wurdack, sp. nov.

M. smaragdinae Naud. in aspectu similis, foliis distincte plinervatis staminum maiorum connectivis ad basim cordiformibus staminum minorum poris distincte dorsaliter inclinatis differt.

Ramuli sicut foliorum subtus venae primariae inflorescentia hypanthiaque primum modice vel sparse resinoso-granulosi glabrati; linea interpetiolaris non evoluta. Petioli 1-2 cm longi; lamina (14-)20-32 X (4-)6-11 cm oblongo-elliptica apice gradatim hebeti-acuminato basi acuta, tenuiter membranacea et essentialiter integra, in superficie glabra, 1-2.5 cm 3-plinervata (pari exteriore debili neglecto) nervis secundariis ca. 5-7 mm inter se distantibus nervulis subtus planis laxiuscule reticulatis areolis 0.5-1 mm latis. Panicula 12-23 cm longa multiflora ramis primariis 2-4 in quoque nodo; flores 5-meri plerumque subsessiles (pedicellis supra articulationem ca. 0.3 mm longis), bracteolis 0.3-0.5 mm longis linearibus caducis. Hypanthium (ad torum) 2-2.3 mm longum; calycis tubus ca. 0.3 mm longus, lobis interioribus 0.2-0.3 mm altis late ovatis dentibus exterioribus minutis. Petala 3 X 1.5-1.7 mm obovato-oblonga sparsiuscule resinoso-granulosa. Stamina dimorphica glabra; filamenta 3-3.7 mm longa; antherarum thecae oblongo-subulatae poro 0.1-0.15 mm diam. minuto. Stamina maiora: thecae 2.6-3 mm longae, poro ventraliter inclinato, connectivo paulo (0.1-0.15 mm) prolongato, appendice basali cordiformi ca. 0.8 mm longa. Stamina minora: thecae 2-2.3 mm longae, poro dorsaliter inclinato, appendice basali ca. 0.6 mm longa. Stigma paulo expansum 0.4 mm diam.; stylus 6.7-6.8 X 0.15-0.2 mm glaber in ovarii apicem 0.1 mm immersus; ovarium 3-loculare et 1/3-1/2 inferum, apice granuloso.

Type Collection: P. C. D. Cazalet & T. D. Pennington 7523 (holotype US 2405354), collected at Taisha, Prov. Morona-Santiago, Ecuador, elev. 450 m, 26 January 1962. "20' shrub. Peduncles red. Petals pale purplish; fruit pale green."

Paratypes: Colombia: Kjell von Sneidern A1332 (US), from Morelia, Caquetá, elev. 150 m, 14 Nov. 1941. "Height 5 m. Flowers pink"; J. A. Ewan 16743 (US), from near San Diego de Colorado above Puerto Asís, Putumayo, elev. 650 m, 11 January 1948. "Shrub 2-3 m". Ecuador, Prov. Napo: Harling, Storm, & Ström 6990 (GB, US), from Hacienda Cotapino (Concepción), elev. ca. 500 m, 19-20 February 1968. "Bush 2-3 m. Inflorescence white."

Miconia smaragdina has leaf blades barely (0.5-1 cm) pseudoplinerved, the connectives of the large stamens with only a ventral bilobulate appendage, and the anther pores in the small stamens terminal or ventro-terminal; the Ecuadorian population of M. smaragdina, with relatively narrower than typical leaf blades, occurs at somewhat higher elevations (1100-1500 m) than M. cazaletii. Miconia gracilis Triana, found in Ecuador only in the western lowlands, has basally nerved leaf blades

with laxer venule areoles, more prominent calyx lobes, and sparsely glandular stamen connective appendages. Miconia rivalis Wurdack has distinctly 5-nerved leaf blades rounded to cordulate at the base, small anthers with a ventrally inclined pore, and a more expanded stigma. The Ecuadorian collections of M. cazaletii were mentioned in the discussion of M. oligantha Wurdack (Phytologia 26: 6. 1973), which has different foliage and stamens. Harling, Storm, & Ström 7468 (GB, US, fruiting) has tentatively been referred to M. cazaletii, but shows sparse gland-tipped hairs along the primary leaf veins beneath and on the hypanthia. An apparently undescribed relative of M. cazaletii has been incompletely collected in Junín (Killip & Smith 26665, 26747) and Cuzco (Madison 10081, 10094), Peru; the bud stamens show expanded connective bases, but the leaves are sparsely fine-setulose above. The widespread and variable M. prasina (Sw.) DC. has not yet been found in Ecuador, but surely is to be expected (at least in the eastern lowlands); it differs from M. cazaletii in the laxer leaf venule areoles and the stamen connective appendages only ventral.

MICONIA ORARIA Wurdack, sp. nov.

M. rivali Wurdack in floribus affinis, foliorum subtus pubescentia discreta plus minusve persistenti differt.

Ramuli obtuse sulcato-quadrangulati sicut petioli foliorum subtus venae primariae inflorescentia hypanthiaque indumento appresso stellulato-lepidoto vix indiscreto omnino obtecti; linea interpetiolaris non evoluta. Petioli 3-5.5(-8) cm longi; lamina (11-)18-31 X (4.5-)8-17 cm elliptica vel paulo ovato-elliptica apice breviter (1-2 cm) hebeti-acuminato basi late acuta vel obtusa, firme membranacea et integra, supra glabrata, subtus densiuscule pilis stellulato-lepidotis appressis ca. 0.15 mm diam. induta, 5-nervata nervis secundariis plerumque 5-7 mm inter se distantibus nervulis subtus planis obscuris ob pilos occultis laxe reticulatis (areolis ca. 1-1.5 mm latis). Panicula 15-22 cm longa multiflora ramis primariis in quoque nodo duobus; flores 5-meri subsessiles non secundi, bracteolis ca. 1 mm longis angustis caducis. Hypanthium (ad torum) 1.9-2 mm longum; calycis tubus 0.3 mm longus, lobis interioribus ca. 0.3 mm altis remotis, dentibus exterioribus lobos interiores aequantibus. Petala 2 X 0.8-1 mm obovata glabra. Stamina paulo dimorphica glabra; filamenta 2-2.2 mm longa; antherarum thecae 1.6-1.8 vel 1.4-1.6 X 0.25 X 0.3 mm anguste oblongae, poro lato 0.25 mm diam. ventraliter inclinato; connectivum paulo (0.2-0.4 mm) prolongatum ad basim praesertim in stamina maiora expansum appendice 0.25-0.3 mm longa. Stigma expansum 0.5 mm diam.; stylus 5 X 0.15-0.2 mm glaber; ovarium 3-4- loculare et 1/2 inferum apice glabro.

Type Collection: B. Sparre 18349 (holotype S), collected in mangrove forest at El Chorro on Río San Antonio near San Lorenzo, Prov. Esmeraldas, Ecuador, 22 August 1967.

Paratype: E. L. Little 6306 (K, NY, US), from 3 km southeast of San Lorenzo, Esmeraldas, Ecuador, elev. ca. 1.3 m,

20 April 1943. "Tree 50 ft. in height, DBH 4 inches. Flowers white. Common in understory of rich virgin wet forest."

The lower leaf surfaces in very young leaves of M. rivalis have a coating of subamorphous-stellulate hairs which are soon deciduous; the blade margins are rather distinctly undulate-serrulate. Miconia oraria rather resembles M. idroboi Wurdack and M. argentea (Sw.) DC. (both with ancipital branchlets, somewhat larger foliar trichomes, and connective bases of the large stamens barely expanded), as well as M. elata (Sw.) DC. (with distinct interpetiolar ridges on the branchlets, undulate-serrulate leaf blades, barely undulate calyx limb, unexpanded connective bases, and moderately stellulate-puberulous ovaries which are 0.8-0.9 inferior). Possibly to be associated with M. oraria is a fruiting collection from El Valle, Colombia (Cuatrecasas & Willard 26011); from Chocó, Colombia, are two other fruiting or fragmentary collections (Triana 4074; Cuatrecasas & Llano 24078), which have the pubescence on the lower leaf surfaces very scanty, but otherwise suggestive of M. oraria.

MICONIA EMENDATA Wurdack, sp. nov.

M. sprucei Triana affinis, ramulorum internodis glabris foliis tenuioribus hypanthiis ad anthesim essentialiter glabris differt.

Ramuli paulo quadrangulati demum teretes primum sicut folia paulo furfuracei mox glabrati. Petioli 0.4-0.8 cm longi graciles; lamina (6-)7-12(-14) X (2-)3-4(-5) cm elliptica apice per 1-2.5 cm subabrupte caudato-acuminato basi acuta, membranacea et obscure distanterque undulato-serrulata, ubique ad maturitatem glabra, breviter (0.3-0.5 cm) 3-plinervata nervis secundariis principalibus ca. 0.3-0.4 cm inter se distantibus venulis subtus planis obscuris laxe reticulatis (areolis ca. 1 mm latis). Panicula 2-4 cm longa pauciflora; flores 5-meri, pedicellis plerumque 3-3.5 mm longis, bracteolis 0.4-0.5 X 0.1 mm linearibus persistentibus ca. 0.2 mm infra hypanthii basim insertis. Hypanthium (ad torum) ca. 2.4 mm longum; calycis tubus ca. 0.3 mm altus, lobis interioribus ca. 0.2 mm altis intus furfuraceis, dentibus exterioribus minutis lobos interiores aequantibus. Petala 2.5 X 0.9 mm obovato-oblonga ubique apicem versus modice granulosa. Stamina paullulo dimorphica glabra; filamenta 2.6-2.7 vel 2.5 mm longa; antherarum thecae 2.9-3 vel 2.5-2.6 X 0.3 mm subulatae poro 0.1 mm diam. dorsaliter inclinato; connectivum non vel vix (0.1 mm) prolongatum ventraliter non appendiculatum dorsaliter dente hebeti 0.1 vel 0.05 mm longo descendenti armatum. Stigma non expansum; stylus 5.5 X 0.2 mm glaber in ovarii collum 0.3 mm immersus; ovarium 3-loculare et 1/2-2/3 inferum apice sparse granuloso; fructus siccus paulo 10-costatus calyce persistenti.

Type Collection: G. Tessmann 5238 (holotype S; isotype NY), collected along "Stromgebiet des Maranon von Iquitos aufwärts bis zur Santiago-Mündung am Pongo de Manseriche," Depto. Loreto, Peru.

Paratypes (all Peru): Loreto: Soledad, Río Itaya, elev. 110 m, Killip & Smith 29709 (US). "Tree 10-12 feet"; Alto Río Itaya, elev. 145 m, Llewelyn Williams 3465 (US). Junín: Puerto Bermudez, elev. 375 m, Killip & Smith 26425 (US). "Shrub 12-15 ft." and 26503 (US). "Slender much-branched shrub."; San Nicolas, Pichis Trail, elev. 1100 m, Killip & Smith 25974 (US). "Tree 12-15 ft.; flower parts white."

Miconia sprucei, known to me from only one recent collection (Prance et al 15488, Río Uneiuxi, Amazonas, Brazil), has young branchlets, primary leaf veins beneath, inflorescences, and hypanthia moderately stellulate-puberulous, hypanthia plus calyx (dry) 3-3.5 mm long (rather than 2-2.5 mm, dry), and petals externally stellulate-puberulous (rather than granulose on both sides). Unfortunately the Uneiuxi material lacks stamens and style. In general aspect, M. emendata is rather like M. juruensis Pilger and M. amacurensis Wurdack, both of which have the stamen connectives bilobulate ventrally (as well as other individual deviations). Tessmann 5238 was collected at Soledad in June 1925 (fide the NY specimen) and was distributed as M. sprucei; most of the paratypes were distributed as Ossaea micrantha (Sw.) Macf.

MICONIA POORTMANNII (Cogn.) Wurdack, comb. nov.

Tococa poortmannii Cogn., DC. Mon. Phan. 7: 971. 1891.

Miconia espinosana Gleason, Phytologia 3: 28. 1948.

The holotypes for both the Cogniaux and Gleason names have been compared. The Poortmann collection was from Cisne on the Loja-El Oro border. Relatives of M. poortmannii include M. rimbachii Wurdack and M. inanis Cogn. & Gl. ex Gleason.

MICONIA OMBROPHILA Wurdack, sp. nov.

Sect. Amblyarrhena. M. inani Cogn. & Gl. ex Gleason affinis, foliorum subtus venulis arcte reticulatis floribus minoribus differt.

Ramuli primum quadrangulati demum teretes sicut folia inflorescentia hypanthiaque primum obscure amorpho-squamulosi mox glabrati. Petioli 1-1.8 cm longi; lamina 9-11.5 X 3-3.5 cm oblongo-elliptica apice per 1-1.5 cm acuminato basi acuta, firme membranacea et integra, 3-plinervata (nervis primariis lateralibus per 0.5-0.8 cm costa poculiforme coalitis) nervulis subtus planis areolis 0.3-0.5 mm latis. Panicula ca. 7 cm longa pauciflora, pedicellis ca. 5-6 mm longis et ca. 1 mm infra hypanthium articulatis, bracteolis deciduis non visis; flores 5-meri. Hypanthium (ad torum) 2.5 mm longum; calycis tubus 0.3 mm longus, lobis interioribus 1.2 mm longis triangularibus, dentibus exterioribus lobos interiores aequantibus vel paullulo (0.1 mm) excedentibus; torus intus glaber. Petala 4 X 3.3-3.6 mm oblongo-suborbicularia dense granulosa. Stamina essentialiter isomorphica; filamenta 3-3.8 mm longa modice glanduloso-puberula; antherarum thecae 2.2-2.3 X 1 X 1 mm oblongae et apicaliter dorsaliter curvatae, poro 0.15 mm diam. terminali; connectivum nec prolongatum nec appendiculatum. Stigma capitellatum 1.8-

2 mm diam.; stylus 6 X 0.7-0.8 mm modice glanduloso-puberulus in ovarii apicem 0.4 mm immersus; ovarium 5-loculare et ca. 2/3 inferum glabrum.

Type Collection: E. L. Little, Alberto Ortega, Alfredo Samaniego, & Francisco Vivar 632 (holotype US 2728825), collected in humid forest of the Cordillera Cutucú 5-10 km east of Logroño, 2° 37' S, 78° 6' W, Prov. Morona-Santiago, Ecuador, elev. 1200-1500 m, 7-9 Oct. 1975. "Arbol de 8 m, 10 cm diam."

Miconia inanis has lax (areoles mostly 1-1.5 mm wide) leaf venule reticulation and considerably larger flowers (hypanthium ca. 4.5 mm long, petals 6-6.5 X 4.5-5 mm, anthers 3-3.2 mm long); Miconia pausana Wurdack has thicker and relatively wider leaf blades, as well as smaller flowers (calyx lobes 0.5 mm long, petals 2 X 1.7-1.8 mm) with glandular ovary apices. In stamens and pistil, M. longisepala Gleason closely resembles M. ombrophila, but the Peruvian species differs in the smaller basally nerved leaf blades, much longer sepals, and somewhat larger petals.

ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXVII

Harold N. Moldenke

PAEPALANTHUS TRICHOPEPLUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 35: 130. 1977.

The Eitens encountered this plant in a natural open campo with "campo rupestre" vegetation, at 1100--1200 m. altitude.

Additional citations: BRAZIL: Minas Gerais: Eiten & Eiten 10986 (W--2799674).

PAEPALANTHUS TRICHOPHYLLUS (Bong.) Körn.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 879 (1960) and imp. 3, 2: 402. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 515, 581, & 959. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1160 & Ind. 12 & 21. 1972; Moldenke, Phytologia 35: 131. 1977.

This species is apparently based on L. Riedel 292 from "an trockenen, sandigen Stellen bei S. João d'El Rey", Minas Gerais, Brazil, collected in anthesis in July, and deposited in the Leningrad herbarium. An isotype in the Berlin herbarium was photographed there by Macbride as his type photograph number 10659. Bongard's original (1831) description is "Caulescens; caule subramoso, folioso; foliis caulinis amplexicaulibus, lanceolatis, acuminatis, mucronatis, subcarinatis, piloso-canescentibus; pedunculis terminalibus vaginisque pilosis". The plate "54", cited by Bongard, apparently was never actually published and probably exists only in the Leningrad herbarium or library. The Angely (1972) reference in the bibliography of this species is sometimes cited as "1970", the title-page date, but was not actually published until 1972.

Collectors have found this plant growing on campos, among rocks, on moist ground, and in damp places and bogs, at 1000--1200 meters altitude, flowering in February, March, April, July, and August. Harley and his associates found it growing in an area of burned-over grassland, marsh, and cutover woodlands, with rocky hillsides of talc and metamorphic rock.

Ruhland (1903) cites, probably from the Berlin herbarium: Minas Gerais: Glaziou 17307 & 18586, L. Riedel 292, and Schwacke 7246, 12182, & 14573. São Paulo: Glaziou 17843. Silveira (1928) cites A. Silveira 250 from Minas Gerais.

The species is similar in general appearance to P. acutipilus Alv. Silv., P. babyloniensis Alv. Silv., P. camptophyllus Ruhl., P. chrysophorus Alv. Silv., and P. flaccidus (Bong.) Kunth.

Citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16066 (Z); Lützelburg 98 (N, Qu), 98a (Mu, Z), 98b (Mu). Minas Gerais: Glaziou 17307 (Br); L. Riedel 292

[Macbride photos 10659] (B--isotype, N--photo of isotype, N--photo of isotype, W--photo of isotype).

PAEPALANTHUS TRUXILLENSIS Körn. in Mart., Fl. Bras. 3 (1): 406. 1863.

Synonymy: Dupatya truxillensis (Körn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya truxillensis Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 405, 406, 502, & 508. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 201, 207, 284, & 292. 1903; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 6, 31, & 55. 1946; Moldenke, Phytologia 2: 373. 1947; Moldenke, Alph. List Cit. 2: 352 (1948) and 3: 974. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 64 & 212. 1949; Moldenke, Phytologia 4: 206. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 72, 282, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Fifth Summ. 1: 126 & 486 (1971) and 2: 959. 1971; Moldenke, Phytologia 31: 383. 1975.

This species is based on Linden 297 from the "oberhalb dem Paramo von Agua de Obispo", at 3300 meters altitude, Trujillo, Venezuela, probably deposited in the Berlin herbarium. An isotype in the Vienna herbarium was photographed there by Macbride as his type photograph number 29996. Ruhland (1903) cites only the type collection.

Ruiz-Terán & López-Figueiros describe the plant as a "Hierba rosulada, caudicirrosuleto o acaulirrosuleto herbáceo, en prado pantanoso. Raíz axonomorfa, ortótropa, robusta, 10 cm. de largo. Cáudice ortótropo, de unas 10 cm. x 15--17 mm., negro pardusco, con raíces adventicias filiformes, del mismo color. Rósula densifoliada, hasta de 6--10 x 16 cm. Hojas sésiles, triangular-lineares o deltado-sublanceoladas o deltado-lineares a lanceolado-lineares, 4--9 cm. x 6--18 mm., agudas pero no espinescentes o espinascentes en el ápice, pilosas o pubescentes en ambas caras, más por el envés o más hacia el tercio proximal por el envés, o virtualmente glabras en ambas caras, ciliadas en los bordes, concoloras, verde intensas, las proximales (adultas) submates, angustihialinas y denticuladas en los bordes, blanco-pilosas. Escapos exsertos, 6--30 cm. de largo o más cortos, estriado-sulcados, pubescentes (sobre todo hacia el tercia distal), con 'bractea' o vaina, verdiamarillentos en el resto. Capítulos hemisféricos, 5--8 x 7--15 mm., con pelos blancos a blanquecino grisáceos. Flores blancas." They report it as frequent or moderately frequent on páramos, "cabecera semibos-cosa de la quebrada", and savannas at 2800--3400 meters altitude.

Additional citations: VENEZUELA: Apure: Ruiz-Terán & López-Figueiros 8860 (Tu). Mérida: Ruiz-Terán 7152 (Ac); Ruiz-Terán &

López-Figueiras 8623 (Kh, Ld). Táchira: Ruiz-Terán & López-Figueiras 1212 (Z), 8918 (Mi). Trujillo: Linden 297 [Macbride photos 29996] (B--isotype, N--photo of isotype, W--photo of isotype). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

PAEPALANTHUS TUBERCULATUS Alv. Silv., Fl. Serr. Min. 52. 1908.

Bibliography: Alv. Silv., Fl. Serr. Min. 52. 1908; Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 4. 1924; Alv. Silv., Fl. Mont. 1: 222--224 & 414, pl. 147. 1928; A. W. Hill, Ind. Kew. Suppl. 8: 169. 1933; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Worsdell, Ind. Lond. Suppl. 2: 184. 1941; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Phytologia 4: 206--207. 1953; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971; Moldenke, Phytologia 33: 146. 1976.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 147. 1928.

This species is apparently based on A. Silveira 365 from "In campis arenosis prope Capão Redondo, in Serra do Cipó", Minas Gerais, Brazil, collected in April, 1905, and deposited in the Silveira herbarium. In his 1928 work Silveira also cites a collection made by Brade "in campis montis Itataiai" in June of 1913. The latter collection appears to be Herb. Jard. Bot. Rio Jan. 1965. In the text of his 1928 work plate 147, illustrating P. tuberculatus, is erroneously cited under P. schwackeanus Ruhl.

Paepalanthus tuberculatus is apparently known thus far only from these two collections.

PAEPALANTHUS TUBEROSUS (Bong.) Kunth, Enum. Pl. 3: 508--509. 1841.

Synonymy: Eriocaulon tuberosum Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 629. 1831. Paepalanthus tuberosus Kunth apud Körn. in Mart., Fl. Bras. 3 (1): 377. 1863. Dupatya tuberosa (Bong.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya tuberosa Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902.

Bibliography: Bong., Ess. Monog. Erioc. 29--30. 1831; Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 629 (1831) and ser. 6, 3: 550, pl. 22. 1835; Steud., Nom. Bot., ed. 2, 1: 586. 1840; Kunth, Enum. Pl. 3: 508--509, 575, 576, 614, & 625. 1841; D. Dietr., Syn. Pl. 5: 260. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 278 & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 377, 400, & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879 (1893) and imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 201, 204, 284, 287, & 292. 1903; Alv. Silv., Fl. Mont. 1: 414. 1928; Stapf, Ind. Lond. 3: 91. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16, 31, 41, & 55. 1946; Moldenke, Known Geogr. Distrib.

Verbenac., [ed. 2], 88 & 212. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 103, 282, 293, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 879 (1960) and imp. 3, 2: 402. 1960; Moldenke, Phytologia 20: 303. 1970; Moldenke, Fifth Summ. 1: 168 & 486 (1971) and 2: 515 & 959. 1971; Moldenke, Phytologia 30: 40, 78, & 111 (1975) and 33: 48. 1976.

Illustrations: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 3: pl. 22. 1835.

This species is based on an L. Riedel collection from the Serra da Lapa, Minas Gerais, Brazil, collected in anthesis in November, and deposited in the Leningrad herbarium. Kunth (1841) comments that "Flores feminei haud observati. P. corymboso et melaleuco valde affinis. Distinguitur rhizomate crasso, tuberoso; foliis basi glabris (nec lanatis), pubescentibus (nec pilosis, nec ciliatis); pedunculis apice canescentibus et vaginis bifidis." This is almost a verbatim repetition of what Bongard (1831) also says. Ruhland (1903) cites the original collection and another Riedel collection from "auf kiesigen Campos bei Cachoeira", flowering in December, probably deposited in the Berlin herbarium. Silveira (1928) cites A. Silveira 491 from Diamantina, collected in 1908.

The P. Clausen 174, distributed as P. tuberosus, is actually P. aequalis (Vell.) J. F. Macbr., while P. Clausen s.n. [Aug.-April 1840] is P. lanceolatus Körn.

As far as I know, P. tuberosus is known only from the three collections mentioned above.

PAEPALANTHUS ULEANUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 146. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 127, 146, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 127. 1908; Lützelburg, Estud. Bot. Nordést. 3: 149 & 151. 1923; Herzog in Fedde, Repert. Spec. Nov. 20: 185. 1924; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Phytologia 4: 207. 1953; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971; Moldenke, Phytologia 29: 501 (1974) and 30: 105. 1975.

This species is based on Ule 4094 from rocky campos in the Serra dos Orgãos, Rio de Janeiro, Brazil, collected in October, 1896, and deposited in the herbarium of the Botanisches Museum in Berlin. Recent collectors have encountered it on moist granite at altitudes of 2000--2400 meters in those mountains, flowering in October and November, and fruiting in January.

Herzog asserts that the species is related to P. hispidissimus Herzog, while Ruhland (1903) claims that its affinity is with P. lundii Körn. It seems to me also to bear striking resemblance to P. elongatulus Ruhl. and P. ovatus Körn. Lützelberg asserts that it grows at altitudes of 2000 to 2300 meters, but is not characteristic of any particular habitat.

The Lützelburg 6584, distributed as P. uleanus in some herbaria, actually is P. ovatus Körn.

Citations: BRAZIL: Rio de Janeiro: Glaziou 17304 [U. S. Nat. Herb. photo 5886] (B, N—photo, P, P, P, P), 17321 (Br, N); Lützelburg 7222 (Mu); Segadas-Vianna 610 (N); Ule 4094 (B—type, Z—isotype).

PAEPALANTHUS UNCINATUS G. Gardn. in Hook., Icon. Pl. 6 [ser. 2, 2]: vi & viii, pl. 523. 1843.

Synonymy: Eriocaulon uncinatum (Gardn.) Steud., Syn. Pl. Glum. 2: [Cyp.] 281—282. 1855. Dupatya uncinata (Gardn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Eriocaulon uncinatum Steud. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 874, in syn. 1893. Dupatya uncinata Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902.

Bibliography: G. Gardn. in Hook., Icon. Pl. 6 [ser. 2, 2]: vi & viii, pl. 523. 1843; Walp., Ann. 1: 889. 1849; Steud., Syn. Pl. Glum. 2: [Cyp.] 281—282 & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 345 & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879 (1893) and imp. 1, 2: 402. 1894; N. E. Br., Trans. Linn. Soc. Lond. Bot., ser. 2, 6: 71. 1901; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 134, 221, 284, 288, & 292. 1903; Stapf, Ind. Lond. 4: 519. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 879 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16, 31, 41, & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 103, 282, 293, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 879 (1960) and imp. 3, 2: 402. 1960; Moldenke, Fifth Summ. 1: 168 & 486 (1971) and 2: 515 & 959. 1971; Moldenke, Phytologia 35: 34. 1976.

Illustrations: G. Gardn. in Hook., Icon. Pl. 6 [ser. 2, 2]: pl. 523. 1843.

This species is based on G. Gardner 5266 from sandy campos in the Diamantina district, Serro do Frio, Minas Gerais, Brazil, collected in August, 1840, and deposited in the herbarium of the Royal Botanic Gardens at Kew. Ruhland (1903) cites only the original collection and comments that the "species a. cl. Koernicke jure subgeneri Xeractidi Mart. adjungitur, in quo floribus ♂ glabris valde insignis". Thus far it is known only from the original collection.

PAEPALANTHUS UNDULATUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 150. 1903.

Synonymy: Paepalanthus damazioi Ruhl. ex Moldenke, Résumé Suppl. 1: 20, in syn. 1959 [not P. damazioi Beauverd, 1908]. Paepalanthus damazii Ruhl. ex Moldenke, Résumé Suppl. 1: 20, in syn. 1959.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 3, 128, 150, 151, & 292. 1903; Beauverd, Bull. Herb. Boiss., ser. 2, 8: 288. 1908; Prain, Ind. Kew. Suppl. 3: 127. 1908; Alv. Silv., Fl. Mont. 1: 414. 1928; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Résumé Suppl. 1: 20. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2:580 & 959. 1971; Moldenke, Phytologia 26: 246 (1973), 29: 315 (1974), and 30: 54 & 81. 1975.

This species is based on Glaziou 17844 from Pico d'Itabira do Campo, Minas Gerais, Brazil, collected in anthesis in December and deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10656. Macbride's photograph number 10592 is of Damazio 709, an isotype of P. damazioi Ruhl. and P. damazii Ruhl., also in the Berlin herbarium. The P. damazioi Beauverd is a valid species previously discussed in this series of notes.

Ruhland (1903) cites only the original collection and comments that the "Folia et pedunculi hirsuti insignia. In capitulis examinatis flores ♀ plures". He asserts that the species is closely related to P. vestitus Ruhl. It certainly bears close habital resemblance to P. barbulatus Herzog, P. leucoblepharus Körn., and P. lützelburgii Herzog. Recent collectors describe it as having inflorescences to 40 cm. tall, with grayish flowerheads, and found it to be frequent among rocks on steep rocky slopes at 1500 meters altitude, flowering and fruiting in February. Silveira (1928) cites A. Silveira 535 from the Serra do Curral, Minas Gerais, collected in 1905.

The M. A. Chase 10342, distributed as P. undulatus, actually is P. mexiae Moldenke.

Citations: BRAZIL: Minas Gerais: Damazio 709 [Macbride photos 10592] (B, N--photo, N--photo, W--photo); Glaziou 17844 [Macbride photos 10656] (B--type, N--photo of type, N--photo of type, W--photo of type, Z--isotype); Irwin, Maxwell, & Wasshausen 19524 (Au, N, W--2759043, Z).

PAEPALANTHUS URBANIANUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 188. 1903.

Synonymy: Paepalanthus urbanii Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 40. 1930.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 184, 188, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 127. 1908; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 40. 1930; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 77 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 592 & 959. 1971; Moldenke, Phytologia 28: 439 (1974), 29: 294 & 296 (1974), and 33: 29, 191, 192, 195, & 196. 1976.

This species is based on Glaziou 22318 from dry campos in the

Serra dos Veadeiros, Goiás, Brazil, collected in flower in January, and deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10657. Ruhland (1903) cites only the original collection and comments that "Species cum P. amoeno Koern. affinis, sed foliis facillime dignoscenda. P. specioso Koern. habitu jam diversa."

Recent collectors describe P. urbanianus as an erect subshrub, 0.8--1.5 m. tall, the stem much branched, and the flower-heads yellow. They have found it growing on campos and rocky campos, in areas of dense cerrado on hillsides and adjacent campo, on wet slopes in campo in areas of campo and cerrado, and in "cascalho úmido", often growing along with Xyris, at altitudes of 950--1500 meters, flowering from March to May and in August, fruiting in August. Héringer 10431 has very narrow leaves, while on Hatschbach 29948 and Mello Barreto 2487 they are extraordinarily broad. Mrs. Chase reports the plant as "stiffly erect, on open rocky steep slope characteristic of upper altitudes, 1100--1200 m." and found it in flower and fruit in March and April.

Material of this species has been misidentified, distributed in some herbaria, and even cited by me in previous installments of this series as P. acanthophyllus Ruhl., P. amoenus (Bong.) Körn., and P. speciosus Körn., to which taxa, as well as to P. cordatus Ruhl., it is obviously closely related.

Emended citations: BRAZIL: Distrito Federal: Héringer 10431 (N). Goiás: W. R. Anderson 7689 (N, Z); Glaziou 22318 [Macbride photos 10657] (B--type, Br--isotype, N--isotype, N--photo of type, N--photo of type, W--photo of type); Irwin, Harley, & Smith 32034 (N, W--2709596). Minas Gerais: M. A. Chase 9221 (W--1282186); Glaziou 19977 (C); Hatschbach 29948 (Ca--1385179, N); Kubitski 71-22 (Mu); Mello Barreto 2487 (N); L. B. Smith 7075 (N, W--2120225, W--2120226).

PAEPALANTHUS USTERII Beauverd, Bull. Herb. Boiss., ser. 2, 8: 295--297, fig. 12 A 1--13. 1908.

Synonymy: Paepalanthus usteri Beauverd apud Stapf, Ind. Lond. 4: 519. 1930.

Bibliography: Beauverd, Bull. Herb. Boiss., ser. 2, 8: 295--297, fig. 12 A 1--13. 1908; Prain, Ind. Kew. Suppl. 4, imp. 1, 170. 1913; Stapf, Ind. Lond. 4: 519. 1930; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Prain, Ind. Kew. Suppl. 4, imp. 2, 170. 1958; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 592 & 959. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1160 & Ind. 21. 1972.

Illustrations: Beauverd, Bull. Herb. Boiss., ser. 2, 8: 296, fig. 12 A 1--13. 1908.

This species is based on "No. 7 (in Herb. polytechn. S. Paulo) 'Charagua, pr. Sao Paulo; leg. A. Usteri, 4 fevrier 1907'" and deposited in the Herbier Boissier in Geneva. Beauverd (1908)

comments that the species is "Voisine du polymorphe Paepalanthus planifolius (Bong.) Koernicke" but that it "s'en distingué nettement par son port beaucoup plus réduit, ses feuilles plus coriacés, d'un vert glauque et à bords enroulés, ses pédoncules beaucoup moins nombreux, à gaines proportionnellement plus longues, et ses capitules 3--4 céphales beaucoup plus petits; seule l'analyse des fleurs accuse de grandes analogues avec celles du P. planifolius. -- Il se pourrait d'ailleurs que l'une des différences essentielles que nous avons remarquées chez les fleurs fût imputable à une cause accidentelle; l'extrémité des sépales mâles nous est toujours apparmue glabre chez la nouvelle espèce tandis qu'elle est ciliée de poils claviformes chez la plante de Koernicke, d'après la planche et cet auteur (tab. 52, fig. 2a), ces poils paraissent être très caducs et auraient du rester inaperçus dans notre spécimen. Néammoins, les autres caractères notés suffisent à justifier la valeur spécifique de cette plante que nous sommes heureux de dédier a son collecteur M. prof. Dr. A. Usteri, du Polytechnicum de São Paulo."

The Angely (1972) work referred to in the bibliography of this species is sometimes cited as "1970", the title-page date, which is incorrect.

The species is thus far known only from the original specimen.

PAEPALANTHUS VAGINANS Alv. Silv., Fl. Mont. 1: 166--167, pl. 106. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 166--167 & 414, pl. 106. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; A. W. Hill, Ind. Kew. Suppl. 9: 200. 1938; Worsdell, Ind. Lond. Suppl. 2: 184. 1941; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 & 486 (1971) and 2: 959. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 106. 1928.

The type of this species was collected "Secus margines capoeiras inter Itacambira et Juramento", Minas Gerais, Brazil, by Álvaro Adolpho da Silveira (no. 817) in July, 1926, and is deposited in the Silveira herbarium; on p. 414 of his work (1928) Silveira gives the type locality as "Itacambira". He comments that the "Species ob folia vaginantia ab omnibus speciebus Paepalanthi P. ocreato excepto valde distincta".

Thus far P. vaginans is known only from the original collection.

PAEPALANTHUS VAGINATUS Körn. in Mart., Fl. Bras. 3 (1): 313--314. 1863 [not P. vaginatus Mart., 1959].

Synonymy: Dupatya vaginata (Körn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya vaginata Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 313--314 & 506. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. &

Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 26, 166, 284, & 292. 1903; Alv. Silv., Fl. Mont. 1: 414. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16, 31, & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 103, 282, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 186, 187, & 191. 1969; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971.

This species is based on a Riedel collection (probably no. 1462) from "auf grasigem Boden der Serra do Caraça", Minas Gerais, Brazil, flowering in January, deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10661. I have personally seen and examined this specimen and have compared it with the photograph to be certain of their identity since the label accompanying Macbride's photograph is erroneously inscribed "Martius 874" and "Paepalanthus vellozioides Koern." On the other hand, Macbride's photograph number 10660, labeled as "Paepalanthus vaginatus", is actually a picture of P. vellozioides Körn. Silveira (1928) cites A. Silveira 334, collected in the Serra do Cipó, Minas Gerais, in 1905.

Irwin and his associates encountered P. vaginatus in wet ground at gallery margin in an area of gallery forest and adjacent cerrado, at 1300 meters altitude, and describe the plant as a "rosette herb, inflorescence to 30 cm. tall in bud".

The Glaziou collection cited below bears a printed label inscribed "Rio de Janeiro", but the collection was actually made on campos at São Vicente in Minas Gerais. Ruhland (1903) says of it "Secundum specimina Glazioviana, certissime ad hanc speciem pertinentia, diagnosis a cl. Koernicke data ita est supplenda: Folia juniora apice, praesertim supra, sparse et breviter puberula, mox calva; antherae demum rotundo-ovatae, hyalinae; flos ♀ : breviter pedicellatus; sepala 2, basi connata, obovata, obtusiuscula, concava, rigidula, ciliata, fusca; petala 2, libera, oblongo-spathulata, rotundato-obtusa, flavidula, apice hyalina et tenuimembranacea, ciliata; germen bicoccum; stylus brevis, stigmate 2, profunde bifida; appendices quam illa paullo breviores filiformes, apice papillosae. Receptaculum pilosum."

The P. vaginatus Mart., referred to in the synonymy above, is a synonym of Syngonanthus fischerianus (Bong.) Ruhl.

Citations: BRAZIL: Minas Gerais: Glaziou 15531 (B, Z); Irwin, Reis dos Santos, Souza, & Fonsêca 22825 (N, Z); L. Riedel 1462 [Macbride photos 10661] (B--type, N--photo of type, N--photo of type, Ut--382--isotype, W--photo of type). State undetermined: Weddell s.n. (P).

PAEPALANTHUS VARIABILIS Alv. Silv., Fl. Serr. Min. 49, pl. 17. 1908.

Bibliography: Alv. Silv., Fl. Serr. Min. 49, pl. 17. 1908; Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 4. 1924; Alv. Silv., Fl. Mont. 1: 142, 154—156, & 414, pl. 97 & 98. 1928; Stapf, Ind. Lond. 4: 519. 1930; A. W. Hill, Ind. Kew. Suppl. 8: 169. 1933; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Worsdell, Ind. Lond. Suppl. 2: 184. 1941; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Phytologia 20: 352. 1970; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971; Moldenke, Phytologia 30: 271. 1975.

Illustrations: Alv. Silv., Fl. Serr. Min. pl. 17. 1908; Alv. Silv., Fl. Mont. 1: pl. 97 & 98. 1928.

This species is based on A. Silveira 313 from "In campis locis siccis arenosisque in Serra do Cipó", Minas Gerais, Brazil, collected in April, 1905, and deposited in the Silveira herbarium. In a later publication, Silveira (1928) cites A. Silveira 366, also from the Serra do Cipó and also collected in 1905.

Recent collectors describe the plant as having inflorescences to 10 cm. tall and have found it growing on wet sandy campos and shady hillside campos, at 1300 meters altitude, flowering in February and April.

Silveira (1928) says that the "Species cum P. applanato Ruhl. valde affinis; sed pedunculis teretibus atque numerosis (usque 80) petalis in 8 speciminibus suppentibus florum femineorum intus pilosis et pilis supremis bracteorum perigoniorumque non tuberculatis distincta est."

The Mello Barreto 2522, distributed as P. variabilis, is actually P. amoenus (Bong.) Körn.

Citations: BRAZIL: Minas Gerais: Irwin, Maxwell, & Wasshausen 20230 (N); Pereira 2900 [Pabst 3726; Herb. Brad. 3836] (Bd); A. Silveira 313 (B—isotype, Z—isotype).

PAEPALANTHUS VARIABILIS var. GLABRESCENS Alv. Silv., Fl. Mont. 1: 156. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 156 & 415. 1928; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971.

This variety is based on A. Silveira 645 from "In campis arenosis in Serra do Cabral", Minas Gerais, Brazil, collected in 1917, and deposited in the Silveira herbarium. Silveira (1928) describes it as "A forma typica foliis longe ciliatis ceterum glabris et bracteis involucrantibus dorso solo pilis brevibus paucisque differt". It is know thus far only from the original collection.

PAEPALANTHUS VELLOZIOIDES Körn. in Mart., Fl. Bras. 3 (1): 401—402, pl. 51, fig. 2. 1863.

Synonymy: Dupatya velloziodes (Körn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya velloziodes Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Paepalanthus vellosioides Körn. ex Moldenke, Résumé 329, in syn. 1959; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 401—402, 499, & 507, pl. 51, fig. 2. 1863; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 23, fig. 12 A—D. 1888; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 201--204, 284, & 292, fig. 29 B—L. 1903; Saunders, Ann. Bot. 39: 157. 1925; Alv. Silv., Fl. Mont. 1: 415. 1928; Stapf, Ind. Lond. 4: 519. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16, 31, & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 103, 282, 329, & 490. 1959; Moldenke, Résumé Suppl. 1: 22. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Résumé Suppl. 18: 10. 1969; Moldenke, Fifth Summ. 1: 168 & 486 (1971) and 2: 591, 592, & 959. 1971; Moldenke, Phytologia 26: 138 & 240 (1973), 29: 301 (1974), 30: 40, 78, & 111 (1975), and 33: 48, 130, & 201. 1976.

Illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl. 51, fig. 2. 1863; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 23, fig. 12 A—D. 1888; Ruhl. in Engl., Pflanzenreich 13 (4-30): 204, fig. 29 B—L. 1903.

This species is based on three cotype collections: Martius 874 from Minas Gerais, Sellow 1368 from "Serra do Caraça, von Capanema bis Campo", and P. Clausen 96 from "ebendaselbst und auf den Gipfel des Berges Jaragua", both also in Minas Gerais, Brazil, and all deposited in the Berlin herbarium, where the Martius collection was photographed by Macbride as his type photograph number 10660, whose accompanying label unfortunately is inscribed "Riedel 1462" and "Paepalanthus vaginatus" in error. On the other hand, Macbride's photograph of the type of P. vaginatus (his photograph number 10661) is erroneously labeled "Martius 874" and "Paepalanthus vellozioides". A sheet of Martius s.n. in the Meisner Herbarium at the New York Botanical Garden also bears a label numbered "874" but is P. melaleucus (Bong.) Kunth. Martius 874 apparently was originally identified by Martius as P. spixianus Mart. and this binomial is included in the synonymy of P. vellozioides by Ruhland (1903), but in error. Paepalanthus melaleucus and P. spixianus appear to be valid species, not identical with, but certainly very similar to closely related to P. vellozioides.

Recent collectors have found P. vellozioides growing on campos and wet campos, at altitudes of 1200--1500 meters, flowering from November to February, as well as in May and August, and fruiting in November, January, and February. Irwin and his associates report the plant as having light-gray flowering heads and "forming large tufts on campo in areas of cerrado, sedge meadow (brejo), sandstone outcrops, and gallery forest", growing in dry sandy soil. The Eitens describe the heads as "light-gray around the edge, white in the center" and the plant as growing in clumps, "common on rocky knolls with very fine sand [which is] light-gray because of a small humus content". Anderson and his associates encountered it in sandy soil with sandstone in an area of forest along streams, adjacent rocky and grassy hillsides, and grassy campos on the tops of the hills.

Silveira (1928) cites A. Silveira 428 from the Serra do Caraça, collected in 1906. The labels for Anderson, Stieber, & Kirkbride 36092, distributed by the New York Botanical Garden, are inscribed "Paepalanthus bryoides (Riedel) Kunth. Det. H. N. Moldenke", but I never made any such determination! A clerical error in transcription must be involved here somewhere.

Paepalanthus vellozioides is closely related to and very similar to P. bromelioides Alv. Silv., P. corymbosus (Bong.) Kunth, P. lanceolatus Körn., P. melaleucus (Bong.) Kunth, and P. rigidulus Mart., with points of resemblance also to P. cacuminis Ruhl., P. hydra Ruhl., P. laxifolius Körn., P. sicaefolius Alf. Silv., etc., although Ruhland (1903) maintains that the "Species forma bractearum involucrantium insignis".

Material of P. vellozioides has been misidentified and distributed in some herbaria as P. bromelioides Alv. Silv., P. bryoides (Riedel) Kunth, P. lanceolatus Körn., P. spixianus Mart., and P. vaginatus Körn. On the other hand, the Macbride photograph number 10661, distributed as P. vellozioides, actually represents P. vaginatus Körn., while Eiten & Eiten 10922 is P. bromelioides Alv. Silv.

Citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 36092 (N, W--2709801); P. Clausen 96 (B--cotype); Costa 138 (Ja, N); Eiten & Eiten 6784 (W--2688355); Glaziou 15523 (Br); Irwin, Harley, & Onishi 29030 (N, W--2709818); Macedo 2995 (N, S, S); Magalhães Gomes & Schwacke 757 [Herb. Magalhães Gomes 757; Herb. Jard. Bot. Belo Horiz. 26678] (N); Maguire, Maguire, & Murça Pires 44680 (N, N); Martius 874 ["213"; Macbride photos 10660] (B--cotype, Br--cotype, Mu--cotype, N--cotype, N--photo of cotype, N--photo of cotype, W--photo of cotype); Mello Barreto 2478 (N); Occhioni & Occhioni s.n. [Herb. Fac. Nac. Farmac. 11421] (Z); L. Riedel s.n. [Serra do Caraça] (Br); Sellow 1368 (B--cotype). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B, B).

PAEPALANTHUS VELUTINUS Alv. Silv., Fl. Mont. 1: 145—147, pl. 91. 1928.

Synonymy: Paepalanthus vehetinus Alv. Silv., Fl. Mont. 1: pl. 91, sphalm. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 145—147 & 415, pl. 91. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; A. W. Hill, Ind. Kew. Suppl. 9: 200. 1938; Worsdell, Ind. Lond. Suppl. 2: 184. 1941; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Phytologia 2: 381. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103, 329, & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 592 & 959. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 91. 1928.

This species is based on A. Silveira 577 from "In pratis arenosis in Serra do Cabral", Minas Gerais, Brazil, collected in May, 1910, and deposited in the Silveira herbarium. Silveira (1928) comments that the "Species ob colorem formam bractearum involucrantium indumentum foliorum caulinorum etc. perbene distincta".

This species is known thus far only from the original collection.

PAEPALANTHUS VENETIFOLIUS Moldenke & Steyerm. ex Moldenke, Phytologia 31: 383, nom. nud. 1975; in press.

Bibliography: Moldenke, Phytologia 31: 383. 1975.

Citations: VENEZUELA: Bolívar: Steyermark, Espinoza, & Brewer-Carias 109405 (Z—type).

PAEPALANTHUS VENUSTOIDES Moldenke, Act. Biol. Venez. 2: 48—50. 1957.

Synonymy: Paepalanthus sp. Soukup, Biota 2: 302. 1959.

Bibliography: Moldenke, Act. Biol. Venez. 2: 48—50. 1957; Anon., Biol. Abstr. 32: 2917. 1958; Soukup, Biota 2: 302. 1959; G. Taylor, Ind. Kew. Suppl. 13: 98. 1966; Moldenke, Résumé 72 & 490. 1959; Moldenke, Fifth Summ. 1: 126 (1971) and 2: 959. 1971; Moldenke, Phytologia 31: 405. 1975.

Illustrations: Moldenke, Act. Biol. Venez. 2: 49. 1957; Soukup, Biota 5: 302. 1959.

Citations: VENEZUELA: Bolívar: Pannier & Schwabe s.n. [Auyantepui] (Ve); Vareschi & Foldats 4854 (N—type, Z—isotype).

PAEPALANTHUS VENUSTUS Moldenke, Mem. N. Y. Bot. Gard. 9: 281—282. 1957 [not P. venustus Alv. Silv., 1928 hyponym].

Bibliography: Alv. Silv., Fl. Mont. 1: pl. 232. 1928; Moldenke, Mem. N. Y. Bot. Gard. 9: 281—282. 1957; Moldenke, Résumé 72 & 490. 1959; G. Taylor, Ind. Kew. Suppl. 13: 98. 1966; Moldenke, Fifth Summ. 1: 126 (1971) and 2: 959. 1971.

The P. venustus of Silveira, referred to above, is a typographic error for Syngonanthus venustus Alv. Silv.

Citations: VENEZUELA: Bolívar: B. Maguire 32800 (Mu, N), 32840 (Mu—isotype, N—type), 32884 (N); J. A. Steyermark 74902 (Z).

[to be continued]

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DNA ANALYSIS OF FUNGAL WILD TYPES

AND SPACEFLIGHT PHENOTYPES

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Abstract: Ascospores of Chaetomium globosum and conidia of Trichophyton terrestre were exposed to ultraviolet light in space on board the flight of Apollo 16. Genome size of the space flown phenotype appeared larger than the wild type of each species based on the number of samples examined.

Introduction: Two wild type filamentous fungi, Chaetomium glosobum ATCC 6205 (Hsu et al., 1973a, 1973b) and Trichophyton terrestre CDC x285 (Hsu et al., 1974) were included for study in the Apollo 16 Microbial Ecology Evaluation Device (MEED) (Volz, 1975). During the transearth Extra Vehicular Activity (EVA), the MEED was deployed at a sun synchronous 90^{o} angle for 10 minutes 7 seconds to specific spaceflight parameters of ultraviolet light and energy levels according to the spaceflight hardware design (Taylor, 1970). Ground control and spaceflight ascospores and conidia were housed dry or in sterile distilled water in the cuvette hardware (Volz, 1974). After the exposure to space parameters the ascospores and conidia were returned to the laboratory in the MEED hardware and allowed to germinate for postflight evaluations (Volz et al., 1974).

Materials and Methods: One phenotype of each species in addition to the parent or ground control strain was selected for base ratio comparison and genome size evaluations. Phenotype T. terrestre 7085-4 was isolated from the spaceflight cuvette receiving light irradiation of 300 nm at 4.2×10^{4} ergs, while the C. globosum 6904-1 phenotype was exposed to full direct sunlight in space at 1.5×10^{7} ergs. The phenotype isolates were morphologically diverse from the parent wild types (Volz, 1973).

The isolates were maintained in culture tubes on Sabouraud's maltose agar and allowed to sporulate. The spores were harvested by washing and centrifugation, inoculated into one liter of Sabouraud's maltose broth in two liter Erlenmeyer flasks and shaken at room temperature for 72 hours. Mycelium was harvested and ground in liquid nitrogen which yielded DNA preparations with a high molecular weight suitable for analysis by buoyant density centrifugation and band velocity sedimentation (Storck and Alexopoulos, 1970).

DNA extraction and purification followed similar techniques previously described by Marmur (1961) and Villa and Storck (1968). The DNA was obtained from the nuclei by cellular disruption, centrifugation, deproteinization, RNase treatment, phenol extraction

and ethanol precipitation. The base composition of the DNA was determined from its buoyant density in CsCl (Meselson et al., 1957; Sawyer et al., 1975; Schildkraut et al., 1962). This method demonstrates a linear relationship between buoyant density and guanine - cytosine content of the DNA. All buoyant densities were related to that of Mucor bacilliformis.

The DNA samples were sheared in a French pressure cell, precipitated, redissolved, layered on a hydroxyapatite column for purification and dialyzed for molecular weight determinations (Dutta and Ojha, 1972). Procedures reported by Studier (1965) were used to determine the correlation between band sedimentation velocity, homogeneity, and number average molecular weight of the DNA fragments. The size of DNA fragments were determined by sedimentation coefficient methods (Studier, 1965). The molecular weights and average number of nucleotides per single stranded DNA fragment for the test organisms were: Chaetomium globosum, 1.19 x 10^5 and 236; Trichophyton terrestre, 1.05 x 10^5 and 324; Bacillus subtilis, 1.11 x 10^5 and 334. The Bacillus subtilis genome was used as the control estimate for accuracy comparison to the test species. Genome size of the test isolates was estimated from the proportionality relationship between the $Cot_{0.5}$ of the unknown (Britton and Kohne, 1968). The molecular weight standard used for B. subtilis was 2.0 x 10^9 daltons and the $Cot_{0.5}$ value was 0.7.

Results: Guanine - cytosine contents were calculated on the preflight control organisms to compare with previously reported data as well as with postflight phenotype results. Chaetomium globosum 6205, run with M. bacilliformis as the standard, had a calculated % GC of 51 as previously reported by Storck and Alexopoulos (1970) while Trichophyton terrestre 285 also exhibited a 51% GC base ratio which falls within the range reported for Deuteromycetes. Following spaceflight exposure, the %GC determinations were calculated for one phenotype each of C. globosum and T. terrestre. No significant differences in the GC base ratio were found between the phenotype and the parent.

Haploid genome DNA content determinations and reassociation studies were performed on one phenotype each of C. globosum and T. terrestre (Table 1). The melting temperature determining 50% of the total hyperchromicity of single stranded DNA fragments included T. terrestre wild type, 72.5° C and T. terrestre phenotype, 72.0° C 1/10 SSC (0.015 M NaCl + 0.0015 M trisodium citrate, pH 7.0); and C. globosum wild type, 90.7° C and C. globosum phenotype, 89.5° C 1 x SSC (1.5 M NaCl + 0.15 M trisodium citrate, pH 7.0). The reassociation of a pair of complementary sequences of the DNA of each organism was characterized by the value of Cot as shown in Fig. 1. The mean value of the separate experiments is presented in the data. Major repetitive DNA components of the control and test organisms were not detectable following the experimental technique of the second order rate plot for the renaturation of DNA (Wetmur

and Davidson, 1968). The $Cot_{0.5}$ values for the organisms were C. globosum wild type, 8; C. globosum phenotype, 8.6; T. terrestre wild type, 6.4; and T. terrestre phenotype, 7.1.

Discussion: The selection of the fungal species for the MEED spaceflight hardware was carried out in preflight studies at the NASA Johnson Space Center, Preventive Medicine Division. Criteria for species selection included the ability of the organism to survive constraints of the spaceflight hardware, the usefulness of the species for identifying change in the microorganisms incurred in space, previous space research in mycology related to the proposed studies, and ease of handling the organisms (Dublin and Volz, 1973). Preflight tests on numerous species representing most all major classes of fungi also assisted in selection of the flight organisms (Volz, 1974).

Chaetomium ascospores and Trichophyton conidia exposed to specific ultraviolet light irradiations in space of known wavelengths and intensities demonstrated variable survival rates and phenotype counts (Volz et al., 1974). Variations in hyphal morphology were also attributed to exposure to irradiation (Volz and Dublin, 1973). Significant variations occurred in fungal growth rates according to phenotype association with specific salivary samples of healthy individuals as control and to saliva from patients receiving radiation treatment for malignancies, protracted corticosteroid regimes for renal complications, and insulin therapy for diabetes mellitus. Host compromised saliva was less able to reduce growth rates of test fungi compared with normal saliva. As spaceflight environmental stress increased in irradiated cells, fungal growth decreased in the presence of salivary peroxidase activity.

Other studies indicate variation in space flown phenotypes from that of the wild type or ground control. A space flown phenotype of T. terrestre compared with the wild type differed in phospholipid content (Sawyer, 1975). Exposure of T. terrestre to specific spaceflight parameters resulted in a phenotype whose whole cell phospholipid content varied from that of the wild type. Preliminary results in other studies including nutritional requirements, exposure to antifungal drugs, induced lesions in mice and hamsters, and cell metabolites indicate change when characterizing the parent strain with phenotype cell isolates obtained from space flown cuvettes (Volz, 1975). In the current study phenotypes exhibiting diverse morphological variation from the parent wild type strains were selected for nuclear weight determinations and reassociation studies. Slight increases in genome size comparisons were observed, however, the differences fall within the experimental error of the analytical techniques.

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Table 1.

Genome size comparisons of the wild type and space flown phenotype (mean ± standard deviation)

Chaetomium globosum

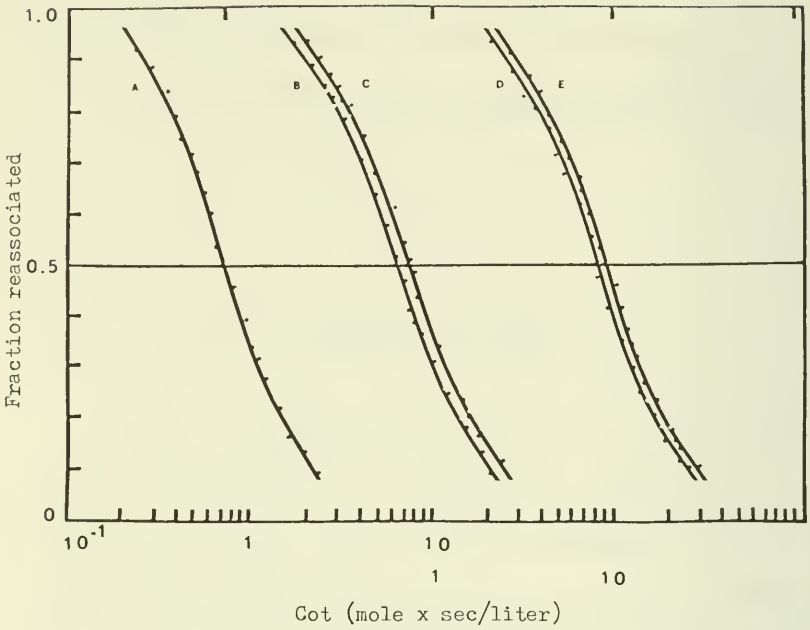
	wild type	phenotype
genome size (daltons)	$2.25 \pm 0.3 \times 10^{10}$	$2.41 \pm 0.16 \times 10^{10}$
nucleotide pairs	$3.36 \pm 0.49 \times 10^{7}$	$3.56 \pm 0.36 \times 10^{7}$
grams per haploid nucleus	$3.75 \pm 0.57 \times 10^{-14}$	$4.00 \pm 0.28 \times 10^{-14}$

Trichophyton terrestre

	wild type	phenotype*
genome size (daltons)	$1.77 \pm 0.06 \times 10^{10}$	2.00×10^{10}
nucleotide pairs	$2.57 \pm 0.12 \times 10^{7}$	3.05×10^{7}
grams per haploid nucleus	$2.93 \pm 0.16 \times 10^{-14}$	3.3×10^{-14}

*T. terrestre phenotype reassociation was only performed on one sample.

Figure 1.



Reassociation of double-stranded nucleic acids from A. B. subtilis, B. T. terrestre wild type, C. T. terrestre phenotype, D. C. globosum wild type, and E. C. globosum phenotype. Log 10 was duplicated to accommodate data.

THE TAXONOMIC SIGNIFICANCE OF CHROMOSOME NUMBERS AND GEOGRAPHY IN CRATÆGUS L.

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Crataegus L. is a relatively large genus of the Rosaceae-Pomoideae, incorporating some 200 species, with two chief centres of geographical distribution in North America and Europe-East Asia (Airy Shaw, 1973). The most comprehensive taxonomic treatment of the genus to date is that of Lange (1897), a synopsis of which is given in the following, with the N. American species indicated by an asterisk:

(A) LATERAL VEINS NEAR THE LEAF-BASE POINTING DOWNWARDS (RARELY HORIZONTAL)

I. Leaves (usually) glabrous

1. Fruit red:
   a. stipules caducous: C. cordata*, C. spathulata*, C. flabellata*, C. coccinea*, C. tiliaefolia*, C. intricata*.
   b. stipules persistent: C. sorbifolia, C. celsiana, C. pinnatifida, C. pinnatiloba, C. monogyna,
2. Fruit yellow or green:
   C. pruinosa*, C. altaica.
3. Fruit black or dark-coloured:
   C. dsungarica, C. platyphylla, C. rubrinervis, C. ambigua.

II. Leaves hirsute

1. Fruit red:
   C. apiifolia*, C. polyacantha, C. pycnoloba, C. laciniata, C. azarolus, C. tournefortii, C. orientalis.

2. Fruit yellow:
C. tanacetifolia.
3. Fruit black or dark-coloured:
C. melanocarpa, C. lambertiana, C. nigra.

(B) LATERAL VEINS OF LEAVES ASCENDING

I. Leaves glabrous

a. Fruit red:
aa. stipules caducous: C. crus-galli*, C. fontanesiana*, C. prunifolia*, C. arborescens*, C. rotundifolia*, C. macracantha*.
bb. stipules persistent: C. sanguinea, C. heterophylla, C. oxyacantha.
b. Fruit yellow:
C. glandulosa*, C. flava*, C. lavalléi*.
c. Fruit black or dark-coloured:
C. hiemalis, C. douglasii*.

II. Leaves hirsute or puberulent

a. Fruit red:
C. grandiflora*, C. punctata*, C. pyrifolia*, C. succulenta*, C. cuneata.
b. Fruit yellow:
C. uniflora*, C. dippeliana.

It is clear from this synopsis that the distinction between the two main groups (A and B) rests solely on the ambiguous difference in leaf venation, and that most of the smaller groups are geographically heterogeneous in that they include species from both centres of distribution.

More recently, copious cytological information in the form of chromosome numbers of Crataegus species has been accumulating, and it seemed worthwhile to put it to some taxonomic use in testing Lange's classification of the genus. Therefore, chromosome numbers of all 121 Crataegus species studied cytologically so far have been collected from the following sources: Longley (1924), Tischler (1950), Darlington and Wylie (1955), Löve and Löve (1961), Fedorov (1969) and Moore (1973). The basic chromosome number (x) has been claculated for the species and it soon became apparent that they have chromosomes either in multiples of 8 (32, 48, 64, 72), or in multiples of 17 (34, 51, 68), with 11 species whose reported chromosome counts conform with both values of x. Furthermore, data on the geographical distribution of each of

these species has been extracted from appropriate floras (e.g. Britton and Brown, 1947; Komarov, 1939) and the Index Kewensis, and pieced together with its value of x. A novel correlation between the two attributes of the plants has emerged and led to their re-arrangement into the two main groups (A' and B') given in Table 1, where the species with both values of x have been referred to one of the two groups according to their geographical distribution.

Table 1. Arrangement of 121 Crataegus species into two groups (A' and B'). * = a species with two basic chromosome numbers (8 and 17); ** = a N. American species placed among the non-American species of Group B'.

Group A' (75 spp.)

Species exclusively North American; x = 8:

Crataegus apposita Sarg.*, C. arnoldiana Sarg., C. asperifolia Sarg., C. assurgens Sarg., C. bartoniana Sarg., C. bealii Sarg., C. bissellii Sarg., C. boytoni Beadle, C. brunetiana Sarg., C. buckleyi Beadle, C. canbyi Sarg., C. chapmani Ashe, C. coccinioides Ashe, C. cognata Sarg.*, C. collina Chapm., C. cordata Soland, C. crus-galli L.*, C. cuprea Sarg., C. dacroides Sarg., C. delawarensis Sarg., C. delosii Sarg., C. diffusa Sarg., C. disperma Ashe, C. dodgei Ashe, C. douglasii Lindl.*, C. eamesii Sarge., C. exclusa Sarg., C. flabellata Sarg., C. flavida Sarg., C. fluviatilis Sarg., C. foetida Ashe, C. forbesae Sarg., C. fusca Sarg., C. hillii Sarg., C. holmesiana Ashe, C. inducta Ashe, C. infera Sarg., C. intricata Lange*, C. jackii Sarg., C. lanuginosa Sarg., C. lobulata Sarg., C. margaretta Ashe, C. meticulosa Sarg., C. modesta Sarg., C. mollis Scheele, C. nitida Sarg., C. padifolia Sarg., C. painteriana Sarg., C. pallens Beadle, C. palmeri Sarg., C. paucispina Sarg., C. pausiaca Ashe, C. peckii Sarg., C. pedicellata Sarg.*, C. pentandra Sarg., C. phaenopyrum Borckh., C. pinetorum Beadle, C. pringlei Sarg., C. punctata Jacq., C. pusilla Sarg., C. pygmaea Sarg., C. rotunda Sarg., C. rotundifolia Moench.*, C. sargenti Beadle, C. sera Sarg., C. sertata Sarg., C. smithii Sarg., C. stonei Sarg., C. tarda Sarg., C. tardipes Sarg., C. tomentosa L., C. treleasei Sarg., C. verecunda Sarg., C. vicina Sarg., C. wheeleri Sarg.

Table 1 (cont.)

Group B' (46 spp.)

Species mostly European and Asian; x = 17:

C. almaatensis Pojark., C. altaica Ledeb., C. armena Pojark., C. aronica (L.) Bosc. ex DC., C. atrocarpa Wolf, C. atrofusca Stev. ex Fisch., C. atrosanguinea Pojark., C. caucasica C. Koch, C. chlorosarca Maxim., C. crenulata Roxb., C. curvisepala Lindm., C. dahurica Koehne, C. deweyana Sarg.**, C. hissarica Pojark., C. lavalléi Hérincq.**, C. lawrencensis Sarg.**, C. maximowiczii C.K. Schneid., C. meyeri Pojark., C. microphylla C. Koch, C. monogyna Jacq.*, C. orientalis Pallas, C. oxyacantha L.*, C. pentagyna Waldst. et Kit., C. pinnatifida Bunge, C. pojarkovae Kossych, C. pontica C. Koch, C. pruinosa C. Koch*, C. pseudoambigua Pojark., C. pseudoazarolus Pojark., C. pseudoheterophylla Pojark., C. pseudomelanocarpa Popov ex Lincz., C. remotiloba Raikova ex Popov, C. sanguinea* Pallas, C. schraderiana Ledeb., C. songarica C. Koch, C. sphaenophylla Pojark., C. stankovii Kossych, C. stevenii Pojark., C. stipulosa Steud.**, C. submollis Sarg.**, C. taurica Pojark., C. tournefortii Griseb., C. turcomanica Pojark., C. turkestanica Pojark., C. ulotricha Pojark., C. uniflora Münchh.**.

Obviously, the two groups A' and B' in Table 1 are at variance with Lange's system as they cut across his two main groups (A and B) and most of their subordinate groups as well. The recognition of our two groups A' and B' is by no means a formal proposal for the subdivision of the genus Crataegus into 2 new sub-genera; it rather represents an indication of a long-neglected correlation between the geographical distribution and the chromosome numbers of the species that can be of potential taxonomic value pending an extensive investigation of the genus.

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NOTES ON NEW AND NOTEWORTHY PLANTS. XCVII

Harold N. Moldenke

CITHAREXYLUM GENTRYI Moldenke, sp. nov.

Arbor; foliis oppositis membranaceis ovatis petiolatis, laminis 13—19 cm. longis 5—8 cm. latis ad apicem acutis vel acuminatis ad basin abrupte acutis vel breviter acuminatis, supra in siccitate minute reticulato-rugulosis glabratis subtus in toto puberulis; inflorescentiis versus apicem sarmentorum aggregatis, racemis numerosis erectis tenuibus multifloris; floribus parvis; tubo corollae albae calycem aequante.

Small tree, to 10 m. tall; branches apparently slender, obtusely tetragonal, brownish, sulcate between the prominent angles, puberulent; leaves decussate-opposite, petiolate; petioles very slender, 1.7—1.9 mm. long, glabrate or microscopically puberulous; leaf-blades thinly membranous, rather uniformly green on both surfaces, ovate, 13—19 cm. long, 5—8 cm. wide, apically acute or acuminate, basally abruptly acute or shortly acuminate into the petiole apex, entire, rather shiny and conspicuously reticulate-rugose above and glabrate except for the larger venation, abundantly puberulent over the entire surface beneath; secondaries very slender and numerous, almost parallel, 8—12 per side, arcuately anastomosing near the margins; veinlet reticulation extremely fine and conspicuous on both surfaces; inflorescence aggregated toward the tip of the branchlets, comprising many pairs of very slender, erect, overlapping, many-flowered racemes; peduncles and rachis tetragonal, conspicuously striate, uniformly puberulent; bractlets absent (or caducous?); pedicels less than 1 mm. long, puberulent; flowers relatively small; calyx about 3 mm. long, campanulate, conspicuously striate during anthesis, minutely puberulous, the rim 5-toothed; corolla hypocrateriform, white, very fragrant with the odor of tuberose (Polianthes), the tube barely equaling the calyx, the lobes 1—1.3 mm. long, rounded, densely puberulent.

The type of this interesting species was collected by C. H. Dodson and A. Gentry (no. 6575) beside the gatehouse of the Río Palenque Biological Station at km. 56 on the road from Quevedo to Santo Domingo, at 150—220 m. altitude, Los Ríos, Ecuador, on October 7, 1976, and is deposited in my personal herbarium.

LANTANA ARISTATA var. LONGIPEDUNCULATA Moldenke, var. nov.

Haec varietas a forma typica speciei pedunculis maturis 5—6.5 cm. longis recedit.

This variety differs from the typical form of the species in having its peduncles much longer, usually 5—6.5 cm. in length during full anthesis.

The type of the variety was collected by Emil Hassler (no. 4619) somewhere in Paraguay and is deposited in the Britton Herbarium at the New York Botanical Garden.

LANTANA FIEBRIGII var. PUBERULENTA Moldenke, var. nov.

Haec varietas a forma typica speciei ramis ramulisque laminisque foliorum subtus dense puberulentis recedit.

This variety differs from the typical form of the species in having its branches, branchlets, petioles, peduncles, and lower leaf-surfaces merely densely puberulent.

The type of the variety was collected by James L. Luteyn, Kent P. Dumont, and Pablo Buritica (no. 4828) 28 km. from Bogotá on the Salto de Tecandama to El Colegio road, on the western slopes of the Cordillera Oriental, Cundinamarca, Colombia, at 2470 m. altitude, on January 13, 1976, and is deposited in the Britton Herbarium at the New York Botanical Garden. The leaves vary from 2 to 4 per node.

LANTANA FUCATA var. LONGIPES Moldenke, var. nov.

Haec varietas a forma typica speciei pedunculis maturis usque ad 10 cm. longis recedit.

This variety differs from the typical form of the species in its peduncles being much longer, usually to 10 cm. in length during full anthesis.

The type of the variety was collected by Raulino Reitz and Roberto M. Klein (no. 7281) in "capoeira" at Matador, at 350 m. altitude, Rio Grande do Sul, Brazil, on October 16, 1958, and is deposited in the Britton Herbarium at the New York Botanical Garden.

PAEPALANTHUS CONVEXUS var. STRIGOSUS Moldenke, var. nov.

Haec varietas a forma typica speciei pedunculis dense antrorseque albido-strigosis recedit.

This variety differs from the typical form of the species in having its peduncles densely antrorsely strigose or substrigose with white or whitish appressed or subappressed hairs.

The type of the variety was collected by João Murça Pires (no. 21; Herb. IPEAN 14998) in the Serra Aracá, Amazônas, Brazil, on February 10, 1975, and is deposited in my personal herbarium.

VITEX EXCELSA var. PETIOLATA Moldenke, var. nov.

Haec varietas a forma typica speciei foliolulis maturis distincte petiolulatis recedit.

This variety differs from the typical form of the species in having its mature leaflets distinctly petiolulate, the blades being cuneate at the base and the petiolules to 1 cm. long.

The type of the variety was collected by Antonio Aróstegui V. (no. 75) in a wet tropical forest at Santa Maria, on the Río Nanay, prov. Maynas, Loreto, Peru, at 150 m. altitude, on November 29, 1962, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collector refers to it as a tree 111.5 feet tall, the trunk diameter 36 inches, and records the vernacular name "quinilla colorado".

ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXVIII

Harold N. Moldenke

PAEPALANTHUS VESTITUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 150--151. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 128, 150--151, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 127. 1908; Alv. Silv., Fl. Mont. 1: 415. 1928; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971; Moldenke, Phytologia 31: 385 (1975) and 35: 257. 1977.

The type of this species was collected by Peter Clausen "auf dem Gipfel des Itabira", Minas Gerais, Brazil, and is no. 151823 in the Reichenbach f. herbarium in Vienna, where it was photographed by Macbride as his type photograph number 29997. Ruhland (1903) cites only this original collection and comments that the "Species, praesertim foliorum indumento insignis, P. undulato Ruhl. proxima esse videtur. Flores ♀ quam ♂ in capitulis examinatis plures". Silveira (1928) cites A. Silveira 473 from the same Pica de Itabira locality, collected in 1907. Belém encountered the plant on humid campos and describes it as 20 cm. tall.

Citations: BRAZIL: Espirito Santo: Belém 3838 (N, Z). Minas Gerais: P. Clausen s.n. [1843; Macbride photos 29997] (B--isotype, N--photo of type, W--photo of type, Z--isotype).

PAEPALANTHUS VESTITUS var. CAULESCENS Moldenke, Phytologia 31: 232--233. 1975.

Bibliography: Moldenke, Phytologia 31: 232--233 & 385. 1975.

Citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15472 (Z--type).

PAEPALANTHUS VIGIENSIS Moldenke, Phytologia 3: 170--171. 1949.

Bibliography: Moldenke, Phytologia 3: 170--171 (1949) and 4: 207. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 176. 1953; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971.

Additional citations: BRAZIL: Pará: Black & Ledoux 50-10568 (Z); Murça Pires 1398 (Be--36529--isotype), 6046 (Z).

PAEPALANTHUS VILLIPES Moldenke, Phytologia 3: 171--172. 1949.

Bibliography: Moldenke, Phytologia 3: 171--172 (1949) and 4: 207. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 176. 1953; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971.

Recent collectors have encountered this species on artificial campos, flowering in July and August.

Additional citations: BRAZIL: Pará: Black 48-3278 (Be--37770--

isotype); Black & Smith 56-18824 (Bm); Ducke 12569 (Bs); W. A. Egler 336 [Black 19679] (Z), 1103 [Herb. Mus. Goeldi 23883] (Mm); Egler & Raimundo s.n. [W. A. Egler 792; Herb. Mus. Goeldi 23631] (Mm); Goeldi 15066 [Herb. Mus. Goeldi 5066] (Bs); Herb. Mus. Goeldi 9800 (Bs); Murça Pires 4082 (Z); N. T. Silva 149 (Be--42554).

PAEPALANTHUS VILLOSULUS Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 400--401. 1863.

Synonymy: Dupatya villosula (Mart.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya villosula Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Paepalanthus villosus Mart. apud Alv. Silv., Fl. Mont. 1: 230 [as "villoso"]. 1928 [not P. villosus (H.B.K.) Kunth, 1969].

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 280, 400--401, & 507. 1863; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 22. 1888; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 201, 204, 284, & 292. 1903; Alv. Silv., Fl. Mont. 1: 230, 231, & 415. 1928; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 40. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Eriocaul. 16, 31, & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 103, 282, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Phytologia 20: 304. 1970; Moldenke, Fifth Summ. 1: 168 & 486 (1971) and 2: 592 & 959. 1971; Moldenke, Phytologia 30: 42 & 111 (1975) and 33: 48. 1976.

This species is based on a Martius unnumbered collection from "in montibus altioribus" in Minas Gerais, Brazil, and deposited in the Munich herbarium where it was photographed by Macbride as his type photograph number 18732. Körnicke (1863) also cites Glaziou 19965 and Wied-Neuwied s.n. from the same state, the Glaziou collection from campos near Diamantina. It has been collected in flower in April and bears considerable habital resemblance to P. bromelioides Alv. Silv., P. cacuminis Ruhl., P. corymboides Ruhl., P. corymbosus (Bong.) Kunth, P. hydra Ruhl., P. lanceolatus Körn., P. laxifolius Körn., P. mellaleucus (Bong.) Kunth, P. pauciflorus Körn., P. rigidulus Mart., P. spixianus Mart., P. tuberosus (Bong.) Kunth, and P. vellozioides Körn.

Silveira (1928) cites A. Silveira 780 from the Serra Geral, Minas Gerais, collected in 1926.

Citations: BRAZIL: Minas Gerais: Martius s.n. [in montibus altioribus prov. min. general.; Macbride photos 18732] (B--isotype, Mu--type, Mu--isotype, Mu--isotype, N--photo of type, W--photo of type, Z--isotype), s.n. [Habit. in campis elatis arenosis distr.

diamantium variis locis] (Mu); Mello Barreto 9497 [Herb. Jard. Bot. Belo Horiz. 23736] (N). State undetermined: Herb. Zuccarini s.n. [Brasilia] (Mu). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

PAEPALANTHUS VIRIDIPES Alv. Silv., Fl. Mont. 1: 115—116, pl. 71. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 115—116 & 415, pl. 71. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; A. W. Hill, Ind. Kew. Suppl. 9: 200. 1938; Worsdell, Ind. Lond. Suppl. 2: 184. 1941; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 71. 1928.

This species is based on A. Silveira 831 from "Sub rupibus inter Itacambira et Juramento", Minas Gerais, Brazil, collected in July, 1926, and deposited in the Silveira herbarium. On page 415 of his work, Silveira (1928) gives "Itacambira" as the tupe locality. Thus far, the species is known only from the original collection.

PAEPALANTHUS VIRIDIS Körn. in Mart., Fl. Bras. 3 (1): 355—356. 1863.

Synonymy: Dupatya viridis (Körn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya viridis Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Paepalanthus virides Körn. apud Alv. Silv., Fl. Mont. 1: 415, sphalm. 1928.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 355—356 & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 153, 162, 284, & 292. 1903; Alv. Silv., Fl. Mont. 1: 415. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16, 31, & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 88 & 212. 1949; Moldenke, Phytologia 4: 207. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 103, 282, 329, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Fifth Summ. 1: 168 & 487 (1971) and 2: 592 & 959. 1971; Moldenke, Phytologia 30: 35 & 37 (1975) and 35: 125. 1977.

This species is based on G. Gardner 2331 and 2332, both from an undesignated locality in Piauí, Brazil, probably deposited in the Munich herbarium. Macbride photographed a duplicate of G. Gardner 2331 in the Geneva herbarium as his type photograph number 25178. Ruhland (1903) cites only the two original collections, but Silveira (1928) cites an "Ubi ? N. 626", probably from Minas Gerais.

Irwin and his associates describe this species as "plants 7 cm. tall, heads light-brown" and found it growing in wet campos in an

area of cerrado interspersed with wet rocky campos, at 950 meters altitude, flowering and fruiting in February. Some of the Irwin, Reis dos Santos, & Fonsêca 23353 material was originally distributed to some herbaria under the mixed label of Irwin, Onishi, Fonsêca, Reis dos Santos, & Ramos 25353 on which the plant was described as "a slender twining vine to ca. 2 m. long. Corolla yellow-green" — the description being an obvious clear indication of mixed labels.

Material of P. viridis has been misidentified and distributed in some herbaria as P. lamarckii Kunth and P. tortilis (Bong.) Mart., species to which it is obviously closely related and very similar in habit. It also closely resembles P. cearensis Ruhl.

Additional citations: BRAZIL: Minas Gerais: Irwin, Reis dos Santos, & Fonsêca 23353 (N, Z). Pernambuco: Pickel 2772 (N, S). Piauí: G. Gardner 2331 [Macbride photos 25178] (B--cotype, N--photo of cotype, W--photo of cotype), 2332 (B--cotype). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

PAEPALANTHUS VIRIDULUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 165. 1903.

Synonymy: Paepalanthus cephalopus Alv. Silv. & Ruhl. ex Ruhl. in Engl., Pflanzenreich 13 (4-30): 165. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 164, 165, 289, & 292. 1903; Ruhl. in Beauverd, Bull. Herb. Boiss., ser. 2, 8: 293. 1908; Prain, Ind. Kew. Suppl. 3: 126. 1908; Alv. Silv., Fl. Mont. 1: 127, 404, & 415. 1928; Moldenke, Known Geogr. Distrib. Erioc. 11, 16, 46, & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 82, 89, 208, & 212. 1949; Moldenke, Résumé 96, 103, 486, & 490. 1959; Moldenke, Résumé Suppl. 1: 6, 20, & 25. 1959; Moldenke, Fifth Summ. 1: 168 & 579 (1971) and 2: 959. 1971; Moldenke, Phytologia 26: 246 (1973), 29: 326 (1974), and 30: 340. 1975.

This species was based by Ruhland (1903) on two collections: (1) H. de Magalhães 1374, collected in the Serra de Ibitipoca in June, 1894, and (2) Schwacke 12305, collected "an feuchten, sandigen Stellen unter Felsen", also in the Serra de Ibitipoca, at 1070 meters altitude, Minas Gerais, Brazil, deposited in the Berlin herbarium. Magalhães 1374 is also the type collection of P. cephalopus, also deposited in the Berlin herbarium.

Of P. viridulus Ruhland (1903) says "Species habitu P. viridi Koern. similis, sed multis notis ab eo differt". For P. cephalopus he notes "Species habitu illi subgeneris Stephanophylli (cfr. Leiothrix) similis, graciliter late repit." He separates these taxa as follows:

"Caulis paullum elongatus; folia temui-membranacea
Sepala floris ♀ obtusa.....P. filosus
Sepala floris ♀ acutiuscula.....P. viridulus
Caulis perbrevis; folia fere rigidulo-membranacea.P.cephalopus

As P. viridulus Silveira (1928) cites A. Silveira 342 from the same Serra de Ibitipoca, and for P. cephalopus he cites Magalhães 238, also from Serra de Ibitipoca, both in the Silveira herbarium.

Citations: BRAZIL: Minas Gerais: H. de Magalhães 1374 (B--cotype, B--cotype, Z--cotype); Schwacke 12305 (B--cotype, Z--cotype).

PAEPALANTHUS VISCOSUS Moldenke, Bull. Torrey Bot. Club 68: 70. 1940.

Bibliography: Moldenke, Bull. Torrey Bot. Club 68: 70. 1940; Moldenke, Known Geogr. Distrib. Erioc. 7 & 55. 1946; Moldenke, Alph. List Cit. 1: 12 (1946) and 2: 461. 1948; Moldenke in Maguire & al., Bull. Torrey Bot. Club 75: 200. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 67 & 212. 1949; Moldenke, Alph. List Cit. 3: 702 (1949) and 4: 1072 & 1114. 1949; Moldenke, Phytologia 4: 207. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 176. 1953; Anon., U. S. Dept. Agr. Bot. Subj. Index 5: 4227. 1958; Moldenke, Résumé 77 & 490. 1959; Lindeman & Görts-van Rijn in Pulle & Lanjouw, Fl. Surin. 1 [Meded. Konink. Inst. Trop. 30, Afd. Trop. Prod. 11]: 331 & 333. 1968; Moldenke, Fifth Summ. 1: 132 (1971) and 2: 959. 1971.

The original publication of this species is sometimes cited as "1941" — the title-page date — but the number containing this paper actually was issued and distributed in the latter days of 1940. Lindeman & Görts-van Rijn (1968) cite Archer 2836 (the type collection) and "Maguire 23665" and "Maguire 24979" from Surinam.

Additional citations: SURINAM: Maguire & Stahel 24979 (S, Se--182993).

PAEPALANTHUS WARMINGIANUS (Körn.) Körn. ex V. A. Pouls., Vidensk. Meddel. Naturh. For. Kjøbenh. 40 [ser. 4, 9]: 223 & 313--321. 1838.

Bibliography: C. Müll. in Just, Bot. Jahresber. 16 (1): 770. 1888; V. A. Pouls., Vidensk. Meddel. Naturh. For. Kjøbenh. 40 [ser. 4, 9]: 223 & 313--321. 1888; Ruhl. in Engl., Pflanzenreich 13 (4-30): 223 & 292. 1903; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Phytologia 2: 374 & 381. 1947; Moldenke, Alph. List Cit. 3: 731. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 89 & 212. 1949; Moldenke, Phytologia 4: 207. 1953; Moldenke, Résumé 103, 294, 329, & 490. 1959; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 149, 160, 161, 166, & 174. 1969; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 518, 592, & 959. 1971; Moldenke, Phytologia 26: 233. 1973.

This species is based on Glaziou 5455 from Minas Gerais, Brazil, deposited in the Copenhagen herbarium, where it was photographed by Macbride as his type photograph number 22296. It should be noted that the involucral bractlets are obscurely acute and the peduncles glabrous. Poulson (1888) gives a detailed anatomical description. Ruhland (1903) merely cites "Brasilien (Glaziou)" and comments only that "V. A. Poulson....anatomice speciem describit;

P. Oerstediano Koern. similem esse clamat".

The Mexia 5881, distributed as and previously cited by me as P. warmingianus, is actually P. comans Alv. Silv.

Additional citations: BRAZIL: Minas Gerais: Glaziou 5455 [Macbride photos 22296] (N--photo of type, W--photo of type).

PAEPALANTHUS WEBERBAUERI Ruhl. in Urb., Engl. Bot. Jahrb. 37: 519--520. 1906.

Bibliography: Ruhl. in Urb., Engl. Bot. Jahrb. 37: 519--520. 1906; Prain, Ind. Kew. Suppl. 4, imp. 1, 170. 1913; J. F. Macbr., Field Mus. Publ. Bot. 13 (363): 490, 491, & 493--494. 1936; Moldenke, Known Geogr. Distrib. Erioc. 7 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 73 & 212. 1949; Anon., U. S. Dept. Agr. Bot. Subj. Index 5: 4227. 1958; Prain, Ind. Kew. Suppl. 4, imp. 2, 170. 1958; Moldenke, Résumé 84 & 490. 1959; Soukup, Biota 2: 302. 1959; Moldenke, Fifth Summ. 1: 142 (1971) and 2: 959. 1971.

This species is based on Weberbauer 1152 and 1326, the former from "Zwischen dem tambo Yumcacoya und dem tambo Cachicachi, am Weg von Sandia nach Chunchusmayo, feuchte Plätze am Rande von Gesträuch, 1800--2200 m.....Blühend am 8. Juni", and the latter from "Ramaspata, offene, feuchte Plätze zwischen Gesträuch, 2500 m.....Blühend am 27. Juli", San Martín, Peru, deposited in the Berlin herbarium. Macbride (1936) cites only the original collections and gives the locality of the second cotype collection as "Pamaspata". Ruhland (1903) comments that the "Species P. diplobetori Ruhl. subsimilis, sed praeter cetera caule et foliis perbene ab illo distincta".

Citations: PERU: San Martín: Weberbauer 1152 [Macbride photos 10662] (B--cotype, B--cotype, N--photo of cotype, N--photo of cotype, W--photo of cotype, Z--cotype), 1326 (B--cotype).

PAEPALANTHUS WEDDELLIANUS Körn. in Mart., Fl. Bras. 3 (1): 317--318. 1863.

Synonymy: Dupatya weddelliana (Körn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya weddelliana Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 317--318 & 506. 1863; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 184, 188, 284, & 292. 1903; Alv. Silv., Fl. Mont. 1: 192. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16, 31, & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 89 & 212. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 103, 282, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 148, 159--161, 174, & 186--189. 1969;

Moldenke, Fifth Summ. 1: 168 & 487 (1971) and 2: 959. 1971; Moldenke, Phytologia 26: 481 (1973) and 33: 191. 1976.

This species is based on Weddell 2927 from "in Sümpfen auf felsigem Boden bei As Lages", Goiás, Brazil, probably deposited in the Munich herbarium. Ruhland (1903) cites only the original collection and notes that the "Species mihi ignota P. specioso valde affinis esse videtur". Actually, it is one of that large group of very similar-appearing species (in the herbarium, at least): P. acanthophyllus Ruhl., P. amoenus (Bong.) Körn. [to which it seems closest in overall habit], P. bifrons Alv. Silv., P. brasiliensis (Mart.) Mart., P. ciliatus (Bong.) Kunth, P. clausseniamus Körn., etc. It is known thus far only from the original collection.

Citations: BRAZIL: Goiás: Weddell 2927 (Br--isotype, N--isotype, N--photo of isotype, Z--photo of isotype).

PAEPALANTHUS WILLIAMSII Moldenke, Phytologia 2: 367--368. 1947.

Bibliography: Moldenke, Phytologia 2: 367--368, 373, & 381. 1947; Moldenke, Alph. List Cit. 4: 1132. 1949; Moldenke, Known Geogr. Distrib. Erioc. 64 & 212. 1949; Moldenke, Mem. N. Y. Bot. Gard. 8: 89. 1963; Moldenke, Phytologia 4: 207. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 176. 1953; Moldenke, Résumé 68, 72, 103, & 490. 1959; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 148--151, 160--165, 176--179, 184--187, & 191, fig. 30, 34 A--C, 36 I & J, & 37 I & J. 1969; Moldenke, Fifth Summ. 1: 119, 126, & 168 (1971) and 2: 959. 1971.

Illustrations: Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 150, 164, 176, & 178, fig. 30, 34 A--C, 36 I & J, & 37 I & J. 1969.

This savanna species has been encountered by recent collectors at altitudes of 120--425 meters, in flower in July and from September to January, in fruit in March. Maguire and his associates refer to it as "locally abundant" at the edges of savannas, an "occasional herb" in moist places at the borders of savannas, "infrequent" in wet places, "occasional" in savannas and scrub savannas, and "rare" on sabanitas.

Additional citations: COLOMBIA: Vaupés: Maguire, Wurdack, & Keith 41846 (N); Schultes, Baker, & Cabrera 18166 (Ss), 18383 (W--2172144, Z). VENEZUELA: Amazonas: Maguire, Cowan, & Wurdack 30463 (N, Ve), 30806 (N, W); Maguire & Wurdack 34549 (N); Maguire, Wurdack, & Keith 41757 (N, N, S); Ll. Williams 15051 (F--1189141--isotype, It--isotype, W--1878072--isotype). BRAZIL: Amazônas: Fróes 33200 (Bm); Schultes & López 10336 (Be--60232, W--1997118). Pará: Ducke 8690 (Gl), 16484 (Bs); Egler & Raimundo s.n. [W. A. Egler 955; Herb. Mus. Goeldi 23629] (Mm); Fróes 29934 (Hk); Murça Pires, Black, Wurdack, & Silva 6183 (N).

PAEPALANTHUS WURDACKI Moldenke, Phytologia 9: 187--188. 1963.

Synonymy: Paepalanthus wurdackii Moldenke, Résumé Suppl. 12:

12, in syn. 1965; G. Taylor, Ind. Kew. Suppl. 14: 97. 1970.

Bibliography: Moldenke, Phytologia 9: 187—188. 1963; Moldenke, Résumé Suppl. 7: 5. 1963; Hocking, Excerpt. Bot. A.7: 455. 1964; Moldenke, Biol. Abstr. 45: 2772. 1964; Soukup, Biota 5: 194. 1964; Moldenke, Résumé Suppl. 12: 12. 1965; G. Taylor, Ind. Kew. Suppl. 14: 97. 1970; Moldenke, Fifth Summ. 1: 142 (1971) and 2: 592 & 959. 1971.

Additional citations: PERU: Amazonas: Wurdack 1081 (N--isotype, S--isotype, W--2403675--type, Z--isotype).

PAEPALANTHUS XANTHOPUS Alv. Silv., Fl. Mont. 1: 70—72, pl. 41. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 70—72 & 415, pl. 41. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; A. W. Hill, Ind. Kew. Suppl. 9: 200. 1938; Worsdell, Ind. Lond. Suppl. 2: 184. 1941; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 89 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 41. 1928.

This species is based on A. Silveira 589 from "In campis prope rivulum Pedra Pintada, in Serra do Cabral", Minas Gerais, Brazil, collected in June, 1910, and deposited in the Silveira herbarium. Silveira (1928) comments that the "Species capitulis magnis simmitate densissime villosis et bracteis involucrantibus hirsutis extimisque longis pulchra et perbene distincta". It is known thus far only from the original collection.

PAEPALANTHUS XIPHOPHYLLUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 218—219. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 214, 218-219, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 127. 1908; Alv. Silv., Fl. Mont. 1: 246. 1928; Moldenke, Known Geogr. Distrib. Erioc. 16 & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 89 & 212. 1949; Moldenke, Résumé 103 & 490. 1959; Moldenke, Fifth Summ. 1: 168 (1971) and 2: 959. 1971; Moldenke, Phytologia 26: 235 (1973) and 30: 41. 1975.

This species is based on a collection made by E. B. Sena [Herb. Schwacke 14678] in the Serra da Gansavelha, Minas Gerais, Brazil, deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10663. The species is known thus far only from the original collection.

Citations: BRAZIL: Minas Gerais: Sena s.n. [Herb. Schwacke 14578; Macbride photos 10663] (B--type, N--photo of type, N--photo of type, W--photo of type, Z--isotype).

PAEPALANTHUS YUCCA Ruhl. ex Moldenke, Phytologia 7: 120—121. 1960.

Bibliography: Moldenke, Phytologia 7: 120—121. 1960; Moldenke, Biol. Abstr. 35: 2177. 1960; Moldenke, Résumé Suppl. 2: 5 & 15. 1960; Hocking, Excerpt. Bot. A.4: 593. 1962; G. Taylor, Ind. Kew. Suppl. 13: 98. 1966; Moldenke, Fifth Summ. 1: 168 (1971) and 2:

959. 1971.
Citations: BRAZIL: Minas Gerais: G. Gardner 5269 (B--type, Z--isotype).

PHILODICE Mart., Nov. Act. Physico-med. Acad. Caes. Leopold.-Carol. Nat. Cur. 17 (1): 16, pl. 3, fig. 1--11. 1835.
Synonymy: Philodyce Mart. apud Steud., Nom. Bot. Phan., ed. 2, 2: 320. 1841. Philodyce Steud. apud Post & Kuntze, Lexicon 431, in syn. 1904. Eriocaulon Auct. (in part) apud Stapf, Ind. Lond. 3: 90, in syn. 1930 [nor Eriocaulon Gron., 1753, nor (Gronov.) L., 1913, nor Juss., 1810, nor L., 1816, nor Mart., 1959, nor (Vell.) L. B. Sm., 1971]. Phylodoce Mart. ex J. F. Macbr., Field Mus. Publ. Bot. 11: 8. 1931. Philodoce J. Hutchinson, Fam. Flow. Pl., ed. 1, 2: 240, sphalm. 1934.
Bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 634 & 654, pl. 10 [inf.]. 1831; Bong., Ess. Monog. Erioc. 34 & 54, pl. 10 [inf.]. 1831; Mart., Nov. Act. Physico-med. Acad. Caes. Leopold.-Carol. Nat. Cur. 17 (1): [Erioc. Selbst. Pflanzenfam.] 6, 7, 16--19, 21, 23, 31, 34, 35, 38, 40, 42, 44, & 57, pl. 3, fig. 1--11. 1835; Endl., Gen. Pl. 123. 1836; Steud., Nom. Bot. Phan., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 495--497, 506, 520, 577, 578, 613, & 624. 1841; Steud., Nom. Bot. Phan., ed. 2, 2: 320. 1841; Meisn., Pl. Vasc. Gen. 1: 407. 1842; Lindl., Veg. Kingd., ed. 1, 122 (1846) and ed. 2, 122. 1847; D. Dietr., Syn. Pl. 5: 261. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 277, 283, & 342. 1855; Körn., Linnaea 27: [561] & 571. 1856; C. Müll. in Walp., Ann. Bot. Syst. 5: 921 & 960. 1860; Körn. in Mart., Fl. Bras. 3 (1): 301--305, 362, 499, 505, & 507, pl. 38, fig. 2. 1863; LeMaout & Decne., Trait. Gén. Bot. 598. 1868; Hook. in Le Maout, Decne., & Hook., Gen. Syst. Bot. 871 & 873. 1873; Benth. & Hook. f., Gen. Pl. 3 (2): 1023--1024 & 1250. 1883; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 22, 25, & 27. 1888; Morong, Bull. Torrey Bot. Club 18: 352. 1891; Baillon, Hist. Pl. 12: 400 & 402. 1894; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 878 & 879 (1893) and imp. 1, 2: 401 & 497. 1894; Malme, Bih. Svensk. Vet. Akad. Handl. 27 (3), no. 11: 26. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30): 29, 30, 223--225, 279--281, 285, 286, 289, & 292. 1903; Post & Kuntze, Lexicon 431. 1904; Pilger in Engl. & Prantl, Nat. Pflanzenfam. Ergänz. 2, Nachtr. 3 zu 2: 38 & 40. 1908; Alv. Silv., Fl. Mont. 1: 415. 1928; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 13--15, 19, 20, 24, 25, 40, 46, 48, 49, & 57, fig. 25. 1930; Stapf, Ind. Lond. 3: 90. 1930; Herzog in Fedde, Repert. Spec. Nov. 29: 213. 1931; J. F. Macbr., Field Mus. Publ. Bot. 11: 8. 1931; J. Hutchinson, Fam. Flow. Pl., ed. 1, 2: 67 & 240. 1934; Nakai & Honda, Nov. Fl. Jap. 6: 4 & 88. 1940; Abbiatti, Rev. Mus. La Plata Bot., ser. 2, 6: [311], 314, & 315. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 878 & 879 (1946) and imp. 2, 2: 401 & 497. 1946; Moldenke, Alph. List Cit. 1: 132 & 223. 1946; Moldenke, Known Geogr. Distrib. Erioc. 6, 16, 33, 38,

47, & 55. 1946; Moldenke, Phytologia 2: 493. 1948; Moldenke, Alph. List Cit. 3: 975 (1949) and 4: 1074. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 64, 66, 89, 95, & 212. 1949; Moldenke, Biol. Abstr. 27: 2682. 1953; Moldenke, Phytologia 4: 207—208. 1953; Angely, Cat. Estat. 10: [2]. 1956; Angely, Fl. Paran. 10: 6, 8, 10, & 11. 1957; J. Hutchinson, Fam. Flow. Pl., ed. 2, 2: 576 & 778. 1959; Moldenke, Résumé 68, 73, 76, 104,112, 287, 290, 324, 334, 403, & 490. 1959; Angely, Liv. Gen. Bot. Bras. 19 & 51. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 878 & 879 (1960) and imp. 3, 2: 401 & 497. 1960; Moldenke, Résumé Suppl. 2: 4. 1960; Angely, Fl. Bacia Paran. 22: 31. 1962; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 53. 1963; Hegnauer, Chemotax. Pfl. 2: 153. 1963; F. A. Barkley, List Ord. Fam. Anthoph. 113 & 196. 1965; Thanikaimoni, Mem. Mus. Nat. Hist. Nat. Paris, ser. 2, B.14: 9—38. 1965; Thanikaimoni, Pollen & Spores 7: 182, 183, 187, & 190, tab. 1. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 864. 1966; Thanikaimoni, Biol. Abstr. 47: 4169. 1966; Moldenke, Résumé Suppl. 15: 21 (1967) and 17: 11. 1968; Aristeguieta, Act. Bot. Venez. 3: 25. 1968; Lindeman & Görts-van Rijn in Pulle & Lanjouw, Fl. Surin. 1: 330—331. 1968; Moldenke, Phytologia 18: 242 & 509 (1969) and 19: 43. 1969; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: [146], 158, 166, 167, 174, 184-187, & 189—191. 1969; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1156 & Ind. 22. 1970; Moldenke, Phytologia 19: 322 & 407. 1970; N. F. Good, Biol. Abstr. 52: 13438. 1971; Koyama & Oldenburger, Rhodora 73: 159. 1971; Moldenke, Fifth Summ. 1: 119, 126, 130, 132, 169, & 180 (1971) and 2: 492, 498, 508, 580, 600, 749, & 959. 1971; Anon., Biol. Abstr. 52 (24): B.A.S.I.C. S.187 & S.240. 1972; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 887. 1973; J. Hutchinson, Fam. Flow. Pl., ed. 3, 710 & 951. 1973; Moldenke, Phytologia 25: 160, 229, & 509 (1973), 29: 317 & 510 (1974), 31: 406 (1975), 34: 257, 276, 390, 391, & 508 (1976), and 35: 14. 1976.

The type species of this genus is P. hoffmannseggii Mart. The genus is named in honor of Philodice, daughter of the river god, Inachus, in Greek mythology. It contains only two recognized species, although Dalla Torre & Harms (1963) say "Sp. 3 v 5. Brasilia, Guiana" (the 3rd, 4th, and 5th species are now placed in Blastocaulon Ruhl. The species of Philodice, in its restricted sense, are known from Colombia and Venezuela through Surinam and Guyana to Brazil. Angely (1957) says "O centro vegetativo está situado entre a Venezuela, Guiana Inglesa, Mato Grosso, Minas até a Ilha de Marajó".

It is of interest to note that the common Sulphur Butterfly of North America, Colias philodice, is dedicated to the same goddess.

Gleason, in his unpublished Flora of British Guiana, characterizes the genus as follows: "Flowers 3-merous; sepals lanceolate; staminate corolla urceolate to hemispheric, 3-lobed; pistillate corolla larger, with longer lobes connate only at the middle; anthers 2-locellate; stigmas alternating with 3 clavate appendages; stems erect, simple or sparingly branched, densely leafy; leaves

linear, heads crowded in the upper axils, forming a subumbellate cluster, the short peduncles without basal sheaths; bracts white and scarious, slightly exceeding the glabrous flowers."

The Martius reference in the bibliography above is often cited as "1833", which was the date of submission of the paper as a manuscript to the Academy. According to Dr. J. H. Barnhart, eminent botanical biographer and bibliographer, it wasn't actually published until 1835. Similarly, Müller's work (1860), cited above, is often credited to "Walp. Ann. 5: 921. 1858", but that volume was actually written by Müller and was not published until 1860.

The Endlicher (1836) reference, also listed above, is often cited as "1836--1856", but the page involved here was actually issued in 1836, while the Meisner (1842) reference is sometimes cited as "1836--1843", but the page here involved was actually issued in 1842. The Malme (1901) work is sometimes erroneously cited as "1903". The "Index Londinensis" gives "1906" as the publication date for the Pilger (1908) work, but the United States Library of Congress printed card retains the 1908 title-page date.

Macbride (1931) feels that Philodice, along with Blastocaulon, Lachnocaulon, and Syngonanthus, should be united in the genus Paepalanthus as a single "natural" genus. I cannot see how such "lumping" of these quite sufficiently well-marked genera would serve any useful purpose. The genus Paepalanthus is already far too bulky and inclusive of disparate elements for convenience in identification.

The Steyermark, Steyermark, Wurdack, Wurdack, & Wiehler 106609, distributed as a species of Philodice, actually is the type collection of Paepalanthus sessiliflorus var. venezuelensis Moldenke.

PHILODICE CUYABENSIS (Bong.) Körn. in Mart., Fl. Bras. 3 (1): 305, pl. 38, fig. 2. 1863.

Synonymy: Eriocaulon cuyabense Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 634 & 654, pl. 10, fig. 2. 1831. Eriocaulon cyabense Bong. ex Steud., Nom. Bot., ed. 2, 1: 585. 1840. Paepalanthus cuyabensis Kunth, Enum. Pl. 3: 520. 1841. Philodice cuiabensis Körn. in Mart., Fl. Bras. 3 (1): 362 & 507. 1863. Eriocaulon cuyabensis Bong. apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 281. 1903.

Bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 634 & 654, pl. 10 [inf.]. 1831; Bong., Ess. Monog. Erioc. 34 & 54, pl. 10 [inf.]. 1831; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 520, 577, 578, 613, & 624. 1841; D. Dietr., Syn. Pl. 5: 261. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 277. 1855; Körn. in Mart., Fl. Bras. 3 (1): 305, 362, & 507, pl. 38, fig. 2. 1863; Benth. & Hook. f., Gen. Pl. 3 (2): 1024. 1883; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 25. 1888; Jacks.

in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 878 (1893) and imp. 1, 2: 401 & 497. 1894; Ruhl. in Engl., Pflanzenreich 14 (4-30): 280, 281, 285, & 289. 1903; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 57. 1930; Stapf, Ind. Lond. 3: 90. 1930; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 878 (1946) and imp. 2, 2: 401 & 497. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16, 33, 47, & 55. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 89 & 212. 1949; Moldenke, Résumé 104, 287, 324, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 878 (1960) and imp. 3, 2: 401 & 497. 1960; Moldenke, Fifth Summ. 1: 169 (1971) and 2: 498, 580, & 959. 1971; Moldenke, Phytologia 25: 160 & 229 (1973) and 29: 317. 1974.

Illustrations: Bong., Mém. Acad. Sci. St. Pétersb., ser. 6, 1: [Ess. Monog. Erioc.] pl. 10 [inf.]. 1831; Körn. in Mart., Fl. Bras. 3 (1): pl. 38, fig. 2. 1863.

This species is based on L. Riedel 946 from wet grassy places near Cuyabá, Mato Grosso, Brazil, flowering in April, and deposited in the Leningrad herbarium. The original description reads: "pusillum, caulescens; cauliculis subcaespitosis simplicibus foliosis; foliis caulinis linearibus glabris; pedunculis fascoculatis foliis involucrantibus brevioribus; vaginis nullis". Kunth comments: "Nulli mihi noto, nisi praecedenti [Paepalanthus bryoides] vel P. fasciculato similis; a Bongardio tamen inter species capitulis glabriusculis positus". Ruhland (1903) cites only the original collection.

It should be noted here that in Bongard's original work (1831) the upper part of plate 10 depicts Paepalanthus bryoides (Riedel) Kunth and is referred to by me as "pl. 10 [sup.]" rather than as "fig. 1" as it is in the Bongard text and elsewhere — it actually consists of figures 1—7. The lower half of the plate depicts Philodice cuyabensis and is referred to by me as "pl. 10 [inf.]" rather than as "fig. 2" — it actually consists of figures 1—6.

The Irwin, Harley, & Smith 32664a, cited below, is a mixture with Syngonanthus ulei var. goyazensis Moldenke, which I am citing as the true no. 32664.

Citations: BRAZIL: Goiás: Irwin, Harley, & Smith 32664a (N). Mato Grosso: L. Riedel 946 (B--isotype, Br--isotype, N--isotype, N--photo of isotype, Z--photo of isotype). MOUNTED ILLUSTRATIONS: Bong., Mém. Acad. Imp. Sci. St. Péters., ser. 6, 1: pl. 10 [inf.]. 1831 (N, Z); drawings by Körnicke (B).

PHILODICE HOFFMANNSEGGII Mart., Nov. Act. Acad. Physico-med. Leopold.-Carol. Nat. Cur. 17 (1): 17—19, pl. 3, fig. 1—11. 1835.

Synonymy: Eriocaulon niveum Hoffmgg. ex Kunth, Enum. Pl. 3: 496 & 615, in syn. 1841 [not E. niveum Bong., 1831]. Philodice hoffmannseggii var. laxa Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 304—305. 1863. Philodice hoffmannseggii var. compacta Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 305, pl. 38, fig. 2. 1863. Phil-

odice hoffmannseggii var. β Körn. in Mart., Fl. Bras. 3 (1): 499. 1863. Paepalanthus hoffmanseggii Mart. apud Benth. & Hook. f., Gen. Pl. 3 (2): 1024. 1883. Philodice hoffmansegii Mart. ex Moldenke, Résumé 334, in syn. 1959. Philodice hoffmanseggii Mart. ex Moldenke, Fifth Summ. 2: 660, in syn. 1971.

Bibliography: Mart., Nov. Act. Physico-med. Acad. Leopold.-Carol. Nat. Cur. 17 (1): 17—19 & 44, pl. 3, fig. 1—11. 1835; Kunth, Enum. Pl. 3: 496—497 & 613. 1841; Steud., Syn. Pl. Glum. 2: [Cyp.] 283 & 342. 1855; Körn. in Mart., Fl. Bras. 3 (1): 304—305, 362, 499, & 507, pl. 38, fig. 2. 1863; Benth. & Hook. f., Gen. Pl. 3 (2): 1024. 1883; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 22, 25, & 27. 1888; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879 (1893) and imp. 1, 2: 497. 1894; Malme, Bih. Svensk. Vet. Akad. Handl. 27 (3), no. 11: 26. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30): 280—281 & 286, fig. 40. 1903; Alv. Silv., Fl. Mont. 1: 415. 1928; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 57, fig. 25. 1930; Herzog in Fedde, Repert. Spec. Nov. 29: 213. 1931; Stapf, Ind. Lond. 5: 62. 1931; Worsdell, Ind. Lond. Suppl. 2: 220. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 879 (1946) and imp. 2, 2: 497. 1946; Moldenke, Alph. List Cit. 1: 132 & 223. 1946; Moldenke, Known Geogr. Distrib. Erioc. 6, 16, 38, & 55. 1946; Moldenke, Phytologia 2: 493. 1948; Moldenke, Alph. List Cit. 3: 975 (1949) and 4: 1074. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 64, 66, 89, 95, & 212. 1949; Moldenke, Phytologia 4: 207—208. 1953; Moldenke, Résumé 68, 73, 76, 104, 112, 290, 334, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 879 (1960) and imp. 3, 2: 497. 1960; Moldenke, Résumé Suppl. 2: 4. 1960; Thanikaimoni, Pollen & Spores 7: 183 & 187, tab. 1. 1965; Aristeguieta, Act. Bot. Venez. 3: 25. 1968; Lindeman & Görts-van Rijn in Pulle & Lanjouw, Fl. Surin. 1: 330—331. 1968; Moldenke, Résumé Suppl. 17: 11. 1968; Moldenke, Phytologia 19: 43. 1969; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 158, 166, 167, 174, 184—187, & 189—191. 1969; N. F. Good, Biol. Abst. 52: 13438. 1971; Koyama & Oldenburger, Rhodora 73: 159. 1971; Moldenke, Fifth Summ. 1: 119, 126, 130, 132, 169, & 180 (1971) and 2: 508, 600, & 959. 1971; Anon., Biol. Abstr. 52 (24): B.A.S.I.C. S.187 & S.240. 1972; Moldenke, Phytologia 29: 317 (1974) and 34: 257. 1976.

Illustrations: Mart., Nov. Act. Physico-med. Acad. Leopold.-Carol. Nat. Cur. 17 (1): pl. 3, fig. 1—11. 1835; Körn. in Mart., Fl. Bras. 3 (1): pl. 38, fig. 2. 1863; Ruhl. in Engl., Pflanzenreich 13 (4-30): 280, fig. 40. 1903; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 57, fig. 25. 1930; Thanikaimoni, Pollen & Spores 7: 183, tab. 1. 1965.

This, the type species of the genus, is based on Sieber s.n. from Grão Pará, Pará, Brazil, probably deposited in the Vienna herbarium; this collection is also the type of var. laxa Mart., the typical variety. Martius' var. compacta is based on G. Gardner 2749bis from Piauí, Brazil. Körnicke (1863) distinguishes

the varieties as follows: var. laxa -- "foliis flaccidis; pedunculis elongatis, plerisque folia superantibus", and var. compacta — "foliis arrectis, rigidis; pedunculis brevibus, folia vix aequantibus vel brevioribus". For var. laxa he cites Sieber s.n. (the type), Spruce s.n. [Santarem], and Weddell 3320 [Mato Grosso]. For var. compacta he cites only G. Gardner 2749bis. Ruhland (1903) feels that the varieties are not sufficiently distinct to merit nomenclatural recognition and cites for the species as a whole the following: VENEZUELA: Delta Amacuro: Passarge & Selwyn 352 & 359. Zulia: Passarge & Selwyn 577. BRAZIL: Ceará: Huber 64. Mato Grosso: Malme 1634; Weddell 3320. Minas Gerais: Glaziou 19991. Pará: Huber 386; Sieber s.n.; Spruce 2693. Piauí: G. Gardner 2749.

Lindeman & Görts-van Rijn (1968) cite J. P. Schulz s.n. from Surinam and give the extra-limital distribution of the species as "North and central Brazil. British Guiana". Malme (1901), whose work is sometimes erroneously cited as "1903", cites Malme 1634 from Mato Grosso "In argillaceis humidis, apertis", flowering in January.

Gleason, in his unpublished flora of British Guiana, described the species as "Stems 5—20 cm. high, the narrowly linear leaves about 1 cm. long; peduncles 1—2 cm. long; heads 5 mm. in diameter, the bracts narrowly lanceolate, acuminate" and cites Appun 1741, Jenman 728, and Lloyd s.n. from Guyana, giving the overall distribution as "Venezuela to Brazil". Silveira (1928) cites Huber 442 from Marajo Island, Brazil.

Kunth (1841) comments "Ob habitam Paepalantho fasciculato similis", a statement which is certainly quite true.

The species has been collected among rocks, on seashores, along the margins of streams and swamps, in dried-up marshes, on clay soil in damp open places, in small lakes, and on sandy soil which is somewhat marshy in the rainy season. Goodland found it "in open hog-wallowed impeded drainage marsh with mottled clay pan in grassland with scattered trees, the dominants being Curatella, Byrsonima, Trachypogon, and Fimbristylis", while Wurdack & Monachino refer to it as "locally abundant in morichal". Oldenburger and his associates found it growing in association with Diplacrum africanum, Syngonanthus glandulosus, S. gracilis var. koernickeanus, Bacopa monierioides, Centunculus pentander, Polygala paludosa, Utricularia adpressa, and Eleocharis nana. Davidse found it growing in an area where water accumulates during rains on open savannas without any trees in a low-lying area between mountain ranges and with a deep layer of sand, and speak of it as having "spikelets white" [the flowers are in heads, not in spikelets].

It has been encountered at altitudes of 40—115 meters, flowering in January, April, May, and July to December, fruiting from August to October.

It should be noted here that the original publication of this

species by Martius is often cited as "1833", but according to the late botanical bibliographer, Dr. J. H. Barnhart, this work was not actually published until 1835. Likewise, it is worth noting that separate reprints of the Koyama & Oldenburger paper, cited in the bibliography above, are inscribed "Reprinted from Rhodora, Vol. 73, 793, 1971", but this is erroneous. The paper appears on pages 159--160 of that volume.

The Eriocaulon niveum Bong., referred to in the synonymy above, is the name-bringing synonym of what is now known as Syngonanthus niveus (Bong.) Ruhl.

Goodland 302, cited below, is a mixture with Syngonanthus huberi Ruhl. and Eriocaulon guyanense Körn. Weddell 3320, in the Brussels herbarium, is inscribed by Körnicke "var. a transitorius ad var. b".

Material of this species has been misidentified and distributed in some herbaria as Eriocaulon fasciculatum Lam.

Additional citations: COLOMBIA: Magdalena: C. Allen 669 (E--1014520). VENEZUELA: Bolívar: G. Davidse 4388 (Ld); Wurdack & Monachino 39958 (N, S). Guaricó: Aristeguieta 4893 (S); Guyon 47 (P), s.n. (P); Tamayo 4562 (S); Tamayo & Aristeguieta 4275 (N). GUYANA: Goodland 302, in part (W--2546172); Goodland & Persaud 778 (N); A. C. Smith 2284 (Er, S). SURINAM: Irwin, Prance, Soderstrom, & Holmgren 55239 (N), 55932 (N); Oldenburger, Norde, & Schulz ON.147 (N). BRAZIL: Amazônas: Lützelburg 20532 (Mu), 21043 (Mu, Mu); Zerny s.n. [18 August 1927] (V--10785). Ceará: Drouet 2371 (Mi). Mato Grosso: Cordeiro 51 (Ld); Malme 1634 (S, S), 1660 (S), 1660a (S); Weddell 3320 (Br). Minas Gerais: A. Lutz 606 [Herb. Lutz 606] (Z). Pará: Black 52-15518 (Be--77500), 54-16915 (N); Black & Ledoux 50-10454 (Z); Fróes 29907 (Hk, N); Murça Pires, Black, Wurdack, & Silva 6505 (N); Sieber [Hoffmannsegg] s.n. [Pará] (B--isotype, Br--isotype, Mu--342--isotype, N--photo of isotype, Z--photo of isotype); Spruce 611 (Mu--274), 2693 (B), s.n. [Prope Santarem, Mart. 1850] (N, S), s.n. [In vicinibus Santarem] (B), s.n. [Amazon] (T); Tavares 17 (N). Roraima: Black 51-12571 (Be--70387), 51-13127 (N), 51-13839 (N); Ule 7666 (W--1615008). MOUNTED ILLUSTRATIONS: Körn. in Mart., Fl. Bras. 3 (1): pl. 38, fig. 2. 1863 (B, B, Mu, N, Z); drawings by Kunth & Körnicke (B).

RONDONANTHUS Herzog in Fedde, Repert. Spec. Nov. 29: 210. 1931.

Synonymy: Rhondonanthus Herzog ex Moldenke, Résumé 343, in syn. 1959. Rodonanthus Steyerm., Act. Bot. Venez. 1: 19, sphalm. 1966. Rononanthus Steyerm. ex Moldenke, Résumé Suppl. 16: 26, sphalm. in syn. 1968.

Bibliography: ImThurn, Timehi 5: 208. 1886; Oliv., Trans. Linn. Soc. Bot., ser. 2, 2: 286, pl. 49B, fig. 7--14. 1887; N. E. Br., Trans. Linn. Soc. Lond. Bot., ser. 2, 6: 69. 1901; Burkill, Trans. Linn. Soc. Lond. Bot., ser. 2, 6: 13. 1901; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 310. 1903; Ruhl. in Engl., Pflanzenreich 13

(4-30): 221. 1903; Gleason, Bull. Torrey Bot. Club 52: 195. 1925; Herzog in Fedde, Repert. Spec. Nov. 29: 210. 1931; Fedde & Schust. in Just, Bot. Jahresber. 53 (1): 60 [42]. 1932; A. W. Hill, Ind. Kew. Suppl. 9: 238. 1938; Fedde & Schust. in Just, Bot. Jahresber. 59 (2): 20. 1939; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 310. 1941; Moldenke, Known Geogr. Distrib. Erioc. 6, 31, 53, 56, & 60. 1946; Moldenke, Phytologia 2: 352 & 381. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 64, 66, & 212. 1949; Moldenke, Biol. Abstr. 27: 2682. 1953; Moldenke, Phytologia 4: 208. 1953; Angely, Cat. Estat. 10: [2]. 1956; Angely, Fl. Paran. 10: 8, 10, & 11. 1957; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 310. 1959; Moldenke, Résumé 73, 76, 282, 328, 343, 401, & 490. 1959; G. Taylor, Ind. Kew. Suppl. 12: 122. 1959; Barkley, List Ord. Fam. Anthoph. 113 & 205. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 977. 1966; J. A. Steyerm., Act. Bot. Venez. 1: 19, 91, & 238. 1966; Moldenke, Résumé Suppl. 16: 26 (1968) and 18: 9. 1969; Moldenke, Phytologia 20: 296 & 297 (1970) and 20: 510. 1971; Moldenke, Fifth Summ. 1: 126, 130, & 485 (1971) and 2: 590, 618, 746, & 960. 1971; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 1003. 1973; J. Hutchinson, Fam. Flow. Pl., ed. 3, 710 & 956. 1973; Moldenke, Phytologia 26: 470 & 509 (1973), 28: 456 & 511 (1974), and 34: 277. 1976; P. Morat, Adansonia, ser. 2, 15: 466. 1976.

This small genus was named in honor of General Rondon, well-known for his many scientific expeditions into the interior and along the boundaries of Brazil, an area now known as the territory of Rondônia. The type species is Paepalanthus roraimae Oliv. [=Rondonanthus roraimae (Oliv.) Herzog]. The plants are dioecious, the peduncles single or few, the heads rather large, the involucral bracts large, narrow, dark-brown, radiating horizontally or finally reflexed, receptacular bractlets present, slightly surpassing the florets. The male florets have 3 sepals which are long-barbate at the apex, the hairs very long, clavate at the apex, the sides thickened, smooth outside, slightly granular within, 3 petals which are subequal, free, and glabrous, 3 stamens, attached to the base of the petals, the anthers 2-celled; the pistillate florets have the sepals and petals subsimilar, black, barbate at the apex. The ovary is 3-celled, the stigmas 3, simple, with obvious appendages. Hutchinson (1973)reduces the genus to the synonymy of Paepalanthus.

RONDONANTHUS MICROPETALUS Moldenke, Phytologia 2: 352, nom. nud. 1947; Fieldiana 28: 126--127. 1951.

Bibliography: Moldenke, Phytologia 2: 352. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 64 & 212. 1949; Moldenke, Fieldiana 28: 126--127. 1951; Moldenke, Phytologia 4: 208. 1953; J. A. Steyerm., Fieldiana 28: 1158. 1957; Moldenke, Résumé 73 & 490. 1959; J. A. Steyerm., Act. Bot. Venez. 1: 91 & 238. 1966; Moldenke, Fifth Summ. 1: 126 (1971) and 2: 960. 1971.

In the absence of pistillate florets, this taxon is placed in this genus tentatively. It differs notably from the type species

and may well represent another genus.

RONDONANTHUS RORAIMAE (Oliv.) Herzog in Fedde, Repert. Spec. Nov. 29: 210. 1931.

Synonymy: Paepalanthus roraimae Oliv., Trans. Linn. Soc. Lond. Bot., ser. 2, 2: 286, pl. 49 B, fig. 7—14. 1887. Dupatya roraimae (Oliv.) Gleason, Bull. Torrey Bot. Club 52: 195. 1925. Dupatya roraimae Gleason apud A. W. Hill, Ind. Kew. Suppl. 7: 79. 1929. Dupatya roraimae (Oliv.) Rusby apud Fedde & Schust. in Just, Bot. Jahresber. 53 (1): 60. 1932.

Bibliography: Oliv. ex ImThurn, Timehri 5: 208. 1886; Oliv. Trans. Linn. Soc. Lond. Bot., ser. 2, 2: 286, pl. 49 B, fig. 7—14. 1887; Burkill, Trans. Linn. Soc. Lond. Bot., ser. 2, 6: 13. 1901; N. E. Br., Trans. Linn. Soc. Lond. Bot., ser. 2, 6: 69. 1901; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 310. 1903; Ruhl. in Engl., Pflanzenreich 13 (4-30): 221. 1903; Gleason, Bull. Torrey Bot. Club 52: 195. 1925; A. W. Hill, Ind. Kew. Suppl. 7: 79. 1929; Stapf, Ind. Lond. 4: 519. 1930; Gleason, Bull. Torrey Bot. Club 58: 330. 1931; Herzog in Fedde, Repert. Spec. Nov. 29: 203 & 210. 1931; Fedde & Schust. in Just, Bot. Jahresber. 53 (1): 60 (1932) and 59 (2): 20. 1939; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 310. 1941; Moldenke, Known Geogr. Distrib. Erioc. 6, 31, 53, 56, & 60. 1946; Moldenke, Phytologia 2: 352. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 64, 66, & 212. 1949; Moldenke, Phytologia 4: 208. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 310. 1959; Moldenke, Résumé 73, 76, 282, 328, & 490. 1959; J. A. Steyerm., Act. Bot. Venez. 1: 91. 1966; Moldenke, Résumé Suppl. 16: 26 (1968) and 18: 9. 1969; Moldenke, Phytologia 20: 296 & 297. 1970; Moldenke, Fifth Summ. 1: 126, 130, & 485 (1971) and 2: 590 & 960. 1971; Moldenke, Phytologia 26: 470 (1973) and 28: 456. 1974.

Illustrations: Oliv., Trans. Linn. Soc. Lond. Bot., ser. 2, 2: pl. 49 B, fig. 7—14. 1887.

The type of this, the type species of the genus, was collected by Sir Everard Ferdinand ImThurn (no. 294) in marshy ground on granite rock on the summit of Mount Roraima, Guyana, in 1884, probably deposited in the herbarium of the British Museum in London. Both Oliver (1887) and Ruhland (1903) cite only the type collection, but Gleason, in his unpublished flora of British Guiana, cites ImThurn 294, Quelch & McConnell 102, 315, & 660, G. H. Tate 372, and Ule 8555. He describes the plant as follows: "Caudex very short, densely woolly; leaves densely rosulate, rigid, narrowly linear, 2—3 cm. long, often curved, obtuse, nearly or quite glabrous; peduncles mostly solitary, 5—15 cm. long, glabrous, their sheaths much exceeding the leaves, dilated distally; heads hemispheric, cinereous, 8—12 mm. in diameter; bracts spreading, black, oblong, conspicuously white-ciliate, exceeding the leaves." He refers to it as endemic to Mt. Roraima.

Ruhland (1903) cites ImThurn "994" [probably an error for 294, the type collection] and expresses his doubt as to the generic

position of this plant by saying "Speciei huius affinitates propter descriptionem atque iconem miserrimam incertissimae. Ne genus quidem, in quo collocanda sit constat." Herzog (1931) says "Diese von Oliver.....beschriebene und abgebildete Art muss als Typus einer eigenen Gattung betrachtet werden, die sich in ihrem Blütenbau von allen den Hunderten von Paepalanthusarten, überhaupt von samtlichen Eriocaulonaceen durch die freien Petalen der ♂ Blüten unterschiedet. Ferner scheint mir die Pflanze obwohl Oliver darüber nichts bemerkt, dioecisch zu sein eine bei den Eriocaulonaceen auch sehr selten beobachtete Eigenschaft....Das wichtigste Merkmal der neuen Gattung sind die freien Petalen der ♂ Blüte. Sie sind fast ebenso lang wie die Kelchblätter und ziemlich derb gebaut, aber kahl und fast hyalin: an ihrer Basis sind sie mit dem zugehörigen dithecischen Staubblatt verwachsen."

Mount Roraima being situated on the Guyana-Brazil-Venezuela international boundary, the type and some of the other collections cited below as from Guyana are sometimes cited by other workers as from northern Brazil (Roraima) or from Venezuela (Bolívar) with equal justification. Lützelburg avers quite definitely that his collection was made in Brazil.

Collectors have found the species growing in sandy bogs and marshy places over granite rock; Irwin refers to it as a "tufted herb", growing "in acid muddy soil in rocky crevice near brook". It has been encountered at altitudes of 2500--3000 meters, flowering in April, November, and December.

Oliver's original (1887) description is sometimes cited as "1886" [the date when the paper was read to the Linnean Society] or even "1884" [by Ruhland], but the actual date of publication seems definitely to have been 1887.

Additional citations: VENEZUELA: Bolívar: Irwin 400 (W--2197624); J. A. Steyermark 58799 (S). GUYANA: Abbensetts 8 (Ut--15035A); ImThurn 294 (N); Quelch & McConnell 102 (N), 660 (N); G. H. H. Tate 372 (N, Qu). BRAZIL: Roraima: Lützelburg 21605 [Macbride photos 18723] (Ja--47671, Mu, N, N--photo, N--photo, W--photo).

SYNGONANTHUS Ruhl. in Urb., Symb. Ant. 1: 487. 1900.

Synonymy: Limnoxeranthemum Salzm. ex Steud., Syn. Pl. Glum. 2: [Cyp.] 281, in syn. 1855. Syngonanthes Ruhl. ex Uphof, Am. Journ. Bot. 14: 44. 1927. Eriocaulon Auct. (in part) ex Stapf, Ind. Lond. 3: 90, in syn. 1930 [not Eriocaulon Gron., 1753, nor (Gronov.) L., 1913, nor Juss., 1810, nor L., 1816, nor Mart., 1959, nor (Vell.) L. B. Sm., 1971]. Syngonatnhus Ruhl. ex Reitz, Sellowia 7: 124, sphalm. 1956. Carphocephalus Kunth ex Moldenke, Résumé 249, in syn. 1959. Andraspidopsis Körn. apud Soukup, Biota 2: 303, in syn. 1959. Carpocephalus Körn. apud Soukup, Biota 2: 303, in syn. 1959. Psilocephalus Körn. apud Soukup, Biota 2: 303, in syn. 1959. Limnoxeranthemum "Salzm. ex Steud." apud Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 656. 1966. Syngon-

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32: 485--487 & 512, fig. 2 (1976), 33: 25, 27, 34, 37--39, 51, 138, 184, 189, 191, 202, 273, 480, & 511 (1976), 34: 248, 256--260, 271--273, 275--278, 390, 392, 395, 486, 487, 505, & 511 (1976), and 35: 14, 16, 18, 24, 28, 31, & 36. 1976; Anon., Biol. Abstr. 61: ACl.718. 1976; P. Morat, Adansonia, ser. 2, 15: [463]. 1976; Lakela, Long, Fleming, & Genelle, Pl. Tampa Bay, ed. 3, [Bot. Lab. Univ. S. Fla. Contrib. 73:] 39, 150, & 180. 1976; Long & Lakela, Fl. Trop. Fla., ed. 2, 259, 262, 930, & 958. 1976; Moldenke, Phytologia 35: 112, 125, 260, & 264. 1977.

The generic name was taken by Ruhland (1900) from the Greek, σύγγονος, united, and ἄνθος, flower, from the fact that the petals are connate in both sexes in this genus. How our knowledge of the extent of this genus has grown in the comparatively few years of botanical exploration may be judged from the fact that Ruhland (1903) knew of only 80 species in the genus, Gleason, in his unpublished Flora of British Guiana (ca. 1930) listed 85 species, Moldenke (1939, 1940) "about 160" species, Herter (1954) 100 species, Moldenke in Humbert (1955) 247 taxa, and Angely (1956, 1957) 258 taxa. Thorne (1973) avers that there are 196 species, of which, he says, 195 are American, 1 is African, and 1 is in Madagascar. Actually, as of the date of this writing, we now recognize 297 taxa, of which 286 are American, 10 are African, and 1 is from Madagascar.

In 1956 Angely recognized from Brazil, 22 species in Amazônas, 14 in Pará, 3 in Maranhão, 11 in Piauí, 2 in Pernambuco, 12 in Bahia, 135 in Minas Gerais, 6 in Mato Grosso, 24 in Goiás, 10 in Rio de Janeiro, 14 in São Paulo, 8 in Paraná, 4 in Santa Catarina, and 4 in Rio Grande do Sul. He also asserts that there are 28 species in Venezuela, 13 in Guyana, 9 in Surinam, 2 in Zaire, and 4 in Cuba.

The type species of the genus is Eriocaulon umbellatum Lam. [=Syngonanthus umbellatus (Lam.) Ruhl.]

It should be noted here that Eulepis was proposed as a section of Eriocaulon by Bongard in 1831, and included (in this order) the following species:

E. prescottianum
E. elegans
E. niveum
E. aciphyllum
E. nitidum
E. anthemiflorum

Post & Kuntze (1904), in elevating Eulepis to generic rank, chose E. prescottianum (Bongard's first-mentioned species) as type. Since E. prescottianum is a Mesanthemum, it is apparent that the generic name, Eulepis, must fall into the synonymy of Mesanthemum. Yet Ruhland (1903) transferred the name, Eulepis, to Syngonanthus as a section name for Bongard's other species: S. elegans, S. niveus, S. aciphyllus, S. nitidus, S. anthemiflorus, and their more recently described relatives. Bongard's sole diagnosis of Eulepis, "squamis

capitulorum radiantibus", applies equally well in both interpretations, but, of course, the essential floral characters are now known to be quite different in the two groups.

Martin (1946) reports the presence of endosperm in the seeds of Syngonanthus. Pollen characters are given for the genus (on the basis of 2 species studied!) by Thanikaimoni (1965). LeCointe (1947) records the vernacular name, "pepalantho", for members of the genus in Amazônas, Brazil, while Long & Lakela (1971) record "bantum buttons" from Florida (where only a single species, S. flavidulus, is found). In both cases the names are given as applying to the entire genus.

Limnoxeranthemum Salzm. and Limnoxeranthemum "Salzm. ex Steud." are sometimes given as synonyms of Paepalanthus Mart., notably by Airy Shaw (1966), but both species on which the name was based originally are members of the genus Syngonanthus, so the name must fall into the synonymy of Syngonanthus, not of Paepalanthus.

Curiously, in Biol. Abstr. 27: 3767 (1955) Syngonanthus is classified as a "Dicotyledon". It is also worth noting here that Ruhland (1900) dates Körnicke's monumental work on the family as "1871" when actually it should be 1863. Lecomte's paper (1909) is sometimes cited as "1908" — actually the paper was read at the November 13, 1908, meeting of the society, but was not published until 1909. My work in Bull. Torrey Bot. Club 68: 70 is dated "1941" on the cover, but was actually published and deposited in the New York Botanical Garden library on December 31, 1940. The Angely (1972) work is often cited as "1970", the title-page date, but was not actually published until 1972. Stapf (1931) gives "1906" as the date for the Pilger (1908) work, but the United States Library of Congress printed card retains the 1908 title-page date as correct.

The Soukup (1959) work, cited in the bibliography above, is sometimes referred to as being in volume "5" — actually it is in volume 2 of Biota. The names which he lists there as generic synonyms of Syngonanthus [Andraspidopsis Körn., Carpocephalus [error for Carphocephalus] Körn., and Psilocephalus Körn.] are actually subgeneric names which Körnicke proposed in Paepalanthus and later transferred by Ruhland to sectional and subsectional rank in Syngonanthus.

Koyama & Oldenburger (1971) encountered species of Syngonanthus growing in association with Diplacrum africanum, Philodice hoffmannseggii, Bacopa monnierioides, and Centunculus pentander in Surinam.

The Bogner 1010, distributed as a species of Syngonanthus, is actually Paepalanthus cristatus Moldenke, Moore, Dietz, & Pfister 9793 is P. squamuliferus Moldenke, Moore, Ambrose, Dietz, & Pfister 9813 is P. cumbricola Moldenke, Pannier & Schwabe s.n. [Auyantepui] is not eriocaulaceous, and Vareschi & Foldats 4727 is something in the Cyperaceae.

Ruhland (1903) distinguishes his 5 sections of Syngonanthus as

follows:

1. Floris feminei petala sepalis breviora vel vix aequalia.
2. Petala floris masculi in tubum tenui-membranaceum, breviter trilobum, demum involutum connata; caulis (uno S. hygrotricho excepto) perbrevis, simplex, pedunculifer vel sterilis tumque ramis perbrevibus, aphyllis vel apice modo vel tota superficie foliosis, terminaliter pedunculiferis auctus. Sect. 1. Dimorphocaulon Ruhl.

2a. Petala floris masculi in tubum plusminusve urceolatum, carnosulum, apice temiiorem et saepius involutum, demum plerumque in petala 3 rhomboidea solubilem connata. Sect. 2. Carphocephalus Körn.

1a. Floris feminei petala sepalis perspicue longiora, raro demum inflexa, rigidula.
3. Bracteae involucrantes disco plusminusve longiores, membranaceae.
4. Bracteae paucae non radiantes, aequales, disco parum longiores; appendices styli nullae; caulis elongatus. Sect. 3. Chalarocaulon Ruhl.

4a. Bracteae discum multo superantes, radiantes, inaequales (exteriores interioribus multo breviores); stylus appendicibus instructus; caulis perbrevis. Sect. 4. Eulepis Bong.

3a. Bracteae involucrantes disco perspicue breviores, perrigidae; capitula campanulata, thysanomorpha. Sect. 5. Thysanocephalus Körn. [Thysanocephalus Ruhl. ex Moldenke, Fifth Summ. 2: 743. 1971].

His Section Dimorphocaulon is divided by him into two subsections as follows:

1. Psilocephalus (Körn.) Ruhl. -- Caulis primo intuitu semper fertilis; id est: pedunculi ex axilla folii caulini egredientes, rarius in apice ramorum perbrevium et vix conspicuorum, apice modo foliosorum solitarii.
2. Andraspidopsis (Körn.) Ruhl. — Caulis semper perspicue sterilis; id est: pedunculi in apice ramorum foliorum caespitem caulinem multo superantium per plures fasciculato-congesti vel solitarii.

In his original description of the genus, Ruhland (1900) gives its essential diagnostic characters as "Flores masculi et feminei mixti, trimeri, perigonio duplici instructi. Stamina numero laciniis perigoniorum aequalia. Antherae quadriloculares. Flores feminei partes peroginii interioris margine medio connatae. Stigma simplicia. Pili bractearum et perigoniorum acuti, extus et intus laeves, numquam clavati." He comments that "Differt hoc genus a Paepalantho (sens. strict.) praesertim structura perigonii interioris floris feminei. In monographia jam a me praeparata characteres amplius digeram." He separates the West Indian species known to him as follows:

1. Caulis perbrevis, sterilis, ramo plerumque uno vel rarius paucis elongatis. Apice modo caespitem foliorum pedunculorum

proferente ornatus.....S. umbellatus.
1a. Caulis perbrevis, subsimplex, pedunculifer.
2. Bracteae involucrantes plus minus fulvo-flavidae, basi ciliolatae; folia olivaceovirentia, plerumque 3.5 cm. longa.... S. androsaceus.
2a. Bracteae involucrantes pallide stramineo-flavae, glabrae; folia laete viridia, plerumque modo 2 cm. longa..... S. lagopodioides.

A more up-to-date key to the West Indian species, as well as North and Central American taxa, will be found in my 1937 work cited in the bibliography above.

The Yucatán species are keyed out by me (1940) as follows:
1. Peduncles glabrous or practically so.....S. oneillii.
1a. Peduncles conspicuously pubescent.
2. Involucral bractlets hyaline, completely colorless..... S. bartlettii.
2a. Involucral bractlets more or less olivaceous.
3. Sheaths shorter than the leaves, densely short-pubescent; the pubescence on the peduncles mostly appressed; bractlets to 2.5 mm. long, glabrous.....S. hondurensis.
3a. Sheaths longer than the leaves, loosely long-pilose; pubescence on peduncles spreading; bractlets to 8 mm. long, villous.....S. lundelliamus.

Lindeman & Görts-van Rijn (1968) separate the Surinam species known to them at that time as follows:
1. Leaves all radical in a dense rosette or partly in a second rosette at the end of the stem.
2. Peduncles umbellate at the end of the leafless stem; leaves often in a second rosette beneath the pedunculate umbel.. S. umbellatus.
2a. Stemless.
3. Peduncular sheaths with rounded sinus; involucral bracts narrow, acute; style with appendages.....S. glandulosus.
3a. Peduncular sheaths not with rounded sinuses.
4. Involucral bracts glabrous, the inner ones twice as long as the flowers, radiating; petals of the female flowers longer than the sepals.....S. kegeliamus.
4a. Involucral bracts almost as long as the flowers.
5. Male and female florets not very unequal in size or shape; involucral bracts about the same length as the flowers.
6. Leaves about 5 mm. long, densely rosulate, white-villous and pilose, later glabrous; peduncles 5—7 cm. long; involucral bracts glabrous, the inner ones ciliate; style without appendages..S. simplex.
6a. Leaves 1—3 cm. long, cespitose, glabrous or slightly puberulous; peduncles 6—30 cm. long; involucral bracts longer than or equaling the florets; sepals at first puberulous in the middle, later glabrous.....S. gracilis.

5a. Male florets about half as long as the female ones, irregular, longer-pedicelled; heads somewhat echinate in appearance; leaves 6—8 mm. long, arachnoid, tomentose to glabrous above; involucral bracts much shorter than the florets.....S. biformis.

1a. Stems leafy, more or less elongate.

7. Stems densely arachnoid-pubescent with white matted hairs. S. surinamensis.

7a. Stems not arachnoid-pubescent.

8. Peduncles glandular-pubescent, 7—11 cm. long; leaves 1.5 mm. wide, about 1 cm. long; peduncular sheaths with rounded sinus.....S. glandulosus.

8a, Peduncles pubescent to glabrous, their sheaths obliquely split; leaves 1—5 cm. long.

9. Stems floating, up to 3 dm. long; leaves fenestrate, 0.2 x 3—4.5 cm.; peduncles 2—4 together at the end of the stem, 3—6 cm. long; petals of the female florets slightly longer than the sepals; style without appendages.....S. macrocaulon.

9a. Stems up to 8 dm. long, simple; leaves 1.5—4.5 mm. x 1.5—3.5 cm.; peduncles 5—30 cm. long, in a terminal fascicle; petals of the female florets shorter than the sepals; styles appendaged.....S. caulescens.

Gleason, in his unpublished flora of British Guiana, keys out the species known to him from that area at that time as follows:

1. Leaves scattered along the elongate stem.

2. Subtending bracts present; leaves 1 mm. wide or less.

3. Principal leaves about 15 mm. long, very thin and lax; peduncular sheaths acuminate.....S. anomalus.

3a. Principal leaves about 5 mm. long, firm, priminently nerved; peduncular sheaths obtuse.....S. brevifolius.

2a. Subtending bracts none; leaves 2—5 mm. wide.S. caulescens.

1a. Leaves rosulate, cespitose, or whorled.

4. Heads in leafy-bracted, long-stalked umbels.

5. Leaves subtending the umbels about 1 mm. wide; bracts acuminate.....S. umbellatus.

5a. Leaves subtending the umbels 3—5 mm. wide; bracts obtuse or subacute.....S. longipes.

4a. Heads 1 to several, on separate peduncles arising from among the basal leaves

6. Petals of the pistillate florets distinctly exceeding the sepals.....S. tricostatus.

6a. Petals of the pistillate florets shorter than the sepals.

7. Lateral sepals of the staminate florets strongly falcate and inequilateral.

8. Pistillate and staminate florets, including their pedicels, about equal in length.....S. simplex.

8a. Pistillate florets about twice as long as the staminate.....S. biformis.

7a. Lateral sepals of the staminate florets not falcate, equilateral.

9. Bracts obovate, broadly rounded at the summit..... S. gracilis.
9a. Bracts oblong, acute to obtuse at the apex.
10. Leaves rosulate; peduncles not glandular; sinus of the sheaths, opposite the lamina, acute..... S. eriophyllus.
10a. Leaves crowded on a very short stem; peduncles glandular; sinus of the sheaths broadly rounded... S. glandulosus.

Hess (1955) says of the genus: "Die Gattung Syngonanthus schliesst sich im Blütenbau eng an die Gattung Mesanthemum an. In den verwachsenen Petalen stimmen die beiden Gattungen überein. Syngonanthus hat aber nur noch drei Staubblätter und nie Drüsen an den Petalen. Von den 180 bis 200 heute angegebenen Arten sind nur 6 ausserhalb von Amerika und seinen vorgelagerten Inselgruppen bekannt. Diese Arten sind kontinental afrikanisch; auf Madagaskar fehlt die Gattung wahrscheinlich. Die 6 Arten sind alle miteinander nahe verwandt, und ihre Unterscheidung bietet oft grosse Schwierigkeiten. Die Morphologie der Blüten ist einförmig, zudem haben viele Merkmale eine grosse Variationsbreite. Allen afrikanischen Arten ist das Fehlen von Brakteen der Blüten gemeinsam. Es muss angenommen werden, dass die Arten miteinander Bastarde bilden, die häufig und weit verbreitet sind. Aus Angola sind jetzt 3 Arten bekannt." He keys out the African species as follows:

1. Köpfe vielblütig.
2. Halme 3-rillig.
3. Halme in den Rillen ± dicht mit weissen, spitzen Haaren und mit kopfigen Drüsenhaaren bedeckt.
4. Blätter an der Basis 0.5—1 mm. breit, 1—2.5 cm. lang, oberseits konkav, unterseits konvex, oft im Querschnitt elliptisch oder rundlich; Halme 3—20 cm. hoch.
5. Drei Anhängsel am Griffel vorhanden, in kopfigen Gebilden endigend.....S. wahlbergii.
5a. Anhängsel am Griffel fehlend.....S. schlechteri.
4a. Blätter breit (1.5—2.5 mm.) und flach, bis 8 cm. lang; Halme 30—50 cm. hoch.....S. poggeanus.
3a. Halme in den Rillen vollständig kahl; Sepalen der Blüten 3—3.3, evtl. bis 4 mm. lang, im mittleren Drittel beiderseits land und abstehend behaart, Sepalen der ♀ Blüten weiss, die der ♂ Blüten in der unteren Hälfte braun, oben weiss.....S. angolensis.
2a. Halme 4-rillig.....S. ngoweensis.
1a. Köpfe wenigblütig (etwa 10 Blüten); Pflanzen immer nur 1—2 cm. hoch.....S. welwitschii.

Macbride (1931) makes some interesting comments relative to this and other genera: "The genus Syngonanthus was established by Ruhland.....to include those species of Paepalanthus with more or less connate (at the middle) petals in the case of the female flowers. This seems to me to be a character that serves most usefully as a

means of grouping merely sectionally the supposedly related forms. I think the natural genera in the family are defined only by the variation in the number of the stamens and by the number of the anther cells. On this basis Blastocaulon Ruhl....and Phylodoce Mart., widely separated by Ruhland because the petals of the latter are partially adnate, are to be merged. The only character in this case remaining to Phylodoce that defines it in contrast to Tonina Aubl. is the presence of well-developed petals and in the otherwise similar Lachnocaulon Kunth the petals are reduced to hairs. These four groups defined as genera constitute therefor from a purely disinterested standpoint one natural genus. As they exhibit some habitual differences their maintenance in regional treatments may sometimes be convenient."

SYNGONANTHUS ACIPHYLLUS (Bong.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 273. 1903.

Synonymy: Eriocaulon aciphyllum Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 636. 1831 [not E. aciphyllum Reichenb., 1863]. Paepalanthus aciphyllus Körn. in Mart., Fl. Bras. 3 (1): 438. 1863. Dupatya aciphylla (Bong.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya aciphylla Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus aciphyllus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Additional bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 636. 1831; Bong., Ess. Monog. Erioc. 35 & 36. 1831; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 579 & 612. 1841; D. Dietr., Syn. Pl. 5: 268. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 282 & 333. 1855; Körn. in Mart., Fl. Bras. 3 (1): 438, 507, & 508. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877 (1893) and imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 271, 273, 284, 289, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 415. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877 (1946) and imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 16, 28, 32, 44, & 56. 1946; Moldenke, Phytologia 2: 498. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Phytologia 4: 296 & 311. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 105, 279, 285, 323, 351, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877 (1960) and imp. 3, 2: 401. 1960; Moldenke, Fifth Summ. 1: 171 & 477 (1971) and 2: 492, 577, 635, 960, & 972. 1971; Moldenke, Phytologia 33: 25 (1976), 34: 277 (1976), and 35: 36. 1976.

This species appears to be based on L. Riedel 1042 from "in pratis sabulosis humidis Serra da Lapa", Minas Gerais, Brazil, although Bongard (1831) cites no number for the Riedel collection. An isotype in the Vienna herbarium was photographed there by Macbride as his type photograph number 29988. Bongard's original

description is "caulescens; caule brevissimo ramuloso; foliis caespitosis vaginis brevioribus lanceolato-linearibus acutis canaliculatis; pedunculis caespitosis vaginisque pubescentibus". He cites a plate 38, but this plate apparently never was published and probably exists only in the Leningrad herbarium or library.

The Eriocaulon aciphyllum of Reichenbach, referred to in the synonymy above, is a synonym of Paepalanthus subtilis Miq.

Ruhland (1903) refers this species to page "272" in the Steudel work (1840), but this is an error for page 282. He cites only the type collection and comments that the "Species P. niveo valde affinis". Silveira (1928) cites A. Silveira 451 from the Serra do Cipó, Minas Gerais, collected in 1905.

Recent collectors have found this species growing in sandy campos and in wet sand in an "area of gently sloping open hillsides with sandy soil and sandstone boulders, mostly wet with seeping water, and a rocky area along a rushing stream at the base of the hill", at altitudes of 1200--1300 m. They found it in flower and fruit in February and September and describe the heads as white.

Additional citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 35448 (Ld, N); Hatschbach 27395 (S, Z).

SYNGONANTHUS ACOPANENSIS Moldenke, Phytologia 3: 41--42. 1948.

Bibliography: Moldenke, Phytologia 3: 41--42. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 65 & 212. 1949; Moldenke, Phytologia 4: 296. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Moldenke, Résumé 73 & 490. 1959; Moldenke, Fifth Summ. 1: 127 (1971) and 2: 960. 1971; Moldenke, Phytologia 29: 388. 1975.

Recent collectors describe this plant as having "leaves in clumps, coriaceous or subcoriaceous, stiffly rigid or flexible, erect, in 2 planes", dull- or olive-green on both surfaces or "rich-green", and the flower-heads "dull-white with black at base" (blackish bracts) or "gray and white". They found it growing in wet soil of large swamps and in open forest on laterite deposits above a swamp, at altitudes of 2100--2500 meters, flowering in January, February, and June. Wurdack reports it "locally frequent" in small clumps on the upper "cumbre" and in deep canyons. Wurdack 34213 is a mixture with Paepalanthus fratermus N. E. Br. and has obscurely appressed-pilose or subglabrate peduncles.

Material of S. acopanensis has been misidentified and distributed in some herbaria as Leiothrix sp.

Additional citations: VENEZUELA: Bolívar: Cardona 2280 (Ve--isotype); J. A. Steyermark 75850 (Z), 75925 (Ss); Steyermark & Wurdack 804 (N); Wurdack 34213, in part (Mu, N).

SYNGONANTHUS ALBOPULVINATUS (Moldenke) Moldenke, Phytologia 20: 243. 1970.

Synonymy: Paepalanthus albopulvinatus Moldenke in Maguire & Phelps, Bol. Soc. Venez. Cienc. Nat. 14: 10. 1952. Syngonanthus

albopulvinatus Moldenke, Phytologia 4: 296, hyponym. 1953.

Bibliography: Moldenke in Maguire & Phelps, Bol. Soc. Venez. Cienc. Nat. 14: 10. 1952; Moldenke, Phytologia 4: 296. 1953; Moldenke, Résumé 73 & 490. 1959; G. Taylor, Ind. Kew. Suppl. 12: 101. 1959; Moldenke, Phytologia 20: 243. 1970; Moldenke, Biol. Abstr. 52: 714. 1971; Moldenke, Excerpt. Bot. A.18: 445. 1971; Moldenke, Fifth Summ. 1: 127 & 131 (1971) and 2: 577 & 960. 1971; Heslop-Harrison, Ind. Kew. Suppl. 15: 133. 1974; Moldenke, Phytologia 34: 277. 1976.

This species is based on Maguire, Phelps, Hitchcock, & Budowski 31774 from a Bonnetia savanna on a "cumbre" at 2000 meters altitude at Caño Guaviarito, Río Manapiare, Río Ventuari, Amazonas, Venezuela, collected on February 4, 1951, and deposited in the Britton Herbarium at the New York Botanical Garden.

Recent collectors describe the plant as an herb, 4 inches tall, the leaves in a rosette, spreading, rigid, gray-green, softly hairy, and the flower-heads white or gray-white. They have encountered it in open xeromorphic scrub on white sand, on open savannas with Trachypogon, Echinolaena, and Paspalum dominant, with a narrow strip of gallery forest along the rivers, the soil with the top 20 cm. a sand and organic material mixture, below which is a 1 m. zone of yellow sand, and "locally frequent" on dry sand banks along rivers, at altitudes of 1300--2000 meters, flowering from December to February.

Additional citations: VENEZUELA: Bolívar: E. Davidse 4710 (Z); Steyermark & Wurdack 363 (N). GUYANA: Herb. Univ. Georgetown Bio. 106-20 (N).

SYNGONANTHUS ALLENI Moldenke, Bull. Torrey Bot. Club 77: 390. 1950.

Bibliography: Moldenke, Bull. Torrey Bot. Club 77: 390. 1950; Moldenke, Phytologia 4: 296. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Moldenke, Résumé 68, 73, & 490. 1959; Moldenke, Résumé Suppl. 1: 5 & 6 (1959) and 2: 5. 1960; Moldenke, Biol. Abstr. 35: 2177. 1960; Hocking, Excerpt. Bot. A.4: 593. 1962; Moldenke, Fifth Summ. 1: 119 & 171 (1971) and 2: 960. 1971.

This pretty species is based on P. H. Allen 3149 from Yapoboda, Vaupés, Colombia, collected on December 10, 1943, and deposited in the United States National Herbarium in Washington. Hemming found it on the Cachimbo hills in "campo cerrado" interspersed with rainforest near rivers in sandy soil of open clearing of airfield, altitude 1390 feet, on the Pará-Mato Grosso border, flowering in July.

Additional citations: BRAZIL: Pará: Hemming 7 (Z); Sick 669 [Herb. Brad. 4614] (Bd), s.n. [Serra do Cachimbo, 5.57; Herb. Brad. 4704] (Bd).

SYNGONANTHUS ALLENI var. BRASILIENSIS Moldenke, Phytologia 7: 121. 1960.

Bibliography: Moldenke, Biol. Abstr. 35: 2177. 1960; Moldenke,

Phytologia 7: 121. 1960; Moldenke, Résumé Suppl. 2: 5. 1960; Hocking, Excerpt. Bot. A.4: 593. 1962; Moldenke, Fifth Summ. 1: 171 (1971) and 2: 960. 1971.

Citations: BRAZIL: Pará: Egler & Raimundo s.n. [W. A. Egler 968; Herb. Mus. Goeldi 23628] (Bd--12296--isotype, Z--type).

SYNGONANTHUS ALLENI var. PARVUS Moldenke, Mem. N. Y. Bot. Gard. 8: 99. 1953.

Bibliography: Moldenke, Mem. N. Y. Bot. Gard. 8: 99. 1953; Moldenke, Phytologia 4: 296. 1953; Moldenke, Résumé 73 & 490. 1959; Moldenke, Fifth Summ. 1: 127 (1971) and 2: 960. 1971.

This variety differs from the typical form of the species in its shorter stems, glabrous attenuate leaves, few and shorter bracts, fewer peduncles, and the heads and flowers smaller. The type of the variety was collected by B. Maguire, R. S. Cowan, and J. J. Wurdack (no. 29238) in shallow wet sand and on rock outcrop behind (east of) Hotel Amazonas, Puerto Ayacucho, Amazonas, Venezuela, on October 24, 1950, and is deposited in the Britton Herbarium at the New York Botanical Garden.

Additional citations: VENEZUELA: Amazonas: Foldats 3566 (Ve).

SYNGONANTHUS AMAPENSIS Moldenke, Phytologia 5: 90--91. 1954.

Bibliography: Moldenke, Phytologia 5: 90--91. 1954; Moldenke, Résumé 105 & 490. 1959; G. Taylor, Ind. Kew. Suppl. 12: 138. 1959; Moldenke, Fifth Summ. 1: 171 (1971) and 2: 960. 1971.

Citations: BRAZIL: Amapá: Black & Lobato 50-9492 (Z--type); Murça Pires & Cavalcante 52407 (N, N, N, N).

SYNGONANTHUS AMAZONICUS Moldenke, Phytologia 3: 42--43. 1948.

Bibliography: Moldenke, Phytologia 3: 42--43. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Phytologia 4: 296. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Moldenke, Résumé 105 & 490. 1959; Van Donselaar, Wentia 14: 40. 1965; Moldenke, Fifth Summ. 1: 171 (1971) and 2: 960. 1971.

Van Donselaar (1965) encountered this species in a Syngonantho-xyridion ecologic association.

SYNGONANTHUS ANDROSACEUS (Griseb.) Ruhl. in Urb., Symb. Ant. 1: 488. 1900.

Synonymy: Paepalanthus androsaceus Griseb., Cat. Pl. Cub. 225. 1866. Paepalanthus androsaceus var. flavescens Griseb., Cat. Pl. Cub. 225. 1866. Syngonanthus androsaceus Ruhl. apud Thiselt.-Dyer, Ind. Kew. Suppl. 2: 180. 1904.

Additional bibliography: Griseb., Cat. Pl. Cub. 225. 1866; Sauv., Anal. Acad. Sci. Habana 8: 50. 1871; Sauv., Fl. Cub. 165. 1871; Gomez de la Maza, Not. Bot. Sist. 49 & 110. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 401. 1894; Millsp., Publ. Field Mus. Bot. 1: 426. 1900; Ruhl. in Urb., Symb. Ant. 1: 487 & 488. 1900; Ruhl. in Engl., Pflanzenreich 13 (4-30): 245,

257, 289, & 293. 1903; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 180. 1904; Jennings, Ann. Carnegie Mus. 11: 90. 1917; Moldenke, N. Am. Fl. 19: 43 & 44. 1937; Moldenke, Phytologia 1: 335. 1939; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 401. 1946; León, Fl. Cuba 1: 283. 1946; Moldenke, Known Geogr. Distrib. Erioc. 5, 44, & 56. 1946; Moldenke, Alph. List Cit. 1: 3, 24, 25, 86, & 186 (1946), 2: 470, 486, & 648—650 (1948), 3: 930 (1949), and 4: 1084, 1085, 1144, & 1304. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 45 & 212. 1949; Moldenke, Phytologia 4: 208 & 296. 1953; Moldenke, Résumé 53, 323, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 401. 1960; Moldenke, Fifth Summ. 1: 98 (1971) and 2: 577 & 960. 1971; León & Alain, Fl. Cuba, imp. 2, 1: 283 & 435. 1974; Moldenke, Phytologia 33: 184 (1976) and 34: 277. 1976.

Ruhland (1900) distinguishes this species from the related S. lagopodioides (Griseb.) Ruhl. as follows:

1. "Bracteae involucrantes plus minus fulva-flavidae, basi ciliolatae; folia olivaceo-virentia, plerumque 3.5 cm. longa.... S. androsaceus.

1a. "Bracteae involucrantes pallide stramineo-flavae, glabrae; folia laete viridia, plerumque modo 2 cm. longa..... S. lagopodioides.

He comments that "Equidem varietates Grisebachianas distinguere nequeo. Specimini mihi suppetentia colore foliorum bractearumque involucrantium plane congruunt. Species Syngonantho flavidulo (Koern.) Ruhl. proxima." He cites only C. Wright 3235 & 3236 from Cuba. Jennings (1917) cites Blain 151 from the Isle of Pines and gives the general distribution of the species as "Western Cuba and the Isle of Pines". Van Hermann notes that it is "very plentiful in wet sandy savannas", refers to the flower-heads as white, and found it in flower and fruit in January. The type collection, C. Wright 3235, is a mixture with a grass (at least insofar as the University of California specimen of this number is concerned).

Additional & emended citations: CUBA: Pinar del Río: C. F. Baker 2101 (B); León 19415 (Um—10064); Moldenke & Moldenke 19882 (Ac, Au, Bi, Bm, Bm, Bs, Ca, Ca, Fg, Ft, Gg, Hk, Ip, L, Ld, Le, Lk, Lw, Mi, Mm, Mu, Ok, Sm, Ss, Tk, Ut, Ws, Ws, Z); Van Hermann 570 (W—1146897); C. Wright 3235, in part (Ca—937001—isotype, T—isotype).

SYNGONANTHUS ANGOLENSIS H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 193—194 & 198, text fig. 7 & 8, pl. 9, fig. 10 & 13. 1955.

Bibliography: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 192—198, text fig. 7 & 8, pl. 9, fig. 10 & 13. 1955; Anon., Assoc. Étud. Tax. Fl. Afr. Trop. Index 1955: 30. 1956; Moldenke, Phytologia 5: 341. 1956; Moldenke, Résumé 147, 351, & 490. 1959; G. Taylor, Ind. Kew. Suppl. 12: 138. 1959; Moldenke, Phytologia 18: 256. 1969; Moldenke, Fifth Summ. 1: 244 & 635 (1971) and 2: 960. 1971;

Moldenke, Phytologia 34: 278. 1976.

Illustrations: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 198, text fig. 7 & 8, pl. 9, fig. 10 & 13. 1955.

This species was based by Hess (1955) on H. Hess 52/2098 from "Am Rio Luassinga, 60 km östlich Vila Serpa Pinto (Menongue)", Bié, Angola, at 1400 meters altitude, collected on June 28, 1952. He cites also H. Hess 52/2084, 52/2086, 52/2111, & 52/2112 from Bié and 52/2151 from Huila, Angola, and says that it occurs on "Sandiger und sandig-mooriger Boden entlang Flüssen; ziemlich trocken (Böschungen) bis überschwemmt". He comments further: "Aus dem umfangreichen Material können nur Abweichungen in Grösse und Form der Blätter festgestellt werden, die durch den Standort bedingt sind. So sind bei Nr. 52/2084, die an einer sandigen, trockenen Böschung des Rio Cuatir gesammelt wurden, die Blätter nur etwa 1 cm lang und im Querschnitt elliptisch, während bei Nr. 52/2086, die etwas weiter unten im 2—4 cm tiefen Wasser stand, die Blätter bis 6 cm lang und flach sind. Die gleiche Beobachtungen wurden am Rio Quiriri gemacht: Nr. 52/2111 entwickelte sich submers und hat bis 12 cm lange Blätter; Nr. 52/2112 wurde deneben auf trockenen Sand gesammelt. Die Blätter dieser Pflanzen sind etwa 3 cm lang.

"Verbreitung: Angola: Nur entlang den Seitenflüssen des Rio Cubango (Rio Cuatir, Rio Luassinga, Rio Quiriri) sowie an einem Seitenfluss des Rio Cunene (Rio Quangue) beobachtet und gesammelt.

"Verwandschaftsverhältnisse: Syngonanthus angolensis unterscheidet sich von allen bekannten Syngonanthus-Arten Afrikas durch seine vollständig kahlen Halme, die verschieden gefärbten, 3—3,3 mm langen (bei Fruchtreife wahrscheinlich 4 mm lang) Sepalen, die im mittleren Drittel dorsal und ventral lang behaart sind. Diese Merkmale sind konstant und erlauben, die Art eindeutig zu charakterisieren.

"Die systematischen Unterscheide gegenüber Syngonanthus Poggeanus und S. Wahlbergii sind aber nicht so gross, dass hybridogene Zwischenformen nicht denkbar wären. Mutmassliche Bastarde zwischen den 3 Syngonanthus-Arten wurden verschiedentlich gefunden und sind im folgenden beschrieben." [Cfr. xS. hessii Moldenke and xS. hybridus Moldenke].

SYNGONANTHUS ANGUSTIFOLIUS Alv. Silv., Fl. Mont. 1: 370—371, pl. 236. 1928.

Synonymy: Syngonanthus angustifolia Alv. Silv. ex Moldenke, Known Geogr. Distrib. Erioc. 56, in syn. 1946.

Bibliography: Alv. Silv., Fl. Mont. 1: 370—371 & 415, pl. 236. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Résumé 105, 351, & 490. 1959; Moldenke, Fifth Summ. 1: 171

(1971) and 2: 635 & 960. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 236. 1928.

This species is based on A. Silveira 743 from "In campis arenosis in Serra da Babylonia, prope Passos", Minas Gerais, Brazil, collected in April, 1925, and deposited in the Silveira herbarium. In his original description Silveira (1928) comments that the "Species a S. niveo propter pilositatem foliorum vaginarumque precipue differt". It is known thus far only from the original collection.

It should be noted that Wangerin (1937) erroneously cites the plate number as "CCXXXV".

SYNGONANTHUS ANOMALUS (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 267. 1903.

Synonymy: Paepalanthus anomalus Körn. in Mart., Fl. Bras. 3 (1): 458. 1863. Dupatya anomala (Körn.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya anomala Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus anomalus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Syngonanthus anomalus var. stolonacea Herzog in Fedde, Repert. Spec. Nov. 29: 213, hyponym. 1931. Syngonanthus anomalus f. terrestris Herzog in Fedde, Repert. Spec. Nov. 29: 213, hyponym. 1931. Syngonanthus anomalus var. stolonaceus Herzog ex Moldenke, Known Geogr. Distrib. Erioc. 17 & 56, nom. nud. 1946. Syngonanthus esmeraldae Ruhl. ex Moldenke, Phytologia 4: 297, in syn. 1953.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 279, 458, & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 3, 264, 267, 289, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Herzog in Fedde, Repert. Spec. Nov. 29: 213. 1931; Fedde & Schust. in Just, Bot. Jahresber. 59 (2): 20. 1939; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 6, 17, 44, & 56. 1946; Moldenke, Alph. List Cit. 3: 956. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 65, 66, 90, & 212. 1949; Moldenke, Mem. N. Y. Bot. Gard. 8: 99. 1953; Moldenke, Phytologia 4: 297. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 73, 76, 105, 323, 351, 490, & 491. 1959; Moldenke, Résumé Suppl. 1: 20. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 401. 1960; Moldenke, Résumé Suppl. 10: 2 (1964) and 12: 3. 1965; Van Donselaar, Meded. Bot. Mus. Rijksuniv. 306: 397 & 402. 1968; Oberwinkler, Pterid. & Sperm. Venez. 8 & 52. 1970; Moldenke, Fifth Summ. 1: 119, 127, 131, 132, & 171 (1971) and 2: 577, 582, 635, 636, & 960. 1971; Moldenke, Phytologia 29: 318 (1974), 31: 385 & 407 (1975), and 34: 277. 1976.

This species is based on Spruce 2039 from along the Rio Negro between Barcellos and São Gabriel, Amazônas, Brazil. An isotype

in the Copenhagen herbarium was photographed there by Macbride as his type photograph number 22277, in part [the other part represents Spruce 3259, type collection of S. esmeraldae Ruhl.].

Herzog's var. stolonaceus is based on Lützelburg 23739 from Jutica, Uaupés, Pará, Brazil, while his f. terrensis is based on Lützelburg 22160 & 22184 from Uauaucá, Rio Negro, Amazônas, collected on September 28, 1911, all deposited in the Munich herbarium. It seems virtually impossible to find any constant characters to differentiate these two supposed infraspecific taxa from the typical S. anomalus. Macbride photographed 23739 in the Munich herbarium as his type photograph number 18740. Lützelburg 23299b, cited below, may actually be a cotype of f. natans, but the other number so labeled by Herzog is plainly S. macrocaulon Ruhl., so I prefer to regard the latter as the actual type of f. natans and the former as a mere misidentification. Similarly, I regard Herzog's S. anomalus f. glabriusculus and f. natans glabripes as belonging in the synonymy of S. macrocaulon.

Gleason, in his unpublished Flora of British Guiana, describes S. anomalus as follows: "Stems more or less tufted, often irregularly branched, 3--10 cm. long; leaves rather crowded toward the end of the branches, narrowly linear, 10--15 mm. long; peduncles scattered, filiform, 2--5 cm. long, twisted, minutely pubescent; sheaths long-oblique, pubescent, the lamina acuminate; heads subhemispheric, 3 mm. wide; bracts obovate, obtuse or rounded." He cites only Jenman 937 from Kaieteur Falls, but gives its overall distribution as "Venezuela, northern Brazil". He distinguishes it from related species in Guyana as follows:

1. Subtending bracts present; leaves 1 mm. wide or less.
2. Principal leaves about 15 mm. long, very thin and lax; peduncular sheaths acuminate.....S. anomalus.
2a. Principal leaves about 5 mm. long, firm, prominently nerved; peduncular sheaths obtuse.....S. brevifolius.
1a. Subtending bracts none; leaves 2--5 mm. wide....S. caulescens.

Ruhland (1903) cites only Spruce 3259 from Venezuela and Spruce 2039 from Amazônas, Brazil, and comments that the "Species a cl. Koernicke ad Psilocephalum collocata structura petalorum floris ♂ huc ducenda". Herzog (1931) distinguished two of his proposed infraspecific taxa as follows: "var. stolonacea. A typo differt caulibus stolonaceo-repentibus, ramis floriferis brevissimis erectis parvifoliis.....Bei manchen Blüten kommen appendices styli vor die beim Original und bei n. 22147 fehlen. Ihre kurze und keulige Form spricht aber für rudimentaire Natur, ebenso wie das unregelmässige Auftreten." For f. terrestris he says "in der Blüte vollkommen mit der f. natans übereinstimmend, ebenso in der Form der Brakteen, Behaarung der Pedunculi (s. Original!, Beschreibung ungenau!), den lockeren Scheiden etc."

Recent collectors describe this species as an herb with white inflorescence-heads, white flowers, and white stamens. They have

found it growing on sand and in muddy places at river margins, in sandy soil in blackwater-flooded clearings beside rivers, and "frequent" on marshy riverbanks, at altitudes of 120--500 meters, flowering in March and from August to January, and fruiting in March, October, and November. Irwin and his associates speak of it as an "herb. forming moss-like mats, locally abundant in savannas", Maguire and his associates report it as "frequent at water's edge" and "locally abundant in water on sandy moist riverbanks", while Junk describes it as an "erva imersa na agua alta". Prance asserts that he found it "flowering above and below water".

Herbarium material has been misidentified and distributed in some herbaria as S. biformis (N. E. Br.) Gleason. On the other hand, the Lützelburg 23182, distributed as S. anomalus, is more probably S. huberi Ruhl., while C. D. K. Cook 214 is S. philodicoides (Körn.) Ruhl.

Additional citations: COLOMBIA: Vaupés: Humbert 27453 (P); Schultes, Baker, & Cabrera 18147 (N, W--2198894). VENEZUELA: Amazonas: Spruce 3259 [Macbride photo 22277, in part] (B, B, W--photo); Vareschi & Maegdefrau 6709 (Ve--42897); Maguire, Wurdack, & Bunting 36645 (N); Maguire, Wurdack, & Maguire 42634 (N, S). Bolívar: Agostini 264 (Lw); Hertel & Oberwinkler 15202 (Mu), 15214b (Mu). GUYANA: Sandwith 1257 (Ut--44225A). SURINAM: Irwin, Prance, Soderstrom, & Holmgren 55267 (N, S). BRAZIL: Amapá: Fróes 26056 (Z). Amazônas: Fróes 25388 (N), 27915 (Z), 28467 (Mu, Z), 28717 (Z); Fróes & Addison 29241 (Z); Junk 135 (Ld); Lützelburg 22160 (Mu), 22184 [N. Y. Bot. Gard. Type Photo Neg. N.S. 8841] (Mu, N--photo, Z--photo), 23299b [N. Y. Bot. Gard. Type Photo Neg. N.S. 8840] (Mu, N--photo, Z--photo); Prance, Berg, Bisby, Steward, Monteiro, & Ramos 17814 (Ld); Prance, Maas, Woolcott, Coêlho, Monteiro, & Ramos 15233 (Ac, N); Prance, Maas, Woolcott, Monteiro, & Ramos 15541 (Ld, N); Prance, Pennington, Nelson, & Ramos 21646 (Ld); R. E. Schultes 8904 (Z); Spruce 2039 [Macbride photo 22277, in part] (B--isotype, W--photo of isotype). Pará: Egler & Raimundo s.n. [W. A. Egler 794; Herb. Mus. Goeldi 23632] (Bd--12293, Z); Lützelburg 23739 [Macbride photos 18740] (Mu, N--photo, N--photo, W--photo); Murça Pires & Silva 4347 (Z), 4380 (N, Z). LOCALITY OF COLLECTION UNDETERMINED: Herb. Inst. Agron. Norte 6 (Z).

SYNGONANTHUS ANTHEMIFLORUS (Bong.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 258--259, fig. 37 [as "anthemidiflorus"]. 1903.

Synonymy: Eriocaulon anthemiflorum Bong., Mem. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 636. 1831. Paepalanthus anthemidiflorus Kunth, Enum. Pl. 3: 535. 1841. Eriocaulon chrysanthemiflorum Schnitzl., Iconogr. 1: pl. 47, fig. 3 & 6. 1847. Eriocaulon anthemidiflorum Bong. apud D. Dietr., Syn. Pl. 5: 263. 1852. Eriocaulon arctotiflorum Steud., Syn. Pl. Glum. 2: [Cyp.] 282.

1855. Eriocaulon anthemiflorum Clauss. ex Steud., Syn. Pl. Glum. 2: [Cyp.] 282 & 333, in syn. 1855. Paepalanthus anthemidiflorus var. α Körn. in Mart., Fl. Bras. 3 (1): 440--441. 1863. Paepalanthus anthemidiflorus var. β Körn. in Mart., Fl. Bras. 3 (1): 440--441. 1863. Dupatya anthemidiflora (Bong.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya anthemidiflora Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus anthemidiflorus (Bong.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 258. 1903. Syngonanthus anthemidiflorus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Syngonanthus anthemidiflorus var. β Körn. apud Alv. Silv., Fl. Mont. 1: 415. 1928. Syngonanthus anthemiflorus (Bong.) Ruhl. ex Moldenke, Known Geogr. Distrib. Erioc. 17 & 56. 1946. Paepalanthus anthemidifolius Körn. ex Moldenke, Résumé Suppl. 3: 34, in syn. 1962. Eriocaulon anthemidiflorus Bong. ex Moldenke, Phytologia 31: 397, in syn. 1975. Paepalanthus anthemiflorus Bong. ex Moldenke, Phytologia 31: 403, in syn. 1975. Paepalanthus anthemiflorus Körn. ex Moldenke, Phytologia 31, 403, in syn. 1975. Paepalanthus dichroanthelus Mart. ex Moldenke, Phytologia 31: 404, in syn. 1975.

Bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 636. 1831; Bong.,Ess. Monog. Erioc. 35 & 36 (1831) and 65--66 & 228-229, pl. 15. 1832; Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 2: 228--229, pl. 15. 1832; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 535, 578, 579, 612, & 624. 1841; Schnitzl., Iconogr. 1: pl. 46, fig. 5 & 6*. 1845; D. Dietr., Syn. Pl. 5: 263. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 282, 283, & 333. 1855; Körn. in Mart., Fl. Bras. 3 (1): 283, 284, 440--441, 500, & 507, pl. 57, fig. 2. 1863; Benth. & Hook. f., Gen. Pl. 3 (2): 1023. 1883; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 24. 1888; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877 (1893) and imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 12, 245, 258--259, 284, 285, 289, & 293, fig. 37. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Molfino, Physis 6: 362. 1923; Alv. Silv., Fl. Mont. 1: 415. 1928; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 44. 1930; Stapf, Ind. Lond. 3: 90 (1930), 4: 518 (1930), and 6: 248. 1931; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Castell. in Descole, Gen. & Sp. Pl. Argent. 3: 71, 92--94, & 104, pl. 19 & 21. 1945; Abbiatti, Rev. Mus. La Plata Bot., ser. 2, 6: [311], 312, & 339. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877 (1946) and imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 28, 32, 33, 44, & 56. 1946; Moldenke, Phytologia 2: 374 & 375 (1947) and 2: 498. 1948; Moldenke, Alph. List Cit. 3: 710. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90, 105, & 212. 1949; Moldenke, Phytologia 4: 208 & 297. 1953; Moldenke in Dawson, Los Angeles Co. Mus. Contrib. Sci. 7: 6. 1957; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 105, 126, 279, 285, 286, 323, 351,

418, & 490. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877 (1960) and imp. 3, 2: 401. 1960; Moldenke, Résumé Suppl. 3: 34. 1962; Melchior in Engl., Syllab. Pfl., ed. 12, 2: 556, fig. 230 L. 1964; Moldenke, Fifth Summ. 1: 171, 200, & 478 (1971) and 2: 493, 496, 577, 635, 773, & 960. 1971; Moldenke, Phytologia 31: 397, 403, 404, & 407 (1975), 33: 25 (1976), and 34: 259. 1976.

Illustrations: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 2: [Ess. Monog. Erioc.] pl. 15. 1832; Schnitzl., Iconogr. 1: pl. 46, fig. 5 & 6* (in color). 1845; Körn. in Mart., Fl. Bras. 3 (1): pl. 57, fig. 2. 1863; Ruhl. in Engl., Pflanzenreich 13 (4-30): 258, fig. 37. 1903; Castell. in Descole, Gen. & Sp. Pl. Argent. 3: pl. 19. 1945; Melchior in Engl., Syllab. Pflanzenfam., ed. 12, 2: 556, fig. 230 L. 1964.

This species was based on L. Riedel 1409 from "in paludosis Serra da Lapa", Minas Gerais, Brazil, deposited in the Leningrad herbarium. Bongard's original (1831) description is "caulescens; caule brevi simplici nudo; foliis radicalibus confertis brevissimis linearibus obtusiusculis; pedunculo terminali subsolitario vaginaque pubescente". Actually the number of peduncles per plant varies from 1 to 6. Ruhland (1903) cites from Minas Gerais: Clausen 66 & 160; Glaziou 8496, 8504, 15554, 19980, 19981, & 19982; L. Riedel 1409; Schwacke 8493 & 14543; Ule s.n.; and Weddell 1895. He comments that the "Species magnitudine valde variabili". In his key he distinguishes it from the very similar S. laricifolius as follows:

1. "Folia ramorum dense et persistente pilosa, omnia glaucescentia; vaginae dense et longiuscule pubescentes.S.laricifolius.
1a. "Folia ramorum supra puberula, subtus calva; vaginae glabriusculae".....S. anthemiflorus.

It should be noted, however, that the original description of the species by Bongard (1831) describes the sheaths of S. anthemiflorus as pubescent and in all the specimens examined by me they are decidedly puberulent or short-pubescent. The single collection seen by me with completely glabrous leaves and sheaths is described below as var. subglabrescens Moldenke.

It should also be noted that the illustration of this species in Schnitzlein's work (1845) is referred to as fig. "3" in the text but is labeled "5" on the plate. The work is sometimes cited as "1847", but according to Stapf (1930) the plate in question here was issued in 1845.

Recent collectors describe S. anthemiflorus as an herb. 10--25 cm. tall, tufted, the inflorescences 7--20 cm. tall, and the flower-heads white, cream, or yellow. They have found it growing on wet or dry campos, in sandy marshy places, in swamps, and on outcrops in upland campos and adjacent rocky slopes, at altitudes of 1050--1350 meters, flowering from January to April and in June and November. Silve reports it very frequent on sandstone outcrops; Irwin and his associates encountered it on wet campos in a region of sandy and gravelly campos and cerrado on outcrops. Anderson and his associates found it in sand on the banks of inter-

mittent creeks and in open places in an area of rocky campo and cerrado, sloping down to a wet-sand meadow adjacent to gallery forest along streams, in sandy soil with sandstone outcrops. The vernacular name, "sempre-viva", is recorded for it. Silveira (1928) cites A. Silveira 214 from Diamantina, Minas Gerais, collected in 1918.

Eriocaulon anthemiflorum Clauss. is based on P. Clausen "160 [vel 1160]" from Minas Gerais.

Material of S. anthemiflorus [I see no valid reason to change the original spelling of this specific epithet on the excuse of "correcting" it] has been misidentified and distributed in some herbaria as S. laricifolius (G. Gardn.) Ruhl. On the other hand, the Dawson 14631, distributed as immature S. anthemiflorus and so cited by me in my 1957 work, proves to be S. decorus Moldenke, while Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28089 is the type collection of S. anthemiflorus var. subglabrescens Moldenke.

Additional citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 36202 (Ld, N); Archer & Mello Barreto 4930 [Herb. Jard. Bot. Belo Horiz. 17512, in part; Herb. U. S. Nat. Arb. 1774481 (W--2121741); Black & Magalhães 51-11907 (Z); P. Clausen 7 (Mi, P), 160 (B), s.n. [Itabira do Campo] (B); Glaziou 19981 (Ca--947115, N, W--1124165); Hatschbach, Anderson, Barneby, & Gates 36442 (Z); Héringer & Castellanos 6142 (B); Irwin, Maxwell, & Wasshausen 19901 (Ld, N); Irwin, Onishi, Fonsêca, Souza, Reis dos Santos, & Ramos 25464 (Ac, N, W--2759054); Martius 889 (B, Mu), s.n. [Tejuco, distr. adamant.] (Mu, Mu), s.n. (B); Murça Pires & Black 3327 (B); E. Pereira 2808 [Pabst 36444; Herb. Brad. 3842] (Sm); L. Riedel 1409 (B--isotype, Ut--390--isotype); J. B. Silva 586 [Herb. Set. Lag. 723] (Ba, Ld); L. B. Smith 6845 (Z). State undetermined: Herb. Zuccarini s.n. [Brasilia] (Mu). MOUNTED ILLUSTRATIONS: Bong., Mém. Acad. Imp. Sci. St. Péters., ser. 6, 2: pl. 15. 1832 (N, Z); Castell. in Descole, Gen. & Sp. Pl. Argent. 3: pl. 19. 1945 (N); Körn. in Mart., Fl. Bras. 3 (1): pl. 57, fig. 2. 1863 (B, B, N, Z); drawings by Körnicke (B).

SYNGONANTHUS ANTHEMIFLORUS var. SUBGLABRESCENS Moldenke, Phytologia 34: 259, nom. nud. 1976; var. nov.

Bibliography: Moldenke, Phytologia 34: 259. 1976.

Haec varietas a forma typica speciei foliis caulinis raisque et vaginis glabratis vel glabrescentibus differt.

This variety differs from the typical form of the species in having its basal and stem leaves and the sheaths glabrous or glabrescent. The peduncles are up to 22 cm. long and densely appressed-pilosulous.

The type of the variety was collected by H. S. Irwin, S. F. da Fonsêca, R. Souza, R. Reis dos Santos, and J. Ramos (no. 28089) on the campo in an area of cerrado, campo, and gallery forest, at

1050 meters altitude, about 10 km. north of São João da Chapada on the road to Inhai, Minas Gerais, Brazil, on March 22, 1970, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collectors describe the plant as an herb to about 25 cm. tall, with white flower-heads.

Citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28089 (Ld--isotype, N--type, W--2759053--isotype).

SYNGONANTHUS APPRESSUS (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 269. 1903.

Synonymy: Paepalanthus appressus Körn. in Mart., Fl. Bras. 3 (1): 468, pl. 59, fig. 2. 1863. Dupatya appressa (Körn.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya appressa Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus appressus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Eriocaulon imbricatum Riedel ex Moldenke, Résumé Suppl. 1: 17, in syn. 1959 [not Syngonanthus imbricatus (Körn.) Ruhl., 1903].

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 468, 500, & 507, pl. 59, fig. 2. 1863; Körn. in Warm., Vidensk. Meddel. Nat. Foren. Kjöbenh. 23: 315. 1871; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 246, 269, 289, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 415. 1928; Stapf, Ind. Lond. 4: 518. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 28, 44, & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Phytologia 4: 297. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 105, 279, 323, & 491. 1959; Moldenke, Résumé Suppl. 1: 17. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 401. 1960; Moldenke, Résumé Suppl. 3: 14. 1962; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 149 & 158. 1969; Moldenke, Fifth Summ. 1: 171 & 478 (1971) and 2: 503, 577, & 960. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1161 & Ind. 20 & 28. 1972; Anon., Biol. Abstr. 56 (3): B.A.S.I.C. S.258. 1973; Moldenke, Biol. Abstr. 56: 1243. 1973; Moldenke, Phytologia 25: 118 & 230. 1973.

Illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl. 59, fig. 2. 1863.

This species was based on G. Gardner 5255 and L. Riedel 2302, the former from Minas Gerais and the latter from São Paulo, Brazil, deposited in the Munich herbarium. In my 1953 work I erroneously cited both collections as from São Paulo. In his 1871 work Körnicke cites Warming s.n. from Lagoa Santa, while in 1928 Silveira cited A. Silveira 218 from Belo Horizonte, both localities being in Minas Gerais. Körnicke comments about the Warming collection: "Folia infima specimium glabriuscula, interdum longiora lanceolato-linearia patentia vel patentissima, nec re vera

recurvata (loco natali humidiore?)".

Eriocaulon imbricatum of Riedel is based on L. Riedel 2302 in the Berlin herbarium.

Syngonanthus appressus has been found in wet places, swamps, sandy soil in marshes, and along brooks, flowering in June, August, and September, and fruiting in August. Ruhland (1903) cites only G. Gardner 5255, L. Riedel 2302, and A. Silveira 2020.

Additional & emended citations: BRAZIL: Goiás: Ule 234 (P, P). Minas Gerais: G. Gardner 5255 (B--cotype, N--cotype, N--photo of cotype, S--cotype, W--1067049--cotype, Z--photo of cotype). São Paulo: Eiten, Eiten, Felippe, & Freitas Campos 3029 (N); Freitas Campos 3 (Z), 5 (N); L. Riedel 2302 (B--cotype, Mu--cotype, Ut--391--cotype). MOUNTED ILLUSTRATIONS: drawings by Körnicke (B, B); Körn. in Mart., Fl. Bras. 3 (1): pl. 59, fig. 2. 1863 (B, N, Z).

SYNGONANTHUS APPRESSUS var. CHAPADENSIS Moldenke, Phytologia 25: 118--119. 1973.

Bibliography: Anon., Biol. Abstr. 56 (3): B.A.S.I.C. S.258. 1973; Moldenke, Biol. Abstr. 56: 1243, 1973; Moldenke, Phytologia 25: 118--119 & 230. 1973.

Collectors have encountered this plant in gallery forests and adjacent wet campo, at 1250 m. altitude, flowering in March.

Citations: BRAZIL: Goiás: Irwin, Harley, & Smith 32149 (N--isotype, Z--type), 32203 (Ld, N).

SYNGONANTHUS AQUATICUS Alv. Silv., Fl. Serr. Min. 74, pl. 29. 1908.

Bibliography: Alv. Silv., Fl. Serr. Min. 74, pl. 29. 1908; Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 5. 1924; Alv. Silv., Fl. Mont. 1: 313--314 & 415, pl. 96. 1928; Stapf, Ind. Lond. 6: 248. 1931; A. W. Hill, Ind. Kew. Suppl. 8: 231. 1933; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 56. 1946; Moldenke, Phytologia 2: 492. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; F. C. Hoehne, Pl. Aquat. 88. 1955; Moldenke, Résumé 105 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 960. 1971; Moldenke, Phytologia 24: 19 (1972) and 25: 230. 1973; Moldenke, Biol. Abstr. 55: 4242. 1973; Hocking, Excerpt. Bot. A.23: 291. 1974.

Illustrations: Alv. Silv., Fl. Serr. Min. pl. 29. 1908; Alv. Silv., Fl. Mont. 1: pl. 96. 1928.

The type of this species was collected by Álvaro Adolpho da Silveira (no. 213) "In stagnis perennibus prope Capão Redondo in Serra do Cipó", Minas Gerais, Brazil, in April of 1905 and is deposited in the Silveira herbarium. Thus far the species is known only from the original collection. It should be noted here that Wangerin (1937) erroneously cites the second illustration of this taxon to plate "86" -- actually it is on plate 96.

[to be continued]

REINSTATEMENT OF CARMINATIA DC. (COMPOSITAE: EUPATORIEAE)

David J. Keil, Biological Sciences Department, California Polytechnic State University, San Luis Obispo, California 93407

and

Donald J. Pinkava, Department of Botany and Microbiology, Arizona State University, Tempe, Arizona 85281

Re-examination of cytological material of Carminatia tenuiflora DC. revealed that our recently published chromosome count of $2n = 9_{II}$ for that species (Keil and Pinkava, 1976) was in error and that the count should be $2n = 10_{II}$. This negates our argument that Carminatia should be merged with Brickellia Ell. ($x = 9$). The combinations that we proposed for Carminatia tenuiflora and for C. recondita McVaugh in Brickellia must be relegated to synonymy, and Carminatia must be reinstated as a distinct genus. We also acknowledge that King and Robinson (1972) are fully justified in separating Carminatia from Brickellia in Nueva Galicia using the characters that they had proposed. We thank Dr. King for calling attention to these errors.

Literature Cited

Keil, D. J., and D. J. Pinkava. 1976. Chromosome counts and taxonomic notes for Compositae from the United States and Mexico. Amer. J. Bot. 63:1393-1403.

King, R. M., and H. Robinson. 1972. Studies in the Eupatorieae (Asteraceae). C. A key to the genera of Nueva Galicia, Mexico. Phytologia 24:267-280.

BOOK REVIEWS

Alma L. Moldenke

"SPRING FLORA OF WISCONSIN — A Manual of Plants Growing Without Cultivation and Flowering Before June 15th" by Norman C. Fassett, Fourth Edition Revised & Enlarged by Olive S. Thomson, ix & 413 pp., illus., University of Wisconsin Press, Madison, Wisconsin 53701. 1975. $3.95 paperbound, $8.50 clothbound.

College students, school teachers, amateur field naturalists, botanists, folks in various posts safeguarding the environment herewith have an easily available, inexpensive, accurate, and functionally useful source of information for identifying readily the native and adventive early blooming local flora not only in the State of Wisconsin but in much of contiguous areas.

The illustrations — 571 often multi-part figures -- are line drawings planned to show diagnostic features rather than general appearance — and to show counties, zones of vegetation, etc., on state maps.

The additions and taxonomic corrections bring this work up-to-date, keeping it a credit to Dr. Fassett's first edition of 1931 and also a real credit to Mrs. Thomson's care in revision.

"AUSTRALIAN EUCALYPTS: A Selection of over 80 Tree Studies with Notes on Characteristics, Identification, Uses and Cultivation" by Douglass Baglin & Barbara Mullins, 36 pp., illus., A. H. & A. W. Reed in Australia, imported by Charles E. Tuttle Co., Inc., Rutland, Vermont 05701. 1974. $3.50 paperbound.

Such beautiful natural color photographs so clearly printed and so succinctly described portray how this particular native floral component has become adapted to a great range of soils and climates at home and where introduced for its lumber, honey, essential oils, etc.

This publication is the third in the Mulavon series of real value for schools in any of the many areas where these gum trees now grow and for travel souvenirs well worth keeping and sharing.

"COMMON INSECTS IN NEW ZEALAND" by David Miller, xi & 178 pp., illus., A. H. & A. W. Reed Ltd., Wellington, Sydney & London, in U.S.A. imported by Charles E. Tuttle Co., Inc., Rutland, Vermont 05701. 1974. $13.95.

This excellent new printing for the American market serves as

a fitting memorial to the author as it reveals the breadth, depth and appreciation of his entomological and Maori-anthropological scholarship as well as his gifted skill in conveying this information to the general reader.

Big and little, exotic and native, economically important or not, a few hundred insects representing all known orders are described with items of special interest and illustrated in the drawings and photographs of the often several-parted black/white 456 figures and the 65 figures on the 9 gorgeous color plates. Any intending, armchair or returned visitor to this area, anyone interested in any kind of insects would surely treasure this book as a gift. One may read about the North American Monarch (Danaus plexippus) which bears a pre-European Maori name and continues to overwinter in clusters in repeatedly used locations, about the Fungus Gnat (Arachnocampa luminosa) whose "glow-worm" larvae secrete long pendulous threads with viscous droplets that lure other tiny prey, about a sundew (Drosera) ensnaring a large cranefly, about specific plant fertilization problems dependent upon the length of pollinator bees' "tongues", and about so much more so interestingly and accurately presented.

"INTRODUCTION TO PLANT PHYSIOLOGY" Second Edition by Bernard S. Meyer, Donald B. Anderson, Richard H. Böhning & Douglas G. Fratianne, x & 565 pp., illus., D. Van Nostrand Co., Melbourne, London, Toronto, Cincinnati & New York, N. Y. 10001. 1973. $13.95.

"This text is designed primarily for use in a one-semester or a one- or two-quarter first course.....Background training only in general botany or biology and general chemistry is assumed.

"The central presentation is concerned with the whole plant, with ecological undertones. The authors feel strongly that this is a proper approach to an understanding of the physiology of plants."

The first edition was published in 1960 by the first three authors and it was condensed from "Plant Physiology", last revised in 1952 by the first two authors.

This reviewer appreciates this orientation, the direct clear-cut presentation of information, problems and ideas, and the well chosen illustrations and diagrams.

Hopefully, the next edition is being readied now.

"THE FOREST WORLD OF NEW ZEALAND Realm of Tane-mahuta" by John H. Johns for photographs & C. Geoffrey R. Chavasse for text, 156 pp., illus., A. H. & A. W. Reed Ltd., Wellington, Sydney & in U.S.A. imported by Charles E. Tuttle Co., Inc., Rutland, Vermont 05701. 1975. $23.95.

After advanced training in their respective fields at the close

of World War II these authors joined the New Zealand Forest Service. They previously collaborated on its important publication, "Westland's Wealth".

How fortunate it is now that Americans, too, may have easier access to these exquisite color photographs (over 150) and appreciative descriptions of the Realm of Tane-mahuta, the Maori "god of forests and all that live therein", a realm "beautiful above all else". These forests are extraordinarily rich and varied; some of native origin, others as fortunate introductions.

The millions of Americans from all walks of life have been made aware of the awe-inspiring beauty of our own natural scenery through the Sierra Club's publication of "In Wilderness is the Preservation of the World", and many of these millions to varying degrees realize the concommitant responsibility for conservation. "The Forest World of New Zealand" carries the same message very poignantly.

"CHECKLIST OF THE WORLD'S BIRDS. A Complete List of the Species, with Names, Authorities and Areas of Distribution" by Edward S. Gruson with the assistance of Richard A. Forster, xii & 212 pp., illus., Quadrangle/New York Times Book Co., New York, N. Y. 10022. 1976. $10.95.

The authors who are long-time "birders" and an anonymous computer have made possible in legible compact book form at a modest price "as complete a listing of the species of birds of the world as possible, to give the scientific name and an English common name for each species, to provide a source to which the reader is referred if more information about the species is wanted and to give a gross idea of its range." The last two pieces of information are provided in code form. The source codes will be found on page 193 and the region codes are on the end-papers. These avifaunal or biogeographical maps are the only, but essential, illustrations in the book. The taxonomic arrangement basically follows Peter's "Checklist of the Birds of the World", thirteen of whose scholarly volumes have been published to date. There is an alphabetical index to generic names and also one to English common names.

There will be no problem selling this book! It should be in many public and school libraries and in the hands of many "birders" especially the traveling ones who may keep one copy fresh and a second one much annotated.

"A FIELD GUIDE TO THE NESTS, EGGS, AND NESTLINGS OF BRITISH AND EUROPEAN BIRDS" by Colin Harrison, 432 pp., illus., A Demeter Press Book, Quadrangle/New York Times Book Co., New York, N. Y. 10022. 1976. $12.50.

The author was a "birder" as a youngster and continues now as a

professional ornithologist in charge of the Nest Record Scheme and the National Collection of Eggs and Nests at the British Museum's center in Tring, Hertfordshire.

Fortunately, the collecting of bird eggs and nests is no longer a fad. There are enough already in museum collections, home attics and school science cabinets. Careful, considerate field observations of nests in use, their eggs and their nestlings are conservation-minded legally safe alternatives.

Just a glance at the index will indicate that this interesting book will be of service beyond the title's range into the Near East, North Africa, Canada, and the United States because of migrations, storm-wind-assisted extended flight ranges, intentional and unintentional importations and exportations, and natural holarctic range.

A particularly effective type of keying guides the reader through nest styles and location [well sketched], nestling appearance [145 adorably color-painted], egg size and color [beautifully color photographed] to what he chooses to identify.

This book deserves wide use.

"GUIDE TO AQUARIUM FISHES" by Klaus Paysan, 239 pp., illus., A Demeter Press Book, Quadrangle/New York Times Book Co., New York, N. Y. 10022. 1975. $9.95.

Who would ever have thought over a score of years ago that there would be a profitable market today for a popular, carefully compiled book for practical aquarists and plain fishtank-keepers that has about 650 different color photographs taken by the author of his own living fishes! They travel by plane in O_2-charged plastic bags from all wet corners of the world!

There is an easily workable key additionally aided by outlines of body and fin shapes leading to scientific name, family association, color plate, English common name and descriptive details of special interest to the aquarist about size, nature, locomotion, tank requirements, food, native sources, etc.

Dare one call this work "finastic"?

"ANATOMY, DESCRIPTIVE AND SURGICAL" by Henry Gray, 1901 Edition by T. Pickering Pick & Robert Howden. Facsimile Edition by Running Press, Philadelphia, Pa. 19103, 1257 pp., illus. 1975. $8.95 paperbound plus postage.

For about a century of biology students' college and university years, especially in the eastern United States, there have been two important "Grays" in various editions. For the botanically, field study and taxonomically inclined there was Gray's "Manual" and for the anatomically and medically inclined there was Gray's "Anatomy". The latter's current edition is the 29th of 1973 with, of course, some minor refinements and a purchase

price beyond that of many struggling "med" and allied students', especially foreigners, resources. For such this printing is a great boon if they will carefully check and annotate this edition against a library copy of the newest edition.

"THE THOMPSON BEGONIA GUIDE" Volume I by Mildred L. Thompson, ca. 300 pp., illus., published by Edward J. Thompson, Southampton, N. Y. 11968. 1975. $15.00 in 3-holed plastic looseleaf binder.

The author in her own terms is a hobbyist horticulturist much interested in collecting, collating and making available to similar serious enthusiasts, schools of horticulture, and skilled nursery people the results of her findings in this and subsequent volumes.

Using "The Species of the Begoniaceae" by Fred A. Barkley (a wellknown taxonomic botanist) and Jack Golding (a hobbyist horticulturist and recent president of the American Begonia Society when not working as an electronics engineer) as a basis for listing alphabetically and by vegetative type all registered cultivars and hybrids with parentage, producer and descriptive notes. Each basic type is illustrated. Each page is dated and numbered so that future additions and corrections can easily be substituted by a mere shifting of looseleaf pages.

At the outset the author has rendered a commendable service by simply and carefully explaining the differences in the nature and purpose of botanical and horticultural classification of these plants.

"THE THOMPSON BEGONIA GUIDE" Volume II by Mildred L. & Edward J. Thompson, ca. 250 pp., illus., published by Edward J. Thompson, Southampton, N. Y. 11968. 1975. $15.00 in 3-holed plastic looseleaf binder.

This husband-wife team, now the new co-presidents of the American Begonia Society, have about 675 different kinds of begonias growing in their personal collection, about half of all those at present known.

This second volume is devoted to classifications for display and competitive show purposes of the various cane-like, shrub-like, thick-stemmed, semperflorens, rhizomatous, rex, tuberous, and trailing kinds and many other arrangements. The Thompsons stress and state foremost in this volume that the "primary purpose of flower shows and displays is to educate and to stimulate interest in horticulture and in many cases interest in a particular plant family or group", with competitiveness definitely secondary to the educational value.

Cultural listings and bloom color, timing and amount are given in alphabetical listings. This part closes with directions for propagation by cuttings of various stem and leaf parts as well as by seed.

Again each page is dated & numbered so that new data may be added.

PHYTOLOGIA

Designed to expedite botanical publication

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CONTENTS

Published by Harold N. Moldenke and Alma L. Moldenke

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Price of this number, $2.50; per volume, $9.75 in advance or $10.50 after close of the volume; 75 cents extra to all foreign addresses; 512 pages constitute a volume

NOTES ON MIKANIA (COMPOSITAE) - III

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and

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Additional studies in the large tropical American genus Mikania (Compositae-Eupatorieae) have resulted in the following new species and a note on the synonomy of another. These notes are preliminary to a general treatment of Mikania in Peru.

MIKANIA CUZCOENSIS Holmes & McDaniel, sp. nov.

Suffrutex procumbens; foliis ovatis, ca 6-10 cm longis, 5-8 cm latis, apice acutis vel attenuatis, basi cordatis, supra glabris, subtus glandulis fuscatis et sessilis; paniculis ca 15 cm longis, 15 cm latis, ad extremum dispositus in racemis; capitulis ca 5-6 mm longis, corollis ca 2.5-3 mm longis, dentibus limbi triangularibus; achaenis ca 2.5 mm longis; pappi setis ca 35-40, ca 4 mm longis.

Somewhat shrubby or procumbent liana, stems terete, costate (after drying), glabrous, internodes to ca 20 cm long. Leaves ovate, ca 6-10 cm long, 5-8 cm wide, margins entire, apices acute to attenuate, bases cordate, upper surfaces glabrous, 5-7 nerved from the base, pale green, lower surfaces with dark globular sessile glands, lighter than above, petiole ca 3-8 cm long, thin, puberulent. Inflorescence a racemosely disposed panicle, ca 15 cm long and 15 cm wide, branchlets slightly angular, puberulent, pedicels ca 5 mm long, puberulent. Heads ca 5-6 mm long, exterior bract linear, ca 2-2.5 mm long, borne at base of pedicel. Involucres oblong, ca 4 mm long, glabrate, entire, apices obtuse, bases slightly narrowed, the center portion of the base of the inner two extended into a small knob-like proturberence. Corolla funnelform to slightly campanulate, ca 2.5-3 mm long, tube ca 1.2-1.5 mm long, throat ca 1.2-1.5 mm long, corolla lobes triangular, ca 0.7 mm long.

Achene ca 2.5 mm long, glabrous, dark brown. Pappus bristles ca 35-40, white, ca 4 mm long, barbellate, slightly thickened toward the tips.

Holotype: PERU: Cuzco: Quispicanchis, entre Inambari y 15 Mil, 500-650 m, September 3, 1965, C. Vargas C. 16521 (US).

Additional specimens: PERU: Cuzco: Quispicanchis, entre Mashiche i Tuanssan, 510 m, September 25, 1965, C. Vargas C. 16450 (US); Huanuco: Tulumayo, cerca Tingo Maria, Carretera Huanuco-Pucallpa, 700-800 m, August 5, 1947, Ramon Ferreyra 2159 (US).

Mikania cuzcoensis is characterized by its large racemosely disposed panicle with the heads loosely arranged on pedicels ca 5 mm long. The leaves have very prominent palmate venation (much as in the genus Dioscorea) with cordate bases. Similar species include M. decora Poepp. and M. haenkeana DC., both of Peru and Bolivia. The former has a similar inflorescence, but has ovate-oblong leaves with rounded bases, easily distinguished from the cordate bases of M. cuzcoensis. Mikania haenkeana, while possessing similar foliage, has its heads arranged in a rather dense, somewhat elongated glomerule, much in the manner of M. congesta DC.

MIKANIA VARGASII Holmes & McDaniel, sp. nov.

Suffrutex volubilis, foliis ovatis, ca 6 cm longis, 4 cm latis, apice attenuatis, basi cordatis, quinquenervis, supra pulverulentis et subtus glabris; paniculis ca 20 cm longis et 10 cm latis, ad extremum dispositus in spicas; capitulis ca 10-12 mm longis; corollis ca 6 mm longis, dentibus limbi triangularibus, achaenius 4-4.5 mm longis; pappi setis ca 80-85, ca 5-6 mm longis.

Twining liana, stems costate to sulcate (when dry), glabrous, internodes ca 6-10 cm long. Leaves ovate to ovate-oblong, to 6 cm long and 4 cm wide, margins entire, apices attenuate, bases cordate, upper surfaces sparcely puberulent, dark green, five-nerved from the base, lower surfaces glabrous, dark punctate with globular sessile glands, lighter than above, petiole to ca 2 cm long, thin, glabrous. Inflorescence paniculate with the ultimate branchlets spicately disposed, ca 20 cm long and 10 cm wide, branchlets angular, pilose. Heads sessile, 10-12 mm long, exterior bract elliptic, ca 3-3.5 mm long, glabrate, apices acute. Involucres oblong to obovate, ca 6 mm long, appressed-puberulent, entire, apices rounded to obtuse, bases slightly gibbous. Corolla semi-salverform,

lightly glandular, ca 6 mm long, tube ca 4 mm long, thin, throat ca 2 mm long, corolla lobes triangular, ca 1 mm long. Achene ca 4-4.5 mm long, dark brown to black. Pappus bristles ca 80-85, white, ca 5-6 mm long, barbellate, gradually narrowed from base to tip.

Holotype: PERU: Cuzco: Quispicanchis, Marcapata, 3250 m, June 10, 1963, C. Vargas C. 14565 (US).

Additional specimen: PERU: Cuzco: Calca, Manfio, K84, 2000-2200 m, June 10, 1964, C. Vargas C. 15634 (US).

Mikania vargasii is easily recognized by its large paniculate inflorescence with the heads spicately disposed. The heads are 10-12 mm long, considerably longer than any known Peruvian Mikania with spicately disposed heads. Also the corolla tube is about twice the length of the throat. Possibly approaching nearest to M. vargasii is M. psilostachya DC. of much of northern South America. However, the latter has very scabrous, elliptic-oblong leaves with rounded or acute bases and pinnate venation and it also has a corolla with the tube about one-fourth the length of the throat. Mikania vargasii is a smooth plant with ovate leaves and palmate venation.

MIKANIA AQUARIA Robinson, Contrib. Gray Herb. 73: 21. 1924.

Type: "La Merced, Junin, Perú", J. F. Macbride 5242 F!

M. klugii Robinson, Contrib. Gray Herb. 104: 38. 1934.

Type: "Florida, Río Putumayo at mouth of Río Zubenita, Loreto, Perú", G. Klug 2134 GH (holotype), F!

Mikania aquaria has a large paniculate inflorescence with spicately disposed heads. Mature cauline leaves are ovate with a narrow cordate base. The stem is reported to be hollow, succulent and water-filled. Comparison of the type of this plant with material of M. klugii has shown that the small differences between the two do not justify the specific status of the latter. Salient differences include length of petioles, prominence of veinlets in the leaves and amount of pubescence. These characters are extremely variable in Mikania and more than often quite useless in specific delimitation. More than likely these differences are due to environmental factors. In all other aspects, especially inflorescence and floral charcters, these two plants are inseparable.

ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXIX

Harold N. Moldenke

SYNGONANTHUS AQUATICUS Alv. Silv.

Additional bibliography: Moldenke, Phytologia 35: 322. 1977.

Citations: BRAZIL: Minas Gerais: A. Silveira 213 (B—isotype, Z—isotype).

SYNGONANTHUS AQUATICUS var. CAESPITOSUS Moldenke, Phytologia 24: 19. 1972.

Bibliography: Moldenke, Phytologia 24: 19 (1972) and 25: 230. 1973; Moldenke, Biol. Abstr. 55: 4242. 1973; Hocking, Excerpt. Bot. A.23: 291. 1974.

Citations: BRAZIL: Amazônas: Prance, Maas, Atchley, Steward, Woolcott, Coêlho, Monteiro, Pinheiro, & Ramos 13778 (N—isotype, Z—type).

SYNGONANTHUS ARENARIUS (G. Gardn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 260. 1903.

Synonymy: Eriocaulon arenarium G. Gardn. in Hook., Lond. Journ. Bot. 1: 443—443, pl. 13. 1842 [not E. arenarium Mart., 1903, nor Salzm., 1850]. Paepalanthus arenarius Gardn. apud Walp., Ann. Bot. Syst. 1: 890. 1849. Eriocaulon arenarium Gardn. & Hook. ex Steud., Syn. Pl. Glum. 2: [Cyp.] 333. 1855. Eriocaulon arenarium Hook. ex Steud., Syn. Pl. Glum. 2: [Cyp.] 274. 1855. Paepalanthus arenarius (G. Gardn.) Körn. in Mart., Fl. Bras. 3 (1): 442. 1863. Paepalanthus arenarius Körn. in Mart., Fl. Bras. 3 (1): 284. 1863. Paepalanthus arenarius Gardn. ex Körn. in Mart., Fl. Bras. 3 (1): 307. 1863. Dupatya arenaria (G. Gardn.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Paepalanthus arenarius Walp. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 401. 1894. Dupatya arenaria Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus arenarius Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Bibliography: G. Gardn. in Hook., Lond. Journ. Bot. 1: 442—443, pl. 13. 1842; Walp., Ann. Bot. Syst. 1: 890—891. 1849; Steud., Syn. Pl. Glum. 2: [Cyp.] 274 & 333. 1855; Körn. in Mart., Fl. Bras. 3 (1): 284, 300, 307, 440, 442, 443, & 507. 1863; Benth. & Hook. f., Gen. Pl. 3 (2): 1023. 1883; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877 (1893) and imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 246, 260, 284, 289, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 415. 1928; Stapf, Ind. Lond. 3: 90. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877 (1946) and imp. 2, 2: 401.

1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 28, 32, 45, 49, & 56. 1946; Moldenke, Alph. List Cit. 2: 412 (1948) and 3: 935. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Phytologia 4: 297. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 105, 279, 285, 323, 325, 351, 352, & 491. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877 (1960) and imp. 3, 2: 401. 1960; Moldenke, Résumé Suppl. 12: 11. 1965; Moldenke, Phytologia 20: 98. 1970; Moldenke, Fifth Summ. 1: 172 & 478 (1971) and 2: 493, 577, & 960. 1971; Moldenke, Phytologia 30: 109 & 110 (1975), 34: 275 (1976), and 35: 36. 1976.

Illustrations: G. Gardn. in Hook., Lond. Journ. Bot. 1: pl. 13. 1842.

This species is based on G. Gardner 5261 from "In campis excelsis arenosis in Districtu Adamantum", Minas Gerais, Brazil, deposited in the herbarium of the Royal Botanic Gardens at Kew. The Eriocaulon arenarium Mart., cited above, is a synonym of Paepalanthus parvus Ruhl., while E. arenarium Salzm. belongs to the synonymy of Paepalanthus subtilis Miq.

Gardner's comments (1842) are worth noting here: "This species belongs to Kunth's first section of his genus Paepalanthus 'Capitula villosa', and is nearly allied to P. Bahiensis, ciliatus, and brachypus. I have only access at present to three specimens, and in all of these I find the flowers to be staminiferous, from which I am induced to believe that the plant is dioecious. Fig. 4, the artist considered to be the female flower, but it is certainly nothing more than an older state of fig. 3. It is only in the staminiferous flower of its allies that the inner sepals are connate. The female flowers, therefore, still remain unknown; but most probably they do not differ much from those of P. Bahiensis."

Ruhland (1903) cites only G. Gardner 5261 and Sena s.n. [Herb. Schwacke 12273 & 14576] from Minas Gerais. Silveira (1928) cites A. Silveira 518, collected at Diamantina in 1908.

The species has been found growing on high sandy campos and in "solo arenoso do campo, junta aos afloramentos rochosos", flowering in June and August and fruiting in August.

Material of S. arenarius has been misidentified and distributed in some herbaria as Paepalanthus senaeanus Ruhl. On the other hand, the Archer 3678 and M. A. Chase 10357, distributed as S. arenarius, actually are Leiothrix curvifolia var. plantago (Mart.) Ruhl. One of the Schwacke collections in the Berlin herbarium contains one peduncle which does not appear to pertain to the rest of the material comprising the collection.

Additional citations: BRAZIL: Minas Gerais: G. Gardner 5261 (B—isotype, N—isotype, W—1067951—isotype); Hatschbach 30216 (Z); Sena s.n. [Herb. Schwacke 12273] (B), s.n. [Herb. Schwacke 14576] (B). MOUNTED ILLUSTRATIONS: drawings by Körnicke (B).

SYNGONANTHUS ARENARIUS var. HETEROPHYLLUS (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 260 [as "heterophylla"]. 1903.

Synonymy: Paepalanthus heterophyllus Körn. in Mart., Fl. Bras. 3 (1): 442. 1863. Dupatya heterophylla (Körn.) Kuntze, Rev. Gen. Pl. 2: 746. 1891. Dupatya heterophylla Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus arenarius var. heterophylla (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 260. 1903. Syngonanthus heterophylla (Körn.) Ruhl. ex Moldenke, Phytologia 4: 297, in syn. 1953. Syngonanthus heterophyllus (Körn.) Ruhl. ex Moldenke, Phytologia 4: 297, in syn. 1953 [not S. heterophyllus Alv. Silv., 1928].

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 284, 300, 307, 440—443, 451, & 507. 1863; Benth. & Hook. f., Gen. Pl. 3 (2): 1023. 1883; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 260, 290, & 293. 1903; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 49, & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Phytologia 4: 297. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 105, 325, 351, 352, & 491. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 584, 635, 637, & 960. 1971.

This variety is based on an unnumbered Martius collection from "Minas Novas ad Chapada oppidulum", Minas Gerais, Brazil, collected in June, 1818, and deposited in the Munich herbarium where it was photographed by Macbride as his type photograph number 18741. Ruhland (1903) cites only this collection and Sena s.n. [Herb. Schwacke 14547] from the Serra da Cipó in the same Brazilian state. Silva describes it as a cespitose herb, 20 cm. tall, and found it to be "pouce frequente em afloramente de arenito" at 1350 meters altitude, flowering in April.

Additional citations: BRAZIL: Minas Gerais: Martius s.n. [Minas Novas ad Chapada oppidulum, Junio 1818; Macbride photos 18741] (Mu—type, W—photo of type); Sena s.n. [Herb. Schwacke 14547] (B, Z); J. B. Silva 590 [Herb. Set. Lag. 727] (Ba). MOUNTED ILLUSTRATIONS: drawings by Körnicke (B).

SYNGONANTHUS ARTHROTRICHUS Alv. Silv., Fl. Mont. 1: 364—365, pl. 230. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 364—365 & 415, pl. 230. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Résumé 105 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2:

960. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 230. 1928.

This species is based on A. Silveira 639 from "In campis arenosis prope Diamantina", Minas Gerais, Brazil, collected in September, 1916, and deposited in the Silveira herbarium. On page 415 of his work (1928) Silveira cites also A. Silveira 638 from Baraunas, Minas Gerais, and collected in the same year. In his text he refers to illustration "CCXXXI", but it is plate 230 which is labeled as actually representing S. arthrotrichus (plate 231 is said to illustrate S. erectifolius Alv. Silv.). He comments that S. arthrotrichus "A S. pauperi Ruhl. valde affine differt foliis et indumento pedunculorum". Thus far it is known only from the original collections.

SYNGONANTHUS ATROVIRENS (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 261. 1903.

Additional synonymy: Paepalanthus atrovirens Körn. in Mart., Fl. Bras. 3 (1): 445. 1863. Dupatya atrovirens (Körn.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya atrovirens Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus atrovirens Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 445 & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 246, 261, 289, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 340 & 415. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 28, 45, & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Phytologia 4: 298. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 106, 279, 323, 351, & 491. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 401. 1960; Moldenke, Fifth Summ. 1: 172 & 478 (1971) and 2: 577, 635, & 960. 1971.

This species is based on an unnumbered collection of Martius from "zwischen Cidade Diamantina und dem Flusse Iiquitinhonha oder Rio Belmonte, an felsigen überrieselten Stellen des Gebietes von Serro Frio", Minas Gerais, Brazil, flowering in June [the actual holotype in the Munich herbarium is inscribed "inter Tejuco et fluv. Tequetinnonha in Serra Frio"]. Silveira (1928) cites also A. Silveira 840 from Itacambira, Minas Gerais, collected in 1926, and adds the following to Ruhland's (1903) description: "Folia basalia linearis, acuta, caespirosa, utrinque pilis appressis obsita, erecta vel recurva, basi lanata, 5 cm longa, 2—3 mm medio lata". The type, in the Munich herbarium, was photographed there by Macbride as his type photograph number 18742.

Additional citations: BRAZIL: Minas Gerais: Martius s.n. [inter Tejuco et fluv. Tequetinnonha in Serro Frio; Macbride photos 18742] (Mu—type, W—photo of type).

SYNGONANTHUS AURIFIBRATUS Alv. Silv., Fl. Mont. 1: 360—362, pl. 228. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 360—362 & 415, pl. 228. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 56. 1946; Moldenke, Alph. List Cit. 3: 935. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Phytologia 4: 298. 1953; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 960. 1971; Moldenke, Phytologia 31: 382 & 385. 1975.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 228. 1928.

This species is based on A. Silveira 582 from "In arenosis, locis siccis prope Lagoão, in Serra do Cabral", Minas Gerais, Brazil, collected in May, 1910, and deposited in the Silveira herbarium. On page 415 of his work (1928) Silveira cites a "n. 1.910" from Serra do Cabral, but this is probably a typographic error. In his text he refers to plate "CCXXIX" as representing this plant, but actually S. aurifibratus is illustrated on plate 238. He comments that the "Species propter caulem ramosum paulloque elongatum inter illas sectionis Eulepidis distinctissima".

The species has been collected in anthesis in May and August and closely resembles Paepalanthus saxicola var. conicus Moldenke. Material has been misidentified and distributed in some herbaria as Paepalanthus sp.

Additional citations: BRAZIL: Amazônas: Lützelburg 21962 (Mi, Z).

SYNGONANTHUS AURIPES Alv. Silv., Fl. Mont. 1: 343—344, pl. 217. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 343—344 & 415, pl. 217. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 960. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 217. 1928.

This species is based on Lützelburg 6036 from the Serra do Veado, Goiás, Brazil, collected in 1912, and deposited as no. 631 in the Silveira herbarium. On page 415 of his work (1928) Silveira cites also A. Silveira 515 from the same locality. He comments that the species "A S. nitente (Bong.) Ruhl. bracteis interioribus flores superantibus praecipue differt". Hatschbach has encountered the species in wet candy campos, flowering and fruiting in May.

Citations: BRAZIL: Goiás: Hatschbach 36767 (Z).

SYNGONANTHUS BAHIENSIS Moldenke, Phytologia 25: 230, nom. nud. Feb. 6, 1973 and 27: 69—71. Oct. 12, 1973.

Bibliography: Moldenke, Phytologia 25: 230 (1973) and 27: 69—71, fig. 3. 1973; Moldenke, Biol. Abstr. 57: 3780. 1974.

Illustrations: Moldenke, Phytologia 27: 70, fig. 3. 1973.

Citations: BRAZIL: Bahia: Irwin, Harley, & Smith 30703 (N—isotype, Z—type).

SYNGONANTHUS BALDWINI Moldenke, Phytologia 3: 174. 1949.

Synonymy: Syngonanthus baldwinii Moldenke, Résumé Suppl. 12: 12, in syn. 1965.

Bibliography: Moldenke, Phytologia 3: 174 (1949) and 4: 298. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Moldenke, Résumé 106 & 491. 1959; Moldenke, Résumé Suppl. 12: 12. 1965; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 635 & 960. 1971.

Campbell and his associates found this plant growing "in cracks of exposed rock in debris" and describe the plant as an herb to 6 cm. tall, with white inflorescences. They found it in flower and fruit in June.

Additional citations: BRAZIL: Amazônas: J. T. Baldwin 3479 (W—1878912—isotype); Maguire, Steyermark, & Maguire 60118 (N). Pará: Campbell, Ongley, Ramos, Monteiro, & Nelson P.22435 (Z).

SYNGONANTHUS BARBATUS Alv. Silv., Fl. Mont. 1: 382—383, pl. 243. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 382—383 & 415, pl. 243. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 960. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 243. 1928.

This species is based on A. Silveira 647 from "In campis arenosis in serra do Cabral", Minas Gerais, Brazil, collected in November, 1916, and deposited in the Silveira herbarium. Silveira (1928) in his text refers to plate "CCXLIV" as representing this species, but it is plate 243 which is labeled S. barbatus; plate 244 is labeled S. ensifolius Alv. Silv. He comments that S. barbatus is a "Species ob pulvinum pilosum basis foliorum certe distinctissima", but I feel that it comes uncomfortably close to the typical S. elegans (Bong.) Ruhl. Thus far it is known only from the original collection.

SYNGONANTHUS BARTLETTII Moldenke, Phytologia 1: 335—336. 1939.

Bibliography: Moldenke, Phytologia 1: 335—336. 1939; Moldenke, Carnegie Inst. Wash. Publ. 522: 145—146. 1940; Moldenke, Alph. List Cit. 1: 32. 1946; Moldenke, Known Geogr. Distrib. Erioc. 4 & 56. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 224. 1947; Molden-

ke, Alph. List Cit. 4: 1081. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 37 & 212. 1949; Moldenke, Phytologia 4: 294. 1953; Standl. & Steyerm., Fieldiana Bot. 24: 378—379. 1958; Moldenke, Résumé 43 & 491. 1959; Moldenke, Fifth Summ. 1: 82 (1971) and 2: 960. 1971; Moldenke, Phytologia 35: 306. 1977.

McKee describes this plant as having light-green leaves and white inflorescences and found it to be "less common than no. 11378 [Paepalanthus lamarckii Kunth] in very sandy soil with impeded drainage", at 10 m. altitude, flowering in February. Carrick encountered it "in orchard savanna without lime-loving species, vegetational type 19". The Bartlett specimen cited below was previously cited from the University of Michigan herbarium, from which it is a transfer.

Additional & emended citations: BELIZE: H. H. Bartlett 11670 (Ld—isotype); Carrick 1354 (Kl—7354); Gentle 9631a (Ld, S); Mc Kee 11379 (P, W—2641487).

SYNGONANTHUS BELLUS Moldenke, Phytologia 3: 174—175. 1949.

Bibliography: Moldenke, Phytologia 3: 174—175 (1949) and 4: 298. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Moldenke, Résumé 106 & 491. 1959; Moldenke, Résumé Suppl. 12: 4. 1965; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 960. 1971; Moldenke, Phytologia 30: 318. 1975.

Both the Maguire & Murça Pires 40843 and the N. T. Silva 138 collections, cited below, are topotypes of the species. Recent collectors have encountered the species as "frequent" on wet sandy savannas, flowering in August. Material has been misidentified and distributed in some herbaria as Paepalanthus sp. Prance, Pennington, & Murça Pires 1283 & 1284 are mixtures with S. gracilis var. hirtellus (Steud.) Ruhl. and Paepalanthus polytrichoides Kunth -- apparently the three taxa grow in close association.

Additional citations: BRAZIL: Amapá: Murça Pires & Cavalcante 52383 (N). Maranhão: Fróes 34572 (Bm). Pará: Maguire & Murça Pires 40843 (N); Murça Pires 6049 (Z); Prance, Pennington, & Murça Pires 1283, in part (N, S), 1284, in part (N); N. T. Silva 138 (N).

SYNGONANTHUS BICOLOR Alv. Silv., Fl. Mont. 1: 337—338, pl. 213. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 337—338 & 415, pl. 213. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 960. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 213. 1928.

This species is based on A. Silveira 661 from "In campis in

Riacho das Pedras, prope Diamantina", Minas Gerais, Brazil, collected in April, 1908, and deposited in the Silveira herbarium. Silveira (1928) comments that the species is "A S. anthemidifloro (Bong.) Ruhl. pedunculo 5-costato et forma indumentoque sepalorum floris masculi facile distinguitur". Mello Barreto refers to the plant as frequent "in brejo in pantanosis", flowering in October. Material has been misidentified and distributed in some herbaria as the very similar S. canaliculatus Alv. Silv. and S. laricifolius (G. Gardn.) Ruhl.

Citations: BRAZIL: Minas Gerais: Mello Barreto 9494 [Herb. Jard. Bot. Belo Horiz. 24811, in part] (N).

SYNGONANTHUS BIFORMIS (N. E. Br.) Gleason, Bull. Torrey Bot. Club 56: 394. 1929.

Synonymy: Paepalanthus biformis N. E. Br., Trans. Linn. Soc. Lond., ser. 2, Bot. 6: 71—72. 1929. Syngonanthus biformis Gleason apud A. W. Hill, Ind. Kew. Suppl. 8: 231. 1933.

Bibliography: N. E. Br., Trans. Linn. Soc. Lond., ser. 2, Bot. 6: 71—72. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30): 248 & 289. 1903; Prain, Ind. Kew. Suppl. 3: 126. 1908; Gleason, Bull. Torrey Bot. Club 56: 394. 1929; A. W. Hill, Ind. Kew. Suppl. 8: 231. 1933; Fedde & Schust. in Just, Bot. Jahresber. 57 (2): 16. 1937; Uittien & Heyn in Pulle, Fl. Surin. 1 [Meded. Konink. Ver. Ind. Inst. 30, Afd. Handelmus. 11]: 221. 1938; Moldenke in Gleason & Killip, Brittonia 3: 159. 1939; Moldenke, Alph. List Cit. 1: 132. 1946; Moldenke, Known Geogr. Distrib. Erioc. 5—7, 45, & 56. 1946; Moldenke, Phytologia 2: 352. 1947; Moldenke in Maguire & al., Bull. Torrey Bot. Club 75: 200. 1948; Moldenke, Alph. List Cit. 3: 701, 975, & 976 (1949) and 4: 985 & 1074. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 61, 65, 66, 68, & 212. 1949; Moldenke in Maguire & al., Bull. Torrey Bot. Club 75: 200. 1948; Moldenke, Mem. N. Y. Bot. Gard. 8: 99. 1953; Moldenke, Phytologia 4: 298. 1953; Moldenke in Steyerm., Fieldiana Bot. 28: 824 & 826. 1957; Moldenke, Résumé 68, 73, 76, 77, 106, 323, & 491. 1959; Moldenke, Résumé Suppl. 1: 6 (1959) and 12: 4. 1965; J. A. Steyerm., Act. Bot. Venez. 1: 246. 1966; Lindeman & Görts-van Rijn in Pulle & Lanjouw, Fl. Surin. 1 [Meded. Konink. Inst. Trop. 30, Afd. Trop. Prod. 11]: 335 & 337. 1968; Van Donselaar, Meded. Bot. Mus. Rijksuniv. 306: 402. 1968; Moldenke, Phytologia 18: 105. 1969; Oberwinkler, Pterid. & Sperm. Venez. 8 & 52. 1970; Moldenke, Fifth Summ. 1: 120, 127, 131, 132, & 172 (1971) and 2: 578 & 960. 1971; Moldenke, Phytologia 25: 244 (1973), 31: 386 (1975), and 35: 307 & 317. 1977.

This species is based on McConnell & Quelch 126 from the Kotinga Valley, near Mount Roraima, Guyana, deposited in the herbarium of the Royal Botanic Gardens at Kew. Brown (1901) says of it "This species much resembles Paepalanthus simplex, Moq., but is readily distinguished by the very unequal size and dissimilar form of the male and female flowers, the females conspicuously projecting much beyond the males, so that the heads have a somewhat ech-

inate appearance." He cites only the type collection. Ruhland (1903) reduced it to the synonymy of S. simplex (Miq.) Ruhl., "from which", according to Gleason (1929), "it is abundantly distinct". In his unpublished Flora of British Guiana he separates the two species as follows:

Pistillate and staminate flowers, including the pedicels, about equal in length.....S. simplex.
Pistillate flowers about twice as long as the staminate.S. biformis

He describes S. biformis as "Leaves densely cespitose, narrowly linear, about 1 cm. long, puberulent; peduncles few, erect, 3—6 cm. high, obscurely 3-costate, lightly twisted, sparsely glandular-hirtellous; sheaths exceeding the leaves, 10—15 mm. long, straight, scarcely striate; heads hemispheric, about 5 mm. wide, silvery white, the projecting pistillate sepals very conspicuous." He cites from the Roraima district Loyed 20, Quelch & McConnell 126, and G. H. H. Tate 21 and "without definite locality, C. B. Clarke". He regarded it as endemic to Guyana. Lindeman & Görts-van Rijn (1968) use the same floral characters to separate the two taxa, but add for S. simplex "Involucral bracts about the same length as the flowers", and for S. biformis "Involucral bracts much shorter than the flowers". They cite Maguire 24728 and J. P. Schulz 10351 from Surinam, along with McConnell & Quelch 126 from Guyana. Gleason, in his 1929 work, cites Tate 21 as from "At edge of water, Frechal, extreme northern Brazil" (rather than Guyana). Uittien & Heyn (1938) reduce it to synonymy under the very polymorphic S. gracilis (Bong.) Ruhl.

Gleason, in notes attached to the Britton Herbarium specimen of C. B. Clarke s.n., cited below, asserts: "pistillate sepals 2.5 mm. long, lanceolate, acuminate, glabrous, slightly conduplicate or keeled; pistillate petals 1.1 mm. long, narrowly cuneate-obovate, densely hirsute; staminate lateral sepals 1.4 mm. long, spatulate-obovate, strongly falcate and inequilateral, strongly pubescent on one side only at the middle, posterior sepals 1.4 mm. long, equilateral, narrowly rhombic-spatulate; staminate petals connatin into an obconic cup 1 mm. long, the lobes (if any) strongly involute or hidden; stamens included."

The Ducke collection cited below is placed here tentatively: it does not have the appearance of S. biformis in all respects, e.g., the leaves are very long and there is a dense mat of hairs in the center of the rosette.

Recent collectors describe S. biformis as an herb with white or dull-white heads, white flowers, and dull-green leaves. They have encountered it is moist areas on savannas, in brejo (sedge meadows), on sandy flats bordering woods, at the edge of water, along streams in rainforests, on campos and sandy campos, in seepage among rocks by streams, in white sand, and in boggy or marshy places, at altitudes of 100—1400 meters, flowering in February, April, May, August, September, November, and December, and fruiting in February,

September, November, and December. Steyermark and his associates report it "forming grass-green mats, solitary, or in clumps", and Maguire and his associates refer to it as "locally frequent" or "common on moist sandy banks among rocks".

Material has been misidentified and distributed in some herbaria as S. gracilis (Bong.) Ruhl. On the other hand, the Hertel & Oberwinkler 15202, distributed as S. biformis, is actually S. anomalus (Körn.) Ruhl., while Vareschi & Maegdefrau 6550 is Eriocaulon guyanense Körn.

Additional citations: VENEZUELA: Amazonas: Herb. Exp. Ventuari s.n. (Ve--44017); Maguire, Wurdack, & Keith 41474 (N). Bolívar: Agostini 273 (Ve), 365 (Ve); Koyama & Agostini 7514 (N, N, N); Maguire, Steyermark, & Maguire 53544 (N); Steyermark, Dunsterville, & Dunsterville 104212 (Ac, S), 104528 (Ft, Mu); Vareschi & Foldats 4542 (N). GUYANA: C. B. Clarke s.n. [British Guiana, 1897] (N); Maguire, Maguire, & Wilson-Browne 46012 (N), 46179a (N); G. H. H. Tate s.n. [Mt. Roraima, Nov. 1927] (N). BRAZIL: Amazônas: G. H. H. Tate 21 (N). Goiás: Hatschbach 34587 (Ld). Minas Gerais: Williams & Assis 6885 (W--1832832). Pará: Ducke s.n. [Herb. Mus. Goeldi 12037] (Bs); W. A. Egler 372 (Z), 1118 [Herb. Mus. Goeldi 23898] (Mm); Murça Pires 4080 (Be--74313). Paraíba: Moraes 2164 (Mm). Rondônia: Prance, Rodrigues, Ramos, & Farias 8914 (Ac, N, S).

SYNGONANTHUS BISULCATUS (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 273. 1903.

Synonymy: Paepalanthus bisulcatus Körn. in Mart., Fl. Bras. 3 (1): 436--437. 1863. Dupatya bisulcata (Körn.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya bisulcata Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus bisulcatus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 435--437 & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 271, 273, 289, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 415--416. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 28, 45, & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Phytologia 4: 298--299. 1953; Mendes Magalhães, Anais V Reun. Amual. Soc. Bot. Bras. 236--237. 1956; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 106, 279, 323, 351, & 491. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 401. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Fifth Summ. 1: 172 & 478 (1971) and 2: 578 & 960. 1971.

This species is based on an unnumbered Riedel collection from

central Brazil, probably deposited in the Leningrad herbarium. Ruhland (1903) cites Glaziou 20010 & "20000114a" and Riedel s.n. from Minas Gerais, commenting that the "Species foliorum structura valde insignis". Recent collectors refer to it as a cespitose herb, the inflorescences 12—35 cm. tall, and the heads white. They have found it growing in campos and dry campos, in wet sand on very rocky sandstone hilltops with occasional wet spots, in wet ground in cerrado in narrow valleys, and in wet campos in areas of campo and gallery forest margins, at altitudes of 1080—1300 meters, flowering from October to April and fruiting in January and February. Silveira (1928) cites A. Silveira 452 from Serra do Cabral, Minas Gerais, collected in 1900.

See this series of notes under S. elegans (Bong.) Ruhl. for a key to separate this species from 12 related species. Macbride photographed Glaziou 20010 in the Copenhagen herbarium as his type photograph number 22279, but this collection is not a type of any sort.

Additional citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 35119 (Ub); Glaziou 20010 [Macbride photos 22279] (B); Hatschbach, Smith, & Ayensu 28989 (Ld); Irwin, Maxwell, & Wasshausen 20536 (N, Z); Irwin, Reis dos Santos, Souza, & Fonsêca 22663 (Ld, N); Murça Pires & Black 2819 (N, Z); Occhioni 5600 [Herb. Fac. Nac. Farmac. 14623] (Ld); L. B. Smith 6846 (N, Z).

SYNGONANTHUS BISULCATUS var. ANGUSTIFOLIUS Alv. Silv., Fl. Mont. 1: 362 [as "angustifolia"]. 1928.

Synonymy: Syngonanthus bisulcatus var. angustifolia Alv. Silv., Fl. Mont. 1: 362. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 362 & 416. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Résumé 106, 351, & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 635 & 960. 1971.

This variety "A forma typica foliis angustioribus (0,5 mm latis) et subtus pilis brevibus erecto-patentibusque pubescentibus differt". It is based on A. Silveira 224 from "In campis arenosis prope Biribiri, in vicinia urbis Diamantina", Minas Gerais, Brazil, collected in April of 1919, and deposited in the Silveira herbarium. Silveira, on page 416 of his work (1928), gives "1903" as the date of collection of the type — whether he intends this as a correction or if it represents a typographic error is not clear. The variety is thus far known only from the original collection.

SYNGONANTHUS BISUMBELLATUS (Steud.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 263. 1903.

Synonymy: Eriocaulon bisumbellatum Steud., Syn. Pl. Glum. 2: [Cyp.] 275. 1855. Paepalanthus steudeliamus Körn. in Mart., Fl. Bras. 3 (1): 450, pl. 58, fig. 2. 1863. Dupatya bisumbellata (Steud.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Eriocaulon bisumb.

Steud. apud Kuntze, Rev. Gen. Pl. 2: 746, in syn. 1891. Dupatya bisumbellata Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus bisumbellatus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Syngonanthus bisumbellatus f. elata Herzog ex Lützelb., Estud. Bot. Nordést. 3: 149 & 151. 1923. Syngonanthus bisumbellatus f. elatus Herzog ex Moldenke, Phytologia 4: 299. 1953. Syngonanthus biumbellatus f. elata Herzog ex Moldenke, Phytologia 4: 299, in syn. 1953. Syngonanthus biumbellatus (Steud.) Ruhl. ex Moldenke, Phytologia 31: 408, in syn. 1975.

Bibliography: Steud., Syn. Pl. Glum. 2: [Cyp.] 275 & 333. 1855; Körn. in Mart., Fl. Bras. 3 (1): 450, 500, & 507, pl. 58, fig. 2. 1863; Benth. & Hook. f., Gen. Pl. 3 (2): 1023. 1883; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877 (1893) and imp. 2, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 246, 263, 284, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Lützelb., Estud. Bot. Nordést. 3: 149 & 151. 1923; Stapf, Ind. Lond. 4: 519. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 28, 32, 54, & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 90 & 212. 1949; Moldenke, Phytologia 4: 299. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 69, 106, 279, 286, 328, & 491. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877 (1960) and imp. 3, 2: 402. 1960; Moldenke, Résumé Suppl. 2: 4 & 5. 1960; Moldenke, Fifth Summ. 1: 120, 127, 172, & 478 (1971) and 2: 494, 591, & 960. 1971; Moldenke, Phytologia 31: 386, 407, & 408. 1975.

Illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl. 58, fig. 2. 1863.

This species is based on G. Gardner 2961 from Piauí, Brazil, this collection being the type both of Eriocaulon bisumbellatum and of Paepalanthus steudelianus. Ruhland (1903) cites only this original collection. Jackson (1893) accepts Paepalanthus steudelianus as the prope name for the species. Herzog's f. elatus seems to be based on Lützelburg 1441, 1441a, & 1441b from Rio Preto [Freto?], Goiás, Brazil, collected in August of 1912 and deposited in the herbarium of the Botanische Staatssammlung in Munich. I fail to discern any constant characters by means of which the form can be separated from the typical form of the species.

Recent collectors describe the flowers of S. bisumbellatus as white and have encountered the species on savannas, at altitudes of 700--800 feet, flowering in July and November. Material has been misidentified and distributed in some herbaria under the names S. froesii Moldenke and S. humboldtii (Kunth) Ruhl.

Additional citations: COLOMBIA: Vaupés: Schultes, Baker, & Cabrera 18449 (Z). VENEZUELA: Bolívar: Quezada s.n. [26-12-1959]

(Bm); Vareschi & Maegdefrau 6612 (Ve—42559). BRAZIL: Goiás: Lützelburg 1441 [N. Y. Bot. Gard. Type Photo Coll. Neg. N. S. 8846] (Mu, N—photo, Z—photo), 1441a (Mu), 1441b (Mu). Pará: Egler & Raimundo s.n. [W. A. Egler 963; Herb. Mus. Goeldi 23626](Bd, Mm). Piauí: G. Gardner 2961 (B—isotype, B—isotype, N—isotype, W—936278—isotype, W—1066757—isotype). Roraima: Murça Pires & Leite s.n. [Herb. IPEAN 14801] (Ld). MOUNTED ILLUSTRATIONS: Körn. in Mart, Fl. Bras. 3 (1): pl. 58, fig. 2. 1863 (N, Z).

SYNGONANTHUS BISUMBELLATUS var. FROESII (Moldenke) Moldenke, Phytologia 29: 77. 1974.

Synonymy: Syngonanthus froesii Moldenke, Résumé 107 & 491, nom. nud. (1959), Phytologia 14: 399—400. 1967.

Bibliography: Moldenke, Résumé 107 & 491. 1959; Moldenke, Résumé Suppl. 11: 4 & 5. 1964; Hocking, Excerpt. Bot. A.12: 425. 1967; Moldenke, Phytologia 14: 399—400. 1967; Moldenke, Biol. Abstr. 49: 2290. 1968; Moldenke, Fifth Summ. 1: 120 & 173 (1971) and 2: 962. 1971; Heslop-Harrison, Ind. Kew. Suppl. 15: 133. 1974; Moldenke, Phytologia 29: 77 (1974) and 31: 382, 386, & 408. 1975.

This variety differs from the typical form of the species in its shorter stems and closely overlapping very hispid leaves.

The Schultes, Baker, & Cabrera 18449, distributed as this variety, seems better regarded as representing the typical form of the species.

Citations: BRAZIL: Pará: Fróes 29904 (Hk—isotype, N—isotype, W—2341445—isotype, Z—type).

SYNGONANTHUS BLACKII Moldenke, Phytologia 3: 43—44. 1948.

Bibliography: Moldenke, Phytologia 3: 43—44. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 299. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 960. 1971.

SYNGONANTHUS BRACTEOSUS Moldenke, Phytologia 25: 119—120. 1973.

Bibliography: Anon., Biol. Abstr. 56 (3): B.A.S.I.C. S.258. 1973; Moldenke, Biol. Abstr. 56: 1243. 1973; Moldenke, Phytologia 25: 119—120 & 230. 1973.

Citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27118 (Ld—isotype, N—isotype, Z—type).

SYNGONANTHUS BREVIFOLIUS Gleason, Bull. Torrey Bot. Club 56: 14—15. 1929.

Bibliography: Gleason, Bull. Torrey Bot. Club 56: 14—15. 1929; A. W. Hill, Ind. Kew. Suppl. 8: 231. 1933; Fedde & Schust. in Just, Bot. Jahresber. 57 (2): 16. 1937; Moldenke, Known Geogr. Distrib. Erioc. 6 & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 67 & 212. 1949; Moldenke, Résumé 76 & 491. 1959; Moldenke, Fifth Summ. 1: 131 (1971) and 2: 960. 1971; Moldenke, Phytologia 35: 307 & 316. 1977.

This species is based on Jenman 4755, collected at Bartica, Guyana, in November, 1888, and deposited in the herbarium of the Royal Botanic Gardens at Kew. Gleason (1929) says that it is "related to S. anomalus Ruhl., but differs in its much shorter leaves, with firm texture and prominent nerves, and its shorter, glabrous, truncate peduncular sheaths with obtuse lamina". In his unpublished Flora of British Guiana he describes it as having "Stems tufted, freely branched, somewhat woolly, 3—5 cm. long; leaves crowded toward the summit of the stem, recurved or spreading, narrowly lanceolate, 4—6 mm. long, 1.0 mm. wide; peduncles 10—16 mm. long, in the upper axils, sparsely hirtellous or glandular; sheaths 3—4 mm. long, glabrous, truncate, the lamina obtuse; heads 2—3 mm. wide, the bracts about 5, oblong-elliptic, rounded at the summit." In his key he distinguishes the two taxa as follows:

"Principal leaves about 15 mm. long, very thin and lax; peduncular sheaths acuminate.....S. anomalus.
Principal leaves about 5 mm. long, firm, prominently nerved; peduncular sheaths obtuse.....S. brevifolius."

The species is known thus far only from the original collection. Material has been misidentified and distributed in some herbaria under the name S. esmeraldae Ruhl.

Citations: GUYANA: Jenman 4766 (N—isotype).

SYNGONANTHUS CABRALENSIS Alv. Silv., Fl. Mont. 1: 340—342, pl. 215. 1928.

Synonymy: Syngonanthus carralensis Alv. Silv. apud Wangerin in Just, Bot. Jahresber. 57 (1): 477, sphalm. 1937.

Bibliography: Alv. Silv., Fl. Mont. 1: 340—342 & 416, pl. 215. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 56. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 960. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 215. 1928.

This species is based on A. Silveira 573 from "In arenosis secus margines rivulorum in Serra do Cabral", Minas Gerais, Brazil, collected in May, 1910, and deposited in the Silveira herbarium. It is known thus far only from the original collection and Silveira (1928) says of it: "Propter folia arcte rosulata breviaque et pedunculos gracillimos, 3-costatos longissimosque ab affinibus diversa".

SYNGONANTHUS CACHIMBOENSIS Moldenke, Résumé 106 & 491 [as "cachimboënsis"], nom. nud. 1959; Bol. Mus. Par. Emilio Goeldi, ser. 2, Bot. 3: 2—3. 1960.

Synonymy: Syngonanthus cachimboënsis Moldenke, Résumé 101 & 491. 1959.

Bibliography: Moldenke, Résumé 106 & 491. 1959; Moldenke, Bol. Mus. Par. Emilio Goeldi, ser. 2, Bot. 3: 2--3. 1960; Hocking, Excerpt. Bot. A.4: 284. 1962; Moldenke, Biol. Abstr. 37: 2453. 1962; Dau, Excerpt. Bot. A.7: 520. 1964; G. Taylor, Ind. Kew. Suppl. 13: 132. 1966; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 960. 1971.

This species is based on Murça Pires, Black, Wurdack, & Silva 6168 from among wet rocks in rapids and waterfalls on the Serra do Cachimbo, at 425 meters altitude, Pará, Brazil, collected on December 12, 1956, and deposited in the Britton Herbarium at the New York Botanical Garden. It is known thus far only from the original collection and bears much similarity in aspect to S. huberi Ruhl., but its inflorescence-heads remind one strongly of the cyperaceous genus Eleocharis.

Citations: BRAZIL: Pará: Murça Pires, Black, Wurdack, & Silva 6168 (N--type).

SYNGONANTHUS CAESPITOSUS (Wikstr.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 278--279. 1903.

Synonymy: Eriocaulon caespitosum Wikstr., Kongl. Svensk. Vet. Akad. Handl. Stockh., ser. 2, 1: 78, pl. 4. 1820 [not E. caespitosum Cabanis, 1959, nor Poepp., 1863]. Eriocaulon cespitosum Wikstr. apud Roem. & Schult., Mant. 2: 469. 1824. Paepalanthus caespitosus (Wikstr.) Körn. in Mart., Fl. Bras. 3 (1): 431. 1863. Paepalanthus caespitosus Körn. in Mart., Fl. Bras. 3 (1): 430, 431, & 506. 1863. Dupatya caespitosa (Wikstr.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya caespitosa Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus caespitosus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Leiothrix curvifolia var. fimbriata Herzog ex Moldenke, Phytologia 34: 275, in syn. 1976.

Bibliography: Wikstr., Kongl. Svensk. Vet. Akad. Handl. Stockh., ser. 2, 1: 78, pl. 4. 1820; Wikstr., Trenne Nya Art. Örtsl. Erioc. 11--12 & [15], pl. 4. 1821; Roem. & Schult., Mant. 2: 264 & 469. 1824; Spreng. in L., Syst. Veg., ed. 16, 3: 776. 1826; Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 628. 1831; Bong., Ess. Monog. Erioc. 5 & 28. 1831; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 506, 575, & 612. 1841; D. Dietr., Syn. Pl. 5: 267. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 269 & 333. 1855; Körn. in Mart., Fl. Bras. 3 (1): 430--432 & 506. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877 (1893) and imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 276, 278, 285, 289, & 292. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Stapf, Ind. Lond. 3: 90. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1951; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877 (1946) and imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 29, 33, 45, & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 299 & 311. 1953; Durand & Jacks., Ind. Kew. Suppl.

1, imp. 3, 145. 1959; Moldenke, Résumé 106, 279, 286, 323, & 491. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877 (1960) and imp. 3, 2: 401. 1960; Moldenke, Résumé Suppl. 18: 10. 1969; Moldenke, Phytologia 20: 95 & 417. 1970; Moldenke, Fifth Summ. 1: 172 & 478 (1971) and 2: 496, 578, & 961. 1971; Moldenke, Phytologia 34: 259 & 275. 1976.

Illustrations: Wikstr., Kongl. Svensk. Vet. Akad. Handl. Stockh., ser. 2, 1: pl. 4. 1820; Wikstr., Trenne Nya Art. Örtsl. Erioc. pl. 4. 1821.

This species is based on an unnumbered Freyreiss collection from one of the "östliche Provinzen" of Brazil; Freyreiss 8, cited by me in my 1953 work, may actually be part of this type collection. Wikström (1820) says of the species: "Proxime affinis videtur E[riocaulon] microcephalo et E. temui.....Ab E. microcephalo differt foliis lineari-lanceolatis rigidissimis margine albo-ciliatis; scapis foliis multoties longioribus et unacum vaginis pubescentibus; dum E. microcephali folia ensiformia membranacea pilosa; scapi (s. pedunculi) foliis tantum paullo longiores; vagina glabra et s. p. — Ab E. temui differt foliis lineari-lanceolatis recurvatis margine albo-ciliatis duplo fere longioribus; scapis multoties longioribus; vaginis pubescentibus; dum E. tenuis folia lineari-subulata, basi tantum piloso-lanata; scapi (s. pedunculi) setacei, 4—7 pollicares; vagina glabra et s. p." Kunth (1841) also says "Proxime affine E. microcephalo et temui, sed characteribus datis satis distinctum".

It should be noted here that Eriocaulon caespitosum Poepp., referred to in the synonymy above, and E. caespitosum (Wikstr.?) Poepp. are synonyms of Paepalanthus bifidus (Schrad.) Kunth, while E. caespitosum Cabanis is Syngonanthus flavidulus (Michx.) Ruhl. Leiothrix curvifolia var. fimbriata is apparently based on F. C. Hoehne 5068 in the Munich herbarium.

Ruhland (1903) cites only Freyreiss s.n. and Langsdorff s.n. from the "östliche Provinzen" of Brazil in the Berlin herbarium. Bongard (1831) describes the species as "acaule; foliis caespitosis lineari-lanceolatis obtusiusculis ciliatis; pedunculis caespitosis pubescentibus; vaginis foliis sublongioribus, pubescentibus apice lacinulatis".

Additional citations: BRAZIL: Minas Gerais: F. C. Hoehne 5068 (Mu). State undetermined: Freyreiss s.n. [Brasilia] (B--isotype). MOUNTED ILLUSTRATIONS: drawings by Körnicke (B).

SYNGONANTHUS CANALICULATUS Alv. Silv., Fl. Mont. 1: 327—328, pl. 208. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 327—328 & 416, pl. 208. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Alph. List Cit. 3: 935. 1949; Moldenke, Known Geogr. Distrib. Ver-

benac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 299. 1953; Mendes Magalhães, Anais V Reun. Anual Soc. Bot. Bras. 276—277. 1956; Moldenke, Résumé 106 & 491. 1959; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 961. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 208. 1928.

This species is based on A. Silveira 575 from "In campis arenosis in Serra do Cabral", Minas Gerais, Brazil, collected in May, 1910, and deposited in the Silveira herbarium. Other collectors have found it growing at 1200 meters altitude, flowering and fruiting in September. Silveira (1928) says of it: "Ab affinibus S. densifolio Alv. Silv. et S. flavicepte Alv. Silv. ad quos proxime accedit, bracteis involucrantibus subulatis superne arcato-patentibus, exterioribus non gradatim minoribus et pilositate foliorum praecipue differt".

The Mello Barreto 9494 [Herb. Jard. Bot. Belo Horiz. 24811, in part], previously cited by me as S. canaliculatus (as it also was originally distributed), seems, rather, to represent S. bicolor Alv. Silv.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 27378 (S, Z); A. Silveira 575 [Herb. Marie-Victorin 12431] (N—photo of isotype, Z—photo of isotype).

SYNGONANTHUS CANASTRENSIS Alv. Silv., Fl. Mont. 1: 368—369, pl. 233. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 368—369 & 416, pl. 233. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 961. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 233. 1928.

This species is based on A. Silveira 743 from "In campis arenosis siccisque in Serra da Canastra", Minas Gerais, Brazil, collected in April, 1925, and deposited in the Silveira herbarium. In his text (1928) Silveira refers to his "Tabula CCXXXIV", but the illustration of S. canastrensis is on plate 233 — pl. 234 depicts S. heterophyllus Alv. Silv. Thus far, S. canastrensis is known only from the original collection, and Silveira says of it: "Species ob indumentum foliorum pedunculorumque facile distinguenda".

SYNGONANTHUS CANDIDUS Alv. Silv., Fl. Mont. 1: 359—360, pl. 227. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 359—360 & 416, pl. 227. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941;

Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 299. 1953; Moldenke, Résumé 106 & 491. 1959; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 961. 1971; Anon., Biol. Abstr. 56 (3): B.A.S.I.C. S.258. 1973; Moldenke, Biol. Abstr. 56: 1243. 1973; Moldenke, Phytologia 25: 120 & 230. 1973.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 227. 1928.

This species is based on A. Silveira 665 from "In campis arenosis ad Pico do Itambé", Minas Gerais, Brazil, collected in April, 1918, and deposited in the Silveira herbarium; on page 416 of his work (1928) Silveira gives the type locality as "Serra do Itambé". In his text he cites the illustration of S. candidus as "Tabula CCXXVIII", but is is actually on plate 227 — plate 228 depicts S. aurifibratus Alv. Silv.

Syngonanthus candidus bears striking resemblance to S. elegans (Bong.) Ruhl., S. elegantulus Ruhl., S. prolifer Alv. Silv., and S. niveus (Bong.) Ruhl.

SYNGONANTHUS CANDIDUS var. BAHIENSIS Moldenke, Phytologia 25: 120. 1973.

Bibliography: Anon., Biol. Abstr. 56 (3): B.A.S.I.C. S.258. 1973; Moldenke, Biol. Abstr. 56: 1243. 1973; Moldenke, Phytologia 25: 120 & 230. 1973.

Citations: BRAZIL: Bahia: Irwin, Harley, & Smith 32500 (N—isotype, Z—type).

SYNGONANTHUS CAPILLACEUS Alv. Silv., Fl. Mont. 1: 352—353, pl. 223, fig. 2. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 352—353 & 416, pl. 223, fig. 2. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 299. 1953; Moldenke, Résumé 106 & 491. 1959; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 961. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 223, fig. 2. 1928.

This species is based on A. Silveira 652 from "In campis prope Barauna", Minas Gerais, Brazil, collected in April, 1918, and deposited in the Silveira herbarium. On page 416 of his work (1928) Gives "Baraunas" as the type locality.

SYNGONANTHUS CARACENSIS Alv. Silv., Fl. Mont. 1: 392—393, pl. 251. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 392—393 & 416, pl. 251. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941;

Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Phytologia 2: 498. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 961. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 251. 1928.

This species is based on A. Silveira 430 from "In campis siccis arenosisque in Serra do Caraça", Minas Gerais, Brazil, collected in April of 1906, and deposited in the Silveira herbarium. In his text (1928) Silveira refers to "Tabula CCLII" as illustrative of this species, but it is actually depicted on plate 251 — plate 252 illustrates S. flexuosus Alv. Silv.

Thus far S. caracensis, in its typical form, is known only from the original collection.

SYNGONANTHUS CARACENSIS var. GLABRESCENS Alv. Silv., Fl. Mont. 1: 393. 1928.

Synonymy: Syngonanthus caracensis var. glablescens Alv. Silv., Fl. Mont. 1: 416, sphalm. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 393 & 416. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Phytologia 2: 498. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106, 351, & 491. 1959; Moldenke, Fifth Summ. 1: 172 & 635 (1971) and 2: 961. 1971.

This variety is based on Silveira 797 from "In campis prope Serra da Moeda", Minas Gerais, Brazil, collected in July, 1926, and deposited in the Silveira herbarium. Silveira (1928) describes it as "Differt a forma typica foliis nunc glabris nunc inferiore parte vix pubescentibus". Thus far it is known only from the original collection.

SYNGONANTHUS CAULESCENS (Poir.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 267. 1903.

Synonymy: Eriocaulon caulescens Poir. in Lam., Encycl. Méth. Bot. Suppl. 3: 162. 1813 [not E. caulescens Hook. f., 1903, nor Hook. f. & Thoms., 1864, nor Willd., 1841]. Eriocaulon splendens Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 633. 1831. Paepalanthus caulescens (Poir.) Kunth, Enum. Pl. 3: 537. 1841. Paepalanthus caulescens β humilis Kunth, Enum. Pl. 3: 537. 1841. Paepalanthus caulescens γ parvifolius Kunth, Enum. Pl. 3: 537. 1841. Paepalanthus surinamensis Miq., Linnaea 19: 125. 1847. Paepalanthus caulescens Kunth apud Klotzsch in Schomb., Faun. & Fl. Brit. Guian. 1116. 1848. Eriocaulon geraense Steud., Syn. Pl. Glum. 2: [Cyp.] 276—277. 1855. Eriocaulon simillimum Steud., Syn. Pl. Glum. 2: [Cyp.] 277. 1855. Eriocaulon subuncinatum Steud., Syn. Pl. Glum. 2: [Cyp.] 277. 1855. Eriocaulon surinamense Miq. ex Steud., Syn. Pl. Glum. 2: [Cyp.] 275. 1855. Eriocaulon e Cayenne Willd. ex Körn. in Mart., Fl. Bras. 3 (1): 466, in syn. 1863. Eriocaulon splendens (Bong.) Schnitz. ex Körn.

in Mart., Fl. Bras. 3 (1): 466, in syn. 1863. Eriocaulon splendens var. α Bong. ex Körn. in Mart., Fl. Bras. 3 (1): 466, in syn. 1863. Eriocaulon splendens var. β caule humilior Bong. ex Körn. in Mart., Fl. Bras. 3 (1): 466, in syn. 1863. Paepalanthus caulescens var. a Körn. in Mart., Fl. Bras. 3 (1): 466—468. 1863. Paepalanthus caulescens var. b Körn. in Mart., Fl. Bras. 3 (1): 466—468. 1863. Paepalanthus caulescens var. b subvar. α Körn. in Mart., Fl. Bras. 3 (1): 466—468. 1863. Paepalanthus caulescens var. b subvar. β Körn. in Mart., Fl. Bras. 3 (1): 466—468. 1863. Paepalanthus caulescens var. b subvar. δ Körn. in Mart., Fl. Bras. 3 (1): 466—468. 1863. Paepalanthus caulescens var. b subvar. ε Körn. in Mart., Fl. Bras. 3 (1): 466—468. 1863. Paepalanthus caulescens var. b subvar. ζ Körn. in Mart., Fl. Bras. 3 (1): 466—468. 1863. Paepalanthus splendens (Bong.) Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 466, in syn. 1863. Paepalanthus splendens Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 466, in syn. 1863. Carpocephalus caulescens Kunth ex V. A. Pouls., Vidensk. Meddel. Naturh. Foren. Kjøbenh. 40 [ser. 4, 9]: 359. 1888. Dupatya caulescens (Poir.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Eriocaulon geraënse Steud. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 878, in syn. 1893. Eriocaulon surinamense Steud. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 879, in syn. 1893. Paepalanthus splendens Mart. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402, in syn. 1894. Dupatya caulescens Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus caulescens Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Eriocaulon surinamense (Miq.) Steud. ex Moldenke, Known Geogr. Distrib. Erioc. 41, in syn. 1946. Syngonanthus caulescens var. humilior Kunth ex Moldenke, Phytologia 4: 299, in syn. 1953. Syngonatnhus caulescens (Poir.) Ruhl. ex Reitz, Sellowia 7: 124, sphalm. 1956. Eriocaulon caulescens Salzm. ex Moldenke, Résumé Suppl. 1: 16, in syn. 1959. Eriocaulon caulescens Kunth ex Moldenke, Résumé 286, in syn. 1959. Paepalanthus caulescens var. β subvar. β Kunth ex Moldenke, Résumé Suppl. 1: 20, in syn. 1959. Paepalanthus caulescens var. β subvar. δ Kunth ex Moldenke, Résumé Suppl. 1: 20, in syn. 1959. Paepalanthus caulescens var. β subvar. ε Kunth ex Moldenke, Résumé Suppl. 1: 20, in syn. 1959. Syngonanthus calvescens (Bong.) Ruhl. ex Moldenke, Résumé Suppl. 1: 23, in syn. 1959. Syngonanthus caulescens f. minor Ruhl. ex Moldenke, Résumé Suppl. 1: 23, in syn. 1959. Syngonanthus caulencens (Poir.) Ruhl. ex Soukup, Biota 2: 303. 1959. Syngonanthus caluescens (Bong.) Ruhl. ex Moldenke, Phytologia 34: 277, in syn. 1976.

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Steud., Nom. Bot. Phan., ed. 1, 312. 1821; Roem. & Schult., Mant. 3: 671. 1827; Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 633. 1830; Bong., Ess. Monog. Erioc. 4 & 33. 1831; Steud., Nom. Bot., ed. 2, 1: 585 & 586. 1840; Kunth, Enum. Pl. 3: 537, 577, 612, 614, & 624. 1841; Schnitzl., Iconogr. 1: pl. 46, fig. 1. 1845; Miq., Linnaea 19: 126. 1847; Klotzsch in Schomb., Faun. & Fl. Brit. Guian. 1116. 1848; Walp., Ann. Bot. Syst. 1: 891. 1849; D. Dietr., Syn. Pl. 5: 263 & 268. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 275—277, 280, 324, 333, & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 420, 461, 466—468, 505, & 507. 1863; Körn. in Warm., Vidensk. Meddel. Naturh. Foren. Kjöbenh. 23: 315. 1871; V. A. Pouls., Vidensk. Meddel. Naturh. Foren. Kjøbenh. 40 [ser. 4, 9]: 359. 1888; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877—879 (1893) and imp. 1, 2: 401 & 402. 1894; Baillon, Hist. Pl. 12: [397]. 1894; Kuntze, Rev. Gen. Pl. 3 (2): 329. 1898; Holm, Bot. Gaz. 31: 20. 1901; Malme, Bih. Svensk. Vet. Akad. Handl. 27 (3), no. 11: 32. 1901; Ruhl. in Pilg., Engl. Bot. Jahrb. 30: 147. 1901; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Chod. & Hassl., Bull. Herb. Boiss., ser. 2, 3: 1033 & 1034. 1903; Chod. & Hassl., Pl. Hassler. 2: 255 & 256. 1903; Ruhl. in Engl., Pflanzenreich 13 (4-30): 6, 7, 264, 267—269, 276, [283], 285, 287, 289, 292, & 293, fig. 38. 1903; Pilg. in Engl. & Prantl, Nat. Pflanzenfam. Ergänz. 2, Nachtr. 3 zu 2: 40. 1908; Prain, Ind. Kew. Suppl. 3: 175. 1908; Molfino, Physis 6: 362. 1923; Alv. Silv., Fl. Mont. 1: 356 & 416. 1928; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 42, 43, 56, & 57, fig. 24. 1930; Stapf, Ind. Lond. 3: 91. 1930; Gleason, Bull. Torrey Bot. Club 58: 327. 1931; Herzog in Fedde, Repert. Spec. Nov. 29: 213. 1931; Stapf, Ind. Lond. 6: 248. 1931; Fedde in Just, Bot. Jahresber. 51 (2): 295. 1933; J. F. Macbr., Field Mus. Publ. Bot. 13: 490 & 491. 1936; Uittien & Heyn in Pulle, Fl. Surin. 1 [Meded. Konink. Ver. Ind. Inst. 30, Afd. Handelsmus. 11]: 220 & 222—223. 1938; Moldenke, Phytologia 1: 336. 1939; Moldenke, Bull. Torrey Bot. Club 68: 70. 1940; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Castell. in Descole, Gen. & Sp. Pl. Argent. 3: 71, 75, 92, 95—97, & 104, pl. 20 & 21. 1945; Abbiatti, Rev. Mus. La Plata, ser. 2, 6: [311], 312, 314, 316, 318, 319, 322, 332—335, 339, & 340, fig. 7 & 8, pl. 2 (3). 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877—879 (1946) and imp. 2, 2: 401 & 402. 1946; Moldenke, Alph. List Cit. 1: 132, 136, 195, 223, 238, & 266. 1946; Moldenke, Known Geogr. Distrib. Erioc. 4—7, 17, 19, 20, 29, 33, 35, 40, 41, 46, 52, 54, 55, & 57. 1946; Moldenke, Lilloa 12: 173 (1946) and 13: 10. 1947; Moldenke, Phytologia 2: 351, 352, 373—375, 377, 378, 380, & 381. 1947; Moldenke, Lilloa 14: 66. 1948; Moldenke, Phytologia 2: 498. 1948; Moldenke, Alph. List Cit. 2: 352, 389, 412, 457, 461, 599, 600, 616, 626, 627, & 633 (1948), 3: 655, 758, 815, 821, 855, 869, 870, 903, 935, 957, 967, 975, & 976 (1949), and 4: 1015, 1069, 1075, 1076, 1079, 1169, 1283, 1301, 1302, & 1304. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 40, 61, 65, 67, 68, 73, 91, 97, 99, 105, & 212. 1949; Rambo, An. Bot. Herb. Barb. Rodr. 1: 128. 1949; Moldenke,

Phytologia 4: 299--302 & 311. 1953; Moldenke in Maguire, Mem. N. Y. Bot. Gard. 8: 99. 1953; Rambo, Sellowia 6: 32, 60, 69, & 130. 1954; Goodspeed & Stork, Univ. Calif. Publ. Bot. 28: 128. 1955; Rambo, Sellowia 7: 248. 1956; Reitz, Sellowia 7: 124. 1956; Angely, Fl. Paran. 10: 4 & 15. 1957; Moldenke in J. A. Steyerm., Fieldiana Bot. 28: 825 & 826. 1957; Cuatrecasas, Revist. Acad. Colomb. Cienc. 10: 254. 1958; R. C. Foster, Contrib. Gray Herb. 184: 39. 1958; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Biol. Abstr. 33: 1215. 1959; Moldenke, Résumé 38, 47, 69, 73, 76--78, 84, 106, 112, 115, 117, 119, 126, 249, 279, 286, 288, 292, 293, 324, 327, 328, 351, & 491. 1959; Moldenke, Résumé Suppl. 1: 5, 16--18, 20, 22, & 23. 1959; Reitz, Sellowia 11: 31 & 131. 1959; Soukup, Biota 2: 303. 1959; Angely, Fl. Paran. 16: 77. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877--879 (1960) and imp. 3, 2: 401 & 402. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960:, Angely, Fl. Paran. 17: 24. 1961; Reitz, Sellowia 13: 72 & 90. 1961; Tamayo, Bol. Soc. Venez. Cienc. Nat. 22: 149. 1961; Eiten in Ferré, Simpos. Sôbre Cerrado 194. 1962; Hocking, Excerpt. Bot. A.5: 44. 1962; Moldenke, Résumé Suppl. 3: 12 & 14 (1962), 6: 8 (1963), 7: 5 (1963), and 10: 7. 1964; Angely, Fl. Anal. Paran., ed. 1, 201. 1965; Thanikaimoni, Pollen & Spores 7: 187. 1965; J. A. Steyerm., Act. Bot. Venez. 1: 246. 1966; Dombrowski & Kuniyoshi, Araucariana 1: 15. 1967; Aristeguieta, Act. Bot. Venez. 3: 25 & 37. 1968; Lindeman & Görts-van Rijn in Pulle & Lanjouw, Fl. Surin. 1 [Meded. Konink. Inst. Trop. 30, Afd. Trop. Prod. 11]: 334--339. 1968; Moldenke, Phytologia 17: 481. 1968; Moldenke, Résumé Suppl. 16: 6. 1968; J. A. Steyerm., Act. Bot. Venez. 3: 96. 1968; Van Donselaar, Meded. Bot. Mus. Rijksuniv. Utrecht 306: 397 & 402. 1968; Lasser, Act. Bot. Venez. 4: 35. 1969; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 149, 159, 161, 166, 173, 175, 184--187, 189, & 191. 1969; Moldenke, Phytologia 20: 107, 108, 250, & 418. 1970; Oberwinkler, Pterid. & Sperm. Venez. 8 & 52. 1970; Reitz, Sellowia 22: 137. 1970; Moldenke, Fifth Summ. 1: 74, 89, 120, 127, 131, 132, 134, 143, 172, 180, 184, 187, 189, 200, 369, 422, & 429 (1971) and 2: 496, 499, 501, 513, 514, 579, 589, 591, 635, 638, 961, & 967. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1161, 1162, Ind. 12 & 28, map 1783. 1972; Anon., Biol. Abstr. 53 (10): B.A.S.I.C. S.196. 1972; Anon., Ind. Bot. Guay. Highl. 25. 1972; Moldenke, Biol. Abstr. 53: 5252. 1972; Moldenke in Steyerm., Maguire, & al., Mem. N. Y. Bot. Gard. 23: 850. 1972; Moldenke, Phytologia 24: 343, 344, & 456 (1972), 25: 244 (1973), 26: 178 & 230 (1973), 28: 435 & 440 (1974), 29: 91, 317, 321, & 329 (1974), and 30: 35, 106, 124, & 322. 1975; Schinini, Bol. Soc. Argent. Bot. 16: 351. 1975; Moldenke, Phytologia 31: 383, 386, 392, 397, 404, 405, & 408 (1975), 32: 336 & 461 (1975), 33: 27, 189, & 191 (1976), and 34: 256, 259, 275--277, & 395. 1976; Anon., Biol. Abstr. 61: ACl.718. 1976; Moldenke, Phytologia 35: 307 & 316. 1977.

Illustrations: Schnitzl., Iconogr. 1: pl. 46, fig. 1. 1845; Baillon, Hist. Pl. 12: [397]. 1894; Ruhl. in Engl., Pflanzenreich 13 (4-30): 268, fig. 38. 1903; Pilg. in Engl. & Prantl, Nat. Pflan-

zenfam. Ergänz. 2, Nachtr. 3 zu 2: 40, fig. 7. 1908; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 56, fig. 24. 1930; Castel. in Descole, Gen. & Sp. Pl. Argent. 3: pl. 20. 1945; Abbiatti, Rev. Mus. La Plata Bot., ser. 2, 6: 333 & 334, fig. 7 & 8, pl. 2 (3). 1946; Tamayo, Bol. Soc. Venez. Cienc. Nat. 22: 149 [as S. akurimensis]. 1961.

This common and very variable species is based on a Desfontaines collection from Cayenne, French Guiana, in the Lamarck herbarium at Paris. Paepalanthus caulescens β humilis Kunth is apparently based on Sellow 1292 in the Berlin herbarium, P. surinamensis Miq. is based on Hostmann 1002 in the Utrecht herbarium, and Syngonanthus caulescens f. minor Ruhl. seems to be based on Versteeg 738, also at Utrecht.

The Eriocaulon caulescens credited to "Hook. f.", to Hooker & Thomson, and to Steudel belongs in the synonymy of Eriocaulon atratum var. major Thwaites, while E. caulescens Willd is a synonym of Paepalanthus pilosus (H.B.K.) Kunth. The Eriocaulon splendens var. γ Bong., often included in the synonymy of Syngonanthus caulescens, seems better placed in that of S. glandulosus Gleason; Paepalanthus procerus Klotzsch is now known as S. caulescens var. procerus (Klotzsch) Moldenke; and Paepalanthus caulescens var. b subvar. γ Körn. is S. caulescens var. angustifolius Moldenke. It is very possible that the Hatschbach 24562, Reitz 5343, and Reitz & Klein 11593, cited below, may also actually be var. angustifolius because of their extra slender, thin, ascending cauline leaves. W. R. Anderson 9760 is a remarkably dwarf plant and may represent Ruhland's f. minor. Line drawings of floral parts are included on the Berlin sheets of Clausen 173, Martius s.n., and Sellow 1296 & 1394 and were probably made by Ruhland.

Recent collectors describe S. caulescens as a perennial herb, 10—50 cm. tall, with "neat" large rosettes of dull-green leaves, the inflorescences erect, cream-color, 15—20 cm. tall, the flowerheads "white", "off-white", "gray-white", "grayish-white" or "light-gray", almost globose, the fruiting-heads light-brown, and the flowers white. Ruiz-Terán & López-Palacios refer to it as a "Hierba brevicaulescente, la porción foliada de 3—4 cm. de largo. Hojas subelíptico-oblongas, ±17 x 3 mm., verde obscuras y virtualmente glabras por la haz, algo más claras y aplicado-pilosas por el envés. Escapos de 4—8 cm. de largo."

Recent collectors have found the plant growing in mountain forests, marshy campos, swamps, wet meadows, bogs and places partly covered by water, open marshes with the watertable at the surface, very wet ground, low campo swamps, swampy meadows, sloughs, water pools on campos, wet places in gallery forests, cerrado and burned-over cerrado, wet ground on lower cutover sandy slopes, periodically flooded places, small campos on flat hilltops, "en patanos", as well as in and around "morichals" with standing water

dominated by groves of Mauritia minor or M. flexuosa, often in light grayish-brown soil; also at the edges of lakes, along the marshy edges of ponds and slow-flowing streams, on streambanks, creek banks, wet or white sand savannas, moist sandy banks over rocks, the rocky edges of rivers, and sandy wet creek-bank savannas, in "brejo", beside small streams, on campos and wet campos, on quartzite, and on granite rock in forested hills, standing in stagnant water, submerged in water, or in waterfalls, at altitudes of 65—1600 meters, flowering from August to June, and fruiting from November to May, August, and September. Maguire found it "locally abundant in meadows near streams"; Maguire, Wurdack, & Bunting refer to it as "frequent in morichal and lagunas"; the Maguires report it "common along streams in wet places", while Steyermark & Wurdack found it "locally abundant on drier mud". Schulz encountered it "on granite flats [which are] moist most of the year"; Anderson found it "by streams with roots in water" and "in gallery forest along streams and brejo (sedge meadows) with cerrado on slopes above, sandy soil and sandstone rocks"; Anderson & his associates encountered it "in wet sand in an area of very rocky sandstone hilltops with occasional wet spots". Irwin and his associates found it growing "in shallow water of cerrado seep in an area of gallery forest and adjacent cerrado", "in open places in cerrado in areas of cerrado with outcrops and gallery forest", "on wet campo in area of gallery forest and adjacent cerrado", and "in wet ground of valley flats, capoeira with grazed grasses near swampy creek margins".

Fosberg refers to S. caulescens as "rare in marshy ground in depressions around morichal" and "occasional on mineral soil bank in open grassy bogs". The Eitens encountered it "in open marsh along brook", "in the water at open brookside or in soaking soil alongside", "in sedge meadow on slight slope to river plain", and "in soaking soil at brookside, growing on a clump of soil that fell from the edge of the brook gully". These splendid collectors also found it growing "in soaking dark mud at open edge of pond made by damming a stream" and "in soaking soil at brooksides". Hatschbach and his colleagues found it in "Lageados umidos proximo a filetes de água"; Schulz and his associates in "sitio pantanoso, valle muy húmedo"; Reitz & Klein in "banhado de campo" and "na água corrente"; and Schinini in "borde de estero" and "en campo con Butia yatay en terreno anegadizo".

Vernacular names reported for this plant are "capim manso", "capipoatinga", "gravatá manso", and "semprevivas do campo".

Gleason, in his unpublished Flora of British Guiana, describes S. caulescens as follows: "Stems 2—3 dm. long, sparsely branched or simple, nearly glabrous; leaves scattered, broadly linear to oblong, 2—3 cm. long, 3—6 mm. wide, pubescent, spreading, the upper crowded and subtending the umbel; peduncles numerous, 3-costate, strongly twisted, glabrous or pubescent, 5—15 cm. long; sheaths hirsute, 2—3 cm. long; heads subglobose, 4—6 mm. wide; bracts nearly white, acute, glabrous." At the time when he wrote this description "No specimens has been seen from British Guiana",

but he gives the overall distribution as "Colombia to French Guiana, south to Paraguay and Bolivia". In his key he separates the three obviously caulescent species from the Guiana area known to him as follows:

1. Subtending bracts present; leaves 1 mm. wide or less.
   2. Principal leaves about 15 mm. long, very thin and lax; peduncular sheaths acuminate.....S. anomalus.
   2a. Principal leaves about 5 mm. long, firm, prominently nerved; peduncular sheaths obtuse.....S. brevifolius.
1a. Subtending bracts none; leaves 2--5 mm. wide.....S. caulescens.

Silveira (1928) comments that "Caulis brevissimus vel usque 12 cm altus. Caeterum ut in descriptione Koernickeane, in 'Flora Brasiliensi', Martii". Macbride (1936) gives its distribution as "South America generally". Miquel (1847), in describing his Paepalanthus surinamensis, says "Paepalanthus caulescenti Kunth..... affinis. Caulis basi radicans suberectus 25 cent. longus, totus foliorum basibus obtectus interque eas floccoso-pubescens, e basi ramulos parvos foliis dissitis minutis instructos exserens. Folia 4--5 cent. longa, 5--6 mm. lata, laete viridia, plana vel complicata, apice ad lentem subcalloso-emarginata. Pedunculi in apice caulis numerosissimi, 3--10 cent. longi stricti torti, vaginis 3--3.5 cent. longis striatis ore oblique fissis apice perumper petulis. Capitula juniora elliptica, adulta campanulata, basi fuscule, apice dilute straminea, 3--4 mm. longa."

Bongard (1830) describes the plant as follows, with two unnamed varieties: "Caulescens; caule erecto, simplici, folioso; foliis caulinis lanceolatis, pubescentibus; pedunculis fasciculatis vaginisque pubescentibus.....β stature humiliore (1/3 praecedentis). γ caule brevissimo, submullo; pedunculo solitario. — In humidis graminosis inter Barbacenam et St. Juao Brasiliensium".

Kunth (1841) recognized two varieties: β humilis and γ parvifolius. He lists the typical form of the species as from French Guiana and the other two varieties from "in Brasilia meridionali, ille prope Paxaopeba (Sellow)". He states further that "Varietas γ differt nonnisi caule humiliore, densius folioso, foliis minoribus (12--15 lineas longis, 3/4 — 1 lin. latis), pedunculis vaginisque glabriusculis, capitulis paulo minoribus; flores prorsus ut in var. a.....Eriocaulon caulescens Poir. cum Paepalantho nostro congesto compingere voluit. Eriocauli fasciculati fors tantum varietatem giganteam esse, suspicatur Poiret."

Körnicke (1863) describes his various varieties and subvarieties as follows:

Var. a — "vaginis foliisque appresse puberulis vel pubescentibus, praeterea patenti- vel patentissimo-pilosis [Synonymy: Paepalanthus caulescens Kunth, Eriocaulon canescens Poir., E. simillimum Steud., E. caulescens Salzm., E. e Cayenne Willd.] citing G. Gardner 2748 & 4380, Martin s.n., Salzmann s.n., & Spruce s.n.

Var. b — "vaginis foliisque appresso-puberulis vel pubescentibus,

praeterea non pilosis" [Synonymy: Paepalanthus splendens Mart., Eriocaulon splendens Bong.].

Var. b subvar. α — "caule rigido; foliis confertis, omnibus vel superioribus lanceolatis, acutis, latiusculis vel latis, arrectis; statura majuscula rarius humiliori" [Synonymy: Eriocaulon splendens var. α Bong.] citing Martius s.n. [in arena humida ad fluvium Rio Gr. de Belmonte], Pohl s.n., Houllet s.n., & Riedel s.n. [inter Barbacena et S. João].

Var. b subvar. β — "caule rigido vel laxo; foliis saepe remotis, oblongo-linearibus acutis latis patentibus; statura plerumque altiore" [Synonymy: Paepalanthus surinamensis Miq., P. procerus Klotzsch, Eriocaulon surinamense Steud.] citing Hostmann & Kappler 1002, Kegel s.n., Lhotzky s.n., Martius 888 & s.n. [prope Cidade de Ouro Preto], Otto s.n., & Widgren s.n.

Var. b subvar. γ — "caule laxiusculo; foliis linearibus acuminatis patentissimis confertis, pro ratione longitudinis subangulatis; statura altiore" citing Martius s.n. [in prov. Bahiensis calidis ad fluvium Peruaguassu].

Var. b subvar. δ — "caule brevi; foliis lati-linearibus densissimis; statura humili" [Synonymy: Paepalanthus caulescens β humilis Kunth, Eriocaulon splendens var. caule humiliore Bong.] citing Martius s.n. [in prov. Bahiae arenosis udis ad fluvium S. Francisci prope Joazeiro] & Sellow s.n. [prope Paxaopeba].

Var. b subvar. ε — "caule brevi stricto; foliis lanceolato-linearibus acutis patentibus, inferioribus fere patentissimis et plerumque densioribus, reliquis paullo remotiusculis; statura humili sed quam antecedentis et sequentis subvarietatis paullo altiore" [Synonymy: Eriocaulon splendens (Bong.) Schnitzl., Paepalanthus caulescens γ parvifolius Kunth p.p.] citing Lund s.n. [Taubaté], Martius s.n. [prope Rio de Janeiro] & s.n. [ad flumen S. Francisci prope Salgado], Pohl s.n. [Goiás], Regnell s.n. [Caldas], Riedel s.n. [Taubaté], Raben 903, Sellow s.n. [São Paulo], Vauthier s.n., Weddell 1039, Widgren s.n., & Wied-Neuwied s.n. and Schlim 193 from Ocana, Colombia.

Var. b subvar. ζ — "caule brevi vel brevissimo; foliis subanguste linearibus acutis irregulariter patentibus densis vel remotiusculis; statura humili vel humillima" [Synonymy: Paepalanthus caulescens γ parvifolius Kunth p.p., Eriocaulon splendens var. γ Bong., E. geraënse Steud., E. subuncinatum Steud.] citing Clausen 173, G. Gardner 2959, 2960, & 3487, Pohl s.n., Raben s.n., Riedel s.n. [Barbacena], & Sellow s.n.

It should be noted here that of these proposed taxa subvar. β is now known as var. procerus (Klotzsch) Moldenke and subvar. γ is now known as var. angustifolius Moldenke. The G. Gardner 2960, cited by Körnicke under var. b subvar. ζ is a cotype collection of

S. fertilis (Körn.) Ruhl.

Uittien & Heyn (1938) comment that S. caulescens is "Extremely variable in habit. Koernicke described several varieties and subvarieties, but they are connected by intermediate forms. In Suriname two forms are found, a small form with 1—6 cm long stems and 1—2 cm long, 3 mm wide leaves and a larger one with 20—45 cm long stems and 3 cm long, 6 mm wide leaves". For their small form they cite B. W. 7133, Rombouts 214 & 556, and Versteeg 730; for their large form they cite Hostmann & Kappler 1002 (the type of Paepalanthus surinamensis), Kegel 1105, and Rombouts 556. It is very possible that this larger form represents what I call var. procerus (Klotzsch) Moldenke.

Ruhland (1903) cites no specimens at all, but gives the distribution of the species as "In Venezuela, Columbien, Guiana, Bolivien und Brasilien (Provinzen Amazonas, Bahia, Mattogrosso, Goyaz, Piauhy, Minas Geraës, Rio de Janeiro u. S. Paulo) und in Paraguay weit verbreitet". He notes that the "Species fere inter omnes variabilissima. Variant praesertim habitus (caulis longus vel brevis, folia patentia vel arrecto-patentia, densa vel remota, lata vel angusta) et indumentum foliorum. Varietates cl.Koernickei formis multis intermediis conjunctae sunt."

Castellanos (1945) cites Pickel 153 from Pernambuco and Dusén 15619, Rambo 34 & 9592, and Thei Ben 7655 from Paraná, Brazil, deposited in the Miguel Lillo herbarium. He cites the species' overall distribution as "Centro-américa por Colombia, Venezuela, Guayanas, Brasil (Amazonas, Pernambuco, Piauhy, Bahia, Goyaz, Matto Grosso, Minas Geraes, Rio Janeiro, São Paulo, Paraná, Rio Grande do Sul), Bolivia, Paraguay y Argentina, alcanzando su límite austral en Uruguay. En Argentina, en la provincia botánica Corrientino-paraguaya (Corrientes & Misiones)." Abbiatti (1946) cites Burkart 7893 from Corrientes; Macbride (1936) cites Killip & Smith s.n. and Weberbauer 4565 from Peru; Eiten (1962) cites Eiten & Eiten 1527, 1748, 1985, & 2348 from Brazil; Goodspeed & Stork (1955) cite Woytkowski 35330 from San Martín, Peru; Silveira (1928) lists A. Silveira 221 from Minas Gerais; Aristeguieta (1968) records it from Anzoátegui and Guárico, Venezuela; and Malme (1901) cites Mosén 1056 & 1057 and Regnell I.450 from Minas Gerais, Malme 582 from Rio Grande do Sul, and Löfgren 1214 from São Paulo, commenting that "Specimina omnia supra enumerata ad var. b pertinant; subvarietates a cel. Koernicke receptae parum notabiles esse videntur".

Körnicke (1871) cites Warming s.n. [Lagoa Santa] for his var. b subvar. β and Warming s.n. [Palmeira prope Barbacena] for his var. b subvar. δ. Angely (1957) records the species as cultivated in Brazil.

Some bibliographic corrections should be noted here: The plate 66 cited by Bongard (1830, 1831) for S. caulescens apparently was never published and probably exists only in the Leningrad library or herbarium. The Ruhland (1901) work cited above

is sometimes erroneously cited as "1902", the volume title-page date -- the pages here concerned were actually issued on July 2, 1901. The Soukup (1959) reference is sometimes erroneously cited as volume "5"; the Steyermark work (1968) is sometimes listed as "1969". Angely's (1972) work bears a "1970" title-page date, but was not actually issued until 1972. The Baillon (1894) work is erroneously dated "1884" by Stapf (1930); the Schnitzlein (1845) work is often cited as "1847", but here again the pages concerning us were issued in 1845. The Moldenke (1940) paper bears the date "1941" on the cover, but was actually published (and deposited in the library of the New York Botanical Garden) on December 31, 1940. Malme's (1901) work is sometimes incorrectly cited as "1903".

The index of Steudel's (1855) work refers to a page "270" for S. caulescens, but this seems to be a typographic error for page 276. The illustration given by Tamayo (1961) labeled "Syngonanthus akurimensis Moldenke" actually depicts S. caulescens instead. Syngonanthus akurimensis [now known as Comanthera kegeliana (Körn.) Moldenke] is a plant of entirely different appearance.

A specimen of the Irwin, Grear, Souza, & Reis dos Santos collection in the Aarhus University herbarium bears a label inscribed "15816" and "Tree ca. 6 m x 12 cm., corolla cream" -- this seems to be another case of mixed labels, the proper label for the specimen in question being no. 15876. Cardona Puig 2886 is a mixture with Paepalanthus lamarckii Kunth, Irwin, Prance, Soderstrom, & Holmgren 55312 is a mixture with Paepalanthus oyapockensis Herzog, and Lourteig 2074 is a mixture with something non-eriocaulaceous.

The Eiten & Eiten 8492, cited below, is placed here very tentatively. It was collected on the border of a small lake in gallery forest and is said to have been an "herb growing in water". It is far too immature for accurate determination and thus far I have not been successful in getting more material of it for study.

Material of S. caulescens has been misidentified and distributed in some herbaria as Eriocaulon flaccidum Bong., Paepalanthus macaheensis Körn., P. pseudotortilis Ruhl., P. sp., Syngonanthus caulescens var. procerus (Klotzsch) Moldenke, S. glandulosus Gleason, S. glandulosus var. epapillosus Moldenke, Tonina fluviatilis Aubl., and Eleocharis sulcata Nees.

On the other hand, the Martius s.n. [ad fluv. Paruaguacú] and Reitz & Klein 11593, distributed as typical S. caulescens, are actually S. caulescens var. angustifolius Moldenke; Irwin, Souza, & Reis dos Santos 8730 is the type collection of f. longipes Moldenke; G. Gardner 2748, Irwin, Souza, & Reis dos Santos 11471, and Lützelburg 357 & 1434 are var. procerus (Klotzsch) Moldenke; A. S. Hitchcock 17075 and Jenman 5287 are Paepalanthus bifidus (Schrad.) Kunth; and Pedersen 9399 & 10095 are probably S. glandulosus var. epapillosus Moldenke.

Additional citations: MEXICO: Veracruz: J. G. Smith 116 (E—2168579), 354 (E—2168580). COSTA RICA: Province undetermined: Pittier 11043 [Cienaga de Agua Buena] (Mu). COLOMBIA: Amazonas-Vaupés: Schultes & Cabrera 14968, in part (Ss), 15406 (Ss, Ss), 15956 (Ss). Boyacá: Schulz, Rodríguez P., & Petit B. 465 (Ld); Uribe Uribe 5179 (N), 5180 (N). Cundinamarca: M. L. Grant 10458 [Herb. Nat. Arb. 216584] (W—2166113); F. W. Pennell 2888 (N, W—1042515). Magdalena: C. Allen 649 (E—1014964, F—1391646), 707 (E—1014970). Meta: F. W. Pennell 1411 (N, W—1041725), 1634 (N); Pinto E. & Sastre 807 (P); Smith & Idrobo 1561a (Ca—963319). Santander: Killip & Smith 15031 (N, W—1360979). VENEZUELA: Amazonas: Maguire & Maguire 35435 (N); G. H. H. Tate 246 (N). Anzoátegui: H. M. Curran 163m (N); Pittier 14295 (Ca—734717). Bolívar: Aristeguieta 2248 (N, Ve—36850), 3706 (N, Ve); Bogner 1069 (Mu); Cardona Puig 2886, in part (W—2195081); Hertel & Oberwinkler 15225b (Mu); Killip 37683 (N); Koyama & Agostini 7267 (N); Lasser 1364 (Ve, W—1950297); López-Palacios 3046 (Ac), 3047 (Ld); B. Maguire 33613 (N); Maguire & Wurdack 35752 (N); Maguire, Wurdack, & Bunting 35909 (N); Moritz 610 (B); Ruiz-Terán & López-Palacios 11337 (Mi); J. A. Steyermark 76055 (Ss), 88759 (N), 98198 (Ld); Steyermark & Gibson 95741 (Ld); Steyermark & Wurdack 45b (N); G. H. H. Tate 246 (N). Carabobo: Pittier 9405 (W—1120698). Guárico: Aristeguieta 4514 (N), 6233 (Ac); G. Davidse 3771 (Ld). Monagas: F. R. Fosberg 45233 (W—2724080); Pursell, Curry, & Kremer 8293 (N). State undetermined: Mayeul-Grisol s.n. (B, N); Otto 941 (B, B, B); E. P. Stevens s.n. (C). GUYANA: C. D. K. Cook 83 (N, S); Guppy 634 [Forest Dept. Brit. Guian. 7649] (K, K, Ut—703946); S. G. Harrison 736 (K). SURINAM: Hostmann 1002 (B, Ut—395); Irwin, Prance, Soderstrom, & Holmgren 55265 (N), 55312, in part (N, N); Rombouts 555 (Ut—44054a); J. P. Schulz 10424 (N); Van Donselaar 3673 (N); Versteeg 738 (Ut—396). FRENCH GUIANA: Collector undetermined s.n. (B); Hallé 511 (N, P, W—2756370); Hoock s.n. [11 Aout 1962] (P, P); Leprieur 225 (B); Martin s.n. [Cajenna] (B); Mélinon 175 [339] (N, N). PERU: Amazonas: Wurdack 1082 (W—2403676). Loreto: Killip & Smith 28683 (N, W—1462193); Klug 2866 (W—1457251). San Martín: Klug 3270 (Mi, W—1457680); Woytkowski 35330 (Ca—13669). BRAZIL: Amapá: Black 49-8249 (Z); Cowan 38674 (N); W. A. Egler 1429 [Herb. Mus. Goeldi 24585] (Bm); Irwin, Murça Pires, & Westra 48645 (N). Amazônas: Lützelburg 20940 (Mu); Spruce 930 (Mu); Traill 1159 (P, P). Bahia: Lützelburg 241 (Mu); Martius s.n. [in arena humida ad fluv. Belmonte, 1818] (Mu), s.n. [ad fluv. S. Franc. prope Foazeiro] (Mu), s.n. [ad fluv. S. Franc. prope Salgado] (Mu); Murça Pires 3408 (N, Z). Distrito Federal: Héringer 6780 (B); Irwin, Grear, Souza, & Reis dos Santos 15876 ["15816"] (Ft, N, W—

2759055). Goiás: G. Gardner 3487 (B, W—936275), 4358 (P); Hatschbach & Ramamoothy 38209 (Ld); Irwin, Grear, Souza, & Reis dos Santos 14410, in part (Ac, N, W—2759019); Irwin, Maxwell, & Wasshausen 21424 (Ld, N), 21630 (Ac, Ld, N, N); Irwin, Souza, & Reis dos Santos 9757 (Ac, N); Murça Pires & Black 2416 (Ss, W—2252809). Guanabara: Martius s.n. [prope Sebastianopolis] (Mu). Maranhão: Glaziou s.n. [Maranhão] (P). Mato Grosso: W. R. Anderson 9760 (N); Archer & Gehrt 120 (W—1740803); Eiten & Eiten 8492 (W—2757735), 8768 (Ld, N, W—2615848); Goldsmith 61 (K); Harley, Souza, & Ferreira 10405 (Ac, N); Hatschbach 24562 (Ld, N, S), 33991 (Gz); Hatschbach, Anderson, Barneby, & Gates 36052 (Ld, N); Irwin & Soderstrom 6478 (Ac, N); Krapovickas, Cristóbal, & Ahumada 14084 (Ld); Philcox, Pereira, & Bertoldo 3411 (K); Prance, Lleras, & Coêlho 19232 (Ld); Ramos & Souza R. & S. 127 (Ld, N). Minas Gerais: Anderson, Stieber, & Kirkbride 35146 (N); P. Clausen 12 (P), 173 (B, B); Glaziou 15679 (N, W—1124143), 19992 (C); Henschen I.450 [3/4/1868] (W—9362#8); Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27824 (Ld, N, W—2759056); Irwin, Harley, & Onishi 28843 (Ld, N); Irwin, Reis dos Santos, Souza, & Fonsêca 23281 (Ld, N); Langsdorff s.n. (B, Ut—394); Lhotsky 34 (B); Macedo 2853 (S); Martius s.n. [prope Cidade de Ouro Preto] (Mu); Mello Barreto 943 (N), 2587 [Herb. Jard. Bot. Belo Horiz. 10716; Herb. U. S. Nat. Arb. 236382] (W—2109995), 4658 [Herb. Jard. Bot. Belo Horiz. 17558; Herb. U. S. Nat. Arb. 236405] (W—2121714), 4674 [Herb. Jard. Bot. Belo Horiz. 17527; Herb. U. S. Nat. Arb. 236402] (W—2121715); Mendes Magalhães 3192 (W—2124348); Occhioni 5589 [Herb. Cadeira Bot. 14633] (Ld); E. Pereira 2779 [Pabst 3615; Herb. Brad. 3837] (Sm), 2784 [Pabst 3620; Herb. Brad. 3839] (Sm); L. Riedel 291 (B); Sellow 1296 (B, B), s.n. [Rio das Pedras, 1820] (B); Widgren 824 (W—200754); Williams & Assis 6551 (Ca—74433, W—1932747). Pará: Black 50-9966 (Be—54852); Black & Ledoux 50-10380 1/2 (Be—61676), 50-10480 1/2 (Z); Black, Ledoux, & Stegemann 52-14257 (Be—73986), 52-14355 (Z); W. A. Egler 245 [Black 15531] (Bs), 455 (Bs); Egler & Raimundo s.n. [W. A. Egler 1222; Herb. Mus. Goeldi 24269] (Bm); Frões 29764 (Hk, Hk); Sick s.n. [Herb. Brad. 4702] (Sm). Paraná: Brade 19627 (Ja—65775); Braga 98 [Herb. Inst. Hist. Nat. 5269] (Mm, W—2369354); A. Castellanos 21869 [Herb. Mus. Nac. Rio Jan. 126569] (Ac); Dombrowski 81 [Herb. Inst. Hist. Nat. 6792] (Ac, Lw), 219 [Herb. Inst. Hist. Nat. 8073] (Lw), 524 (Ac), 2098 [Kuniyoshi 1824] (Ld), 2313 [Kuniyoshi 2055] (Ld); Dombrowski & Saito 1031/848 (Ac); Dusén 10433 (W—1280825), 15619 (W—1470491); Freitas 3231 (Rd—14854); Gurgel 106 (Ja—46335, Ja, Ja); Hatschbach 3758 (Sm), 4368 (Rd—15592), 4955 (Sm), 8537 (Lw), 22504 (Ld, N), 22887 (Ac), 27194 (Ac), 27661 (Ld), 28490 (Ld), 38054 (Ld); Hatschbach & Lan-

ge 5290 (Sm), 5311 (Sm), 5316 (Sm); Hatschbach & Moreira 6808 (Bm); Hatschbach, Smith, & Klein 28243 (Ac); Krapovickas, Cristóbal, & Maruffak 23620 (Ld); Kummrow 1065 (Ld); Lindeman & Haas 1122 (Ld); Reitz & Klein 17472 (Ac, N), 17620 (Ac, N, W—2758135); E. Santos 2162 [Sacco 2368; Herb. Mus. Nac. Rio Jan. 126554] (W—2639604); Smith, Klein, & Hatschbach 14549 (Ac); Stellfeld 1519 (W—2527786). Pernambuco: Pickel 153 (B), 2257 (W—1473257), s.n. [Pambos, Jan. 1931] (Ba, W—1523237). Piauí: G. Gardner 2959 (N, W—936274). Rio de Janeiro: Dusén 1906 (W—1055750, W—1470461); Glaziou 6447 (W—1124113), 9002 (P), 11632 (P), 12249 (N, Pd, W—1124125), 17305 (C); Pereira 395 [Herb. Brad. 6113] (Bd); Rose & Lutz 39 [Herb. Mus. Nac. Rio Jan. 52488] (Gg—366040). Rio Grande do Sul: O. Camargo s.n. [Rambo 61599] (S); Leite 140 (Ja—43992), 2063 (A); Rambo 34685 (Gg—354583), 34865 (N), 45414 (Rd—12295), 46178 (Rd—12294), 52140 (B); A. R. Schultz 325 (W—1978446), 453 (W—1978447); Sehnem 2450 (Gg—356425). Roraima: Black 51-12680 (Be—70495); Maguire & Maguire 40100 (N); Prance, Forero, Pena, & Ramos 4488 (Ld, N, S); Ule 7610 [M.G. 12727] (K, Ok). Santa Catarina: Grossmann 144 (Gt), 147 (Gt); Klein 3470 (Ac), 3866 (Ld); Mello Filho 681 [Herb. Mus. Nac. Rio Jan. 49606] (W—2639605); Rambo 49585 (Bl—105064, Vi, W—2055044); Reitz 5343 [Herb. Barb. Rodr. 6346] (N, N); Reitz & Klein 5138 (W—2252157), 6008 (Sm), 11982 (Ld), 16405 (Ld); Schwacke s.n. [10/VII/1885] (P); Smith & Klein 7469 (W—2248751), 8186 (Ok), 8648 (W—2248753), 9884a (W—2248757), 10653 (Ok), 11097 (Ok), 13689 (Ac), 13741 (W—2451596), 13762 (W—2451592), 15502 (Ac); Smith, Klein, & Hatschbach 15694 (Ld, N); Smith & Reitz 14314 (Ac, N); Smith, Reitz, & Caldato 9585 (Ok); Smith, Reitz, & Sufridini 9390 (Ok); Ule 582 (Hg). São Paulo: Black 51-11028 (Be—68873), 51-11048 (Z), 51-11060 (Z); Brade 6580 (Mu), 6592 (Mu); Burchell 3780 (T); Campos Novaes 1152 (W—389982); G. Eiten 1631 (N); Eiten & Eiten 1748 (N), 1937 (N), 1985 (N), 2348 (N), 5107 (W—2426086); Eiten, Eiten, & Mimura 5887 (W—2757749); Eiten & Machado de Campis 1527 (N), 3426 (N); F. R. Fosberg 4331 (Ld); Glaziou 9002 (N); Grossmann 142 (Gt); Guillemin 520 (P); F. C. Hoehne 612 (Mu, N); Löfgren 151 (P); A. Lutz 309 [Herb. Lutz 309] (Ja), 836 [Herb. Lutz 836] (Ja), s.n. [Herb. Lutz 688] (Ja); Lutz & Lutz 44 [Herb. Lutz 1735] (Ja), 225, in part [Herb. Lutz 1217, in part] (Ja); Mimura 32 (N, W—2404890), 81 (N, W—2404917), 268 (N); Pabst, Burkart, & Burkart 9570 [Herb. Brad. 60552] (Gz); L. Riedel 1480 (B, Ut—392); Sellow s.n. (Ut—393). State undetermined: Glaziou 14357 (N), s.n. (W—1123402); Löfgren 1214 (P); Martius 888 (B, M, Mu), 896 (Mu), s.n. [Brasilia] (B, B, B); J. E. Pohl 2396 (B), 5071 (B), s.n. [in Brasilia] (Mu, Mu, Mu); L. Riedel 1482a (B); Sel-

low 100 (B), 1292 (B), 1394 (B), 1399 (B), 1462 (B), 4348 (B); Sidney 1435 [Lago Leo; Onishi 656] (Ld); Tamberlik s.n. [Brasil] (V--7781). MARAJO ISLAND: Huber 2666 (Ut--1682). BOLIVIA: La Paz: R. S. Williams 301 (N, Z). Santa Cruz: Kuntze s.n. [Yapacani, VI.92] (W--701890); J. Steinbach 6908 (Ca--306500). PARAGUAY: Balansa 566 (P); Fiebrig 4671 (Mu); Hassler 1061 (N, P), 3645 (Ca--944903, N), 4709 (Ca--940639, N, V--3010), 6697 (Ca--944901, N), 8483 (Ca--944902, N), 12532 (Ca--930356, N, W--1057419); Jörgensen 4174 (N, N, W--1571235, W--1692478); Krapovickas & Cristóbal 13485 (Ld); Lourteig 2074, in part (S); Morong 249 (W--819023), 331 (C, Ca--2425, Mi, W--45351, W--936246); Pedersen 3252 (W--2169508), 9400 (N); Schinini 5803 (Ld), 10919 (Ld); Sparre & Vervoorst 2141 (S); Woolston 1187 (S, W--2321828). ARGENTINA: Corrientes: Cabrera 11711 (Vi, W--2198011); Krapovickas, Cristóbal, Carnevali, Quarín, González, & Isikawa 24178 (Ld); Krapovickas, Cristóbal, Schinini, Arbo, Quarín, & González 26426 (Ld); Krapovickas, Cristóbal, Schinini, & González 24618 (Ac); Pedersen 496 (W--2122501), 3088 (S, W--2169499); Schinini 7682 (Ld); Schinini, Arbo, González, Ishikawa, & Tressens 8331 (Kh), 8452 (Gz); Schinini & Quarín 8543 (Ld); G. J. Schwarz 340 (Ut--77572b). Misiones: Pedersen 3252 (S). CULTIVATED: Germany: F. C. Hoehne 32 (Mu). MOUNTED ILLUSTRATIONS: Castelli. in Descole, Gen. & Sp. Pl. Argent. 3: pl. 20. 1945 (M); drawings by Körnicke (B, B); drawings by Kunth (B).

SYNGONANTHUS CAULESCENS var. ANGUSTIFOLIUS Moldenke, Bull. Torrey Bot. Club 68: 70. 1940.

Synonymy: Paepalanthus caulescens var. b subvar. γ Körn. in Mart., Fl. Bras. 3 (1): 466--468. 1863. Paepalanthus caulescens var. β subvar. γ Kunth ex Moldenke, Phytologia 31: 403--404, in syn. 1975.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 466--468. 1863; Moldenke, Bull. Torrey Bot. Club 68: 70. 1940; Moldenke, Alph. List Cit. 1: 266. 1946; Moldenke, Known Geogr. Distrib. Erioc. 5 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 61 & 212. 1949; Moldenke, Phytologia 4: 302. 1953; Moldenke, Résumé 69 & 491. 1959; Moldenke, Fifth Summ. 1: 120 (1971) and 2: 961. 1971; Moldenke, Phytologia 28: 435 & 440 (1974), 31: 386 & 404 (1975), and 34: 275. 1976.

This variety differs from the typical form of the species in its uniformly longer and narrower leaves, which are 2--3.5 cm. long and 0.2--2 mm. wide, gradually attenuate to the sharply acute apex. It is based on Haught 2747 from Meta, Colombia.

It should be noted here that the original publication of this taxon is dated "1941" on its cover, but was actually received in at least the library of the New York Botanical Garden on December 31, 1940. Körnicke's subvariety, listed in the synonymy above, appears to be based on Martius s.n. from "ad fluv. Peruaguaçú",

Bahia, Brazil, in the Munich herbarium. Recent collectors have found the variety growing in berjo (sedge meadow), wet campos, swamps, and wet places in general, flowering and fruiting in January, April, August, and December, at 750 meters altitude, and describe the plant as an herb with white flowers and cream-colored fruit. Dombrowski refers to it as "frequent". The Hatschbach 1761 and Leite 101, cited below, were previously erroneously cited by me as typical S. caulescens (Poir.) Ruhl.

Citations: COLOMBIA: Meta: Haught 2747 (Ca--737846--isotype). BRAZIL: Bahia: Martius s.n. [ad fluv. Peruaguaçú] (Mu, Mu). Mato Grosso: Hatschbach 32338 (Ld). Paraná: Dombrowski 5582 (Ld), 5873 (Ld); Hatschbach 1761 (N). Rio Grande do Sul: Leite 101 (N). Rondônia: Cordeiro 838 (Ld). Santa Catarina: Reitz & Klein 11593 (Z).

SYNGONANTHUS CAULESCENS var. BELLOHORIZONTINUS Alv. Silv., Fl. Mont. 1: 358 [as "bello horizontina"]. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946.

Synonymy: Syngonanthus caulescens var. bello horizontina Alv. Silv., Fl. Mont. 1: 358. 1928. Syngonanthus caulescens var. bello-horizontina Alv. Silv., Fl. Mont. 1: 416. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 358 & 416. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 302. 1953; Moldenke, Résumé 106, 351, & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 635 & 961. 1971; Moldenke, Phytologia 34: 259. 1976.

This variety differs from the typical form of the species in having its stems 13--40 cm. tall, erect, and the leaves acute at their apex. It is based on A. Silveira 219 from "In humidis prope Bello Horizonte", Minas Gerais, Brazil, collected in 1903 and deposited in the Silveira herbarium. Hatschbach encountered it "junto a corrego do brejo", flowering and fruiting in May.

Citations: BRAZIL: Goiás: Hatschbach 36758 (Z).

SYNGONANTHUS CAULESCENS var. DISCRETIFOLIUS Moldenke, var. nov.

Haec varietas a forma typica speciei foliis caulinibus distincte alternis perspicue discretis adscendenti-patentibus recedit.

This variety differs from the typical form of the species in having its stem-leaves distinctly alternate, conspicuously and rather widely separated from each other, ascending-spreading, and sharply acute apically.

The type of the variety was collected by B. G. S. Ribeiro (no. 1397) in the Serra dos Carrajás, Pará, Brazil, on June 28, 1976, and is deposited in my personal herbarium. The collector describes the plant as 10 cm. tall, but most of the plants on the type sheet are up to 40 cm. tall. He speaks of the flowers as white. It should be noted that this collection (at least insofar as the type specimen is concerned) contains a large amount of extraneous material of a Panicum sp., etc. [to be continued]

FOREIGN BODY REACTIONS INDUCED BY FUNGI IRRADIATED IN SPACE

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Introduction: The closed environment of spacecraft during extended journeys and the stresses of spaceflight create conditions favorable to induce change in microorganisms. Four fungal species were selected for exposure in space and were returned to earth for postflight evaluations. Phenotypes of Chaetomium globosum Kunze, Rhodotorula rubra (Demme) Lodder, Saccharomyces cerevisiae Hansen, and Trichophyton terrestre Durie et Frey were selected from the Apollo 16 Microbial Ecology Evaluation Device (MEED) after exposure to specific spaceflight parameters (Volz, 1975). Mycological studies in space have been numerous, beginning with high altitude balloon flights that expanded defined experiments beyond the atmosphere of earth (Dublin and Volz, 1973). Previous postflight evaluations of the spaceflight fungal phenotypes currently under study demonstrated variation at the cellular level (Dublin, et al., 1974; Sawyer, et al., 1975; Volz, 1975; Volz and Dublin, 1973; Volz, et al., 1974; Wurzburger and Volz, 1976). Changes in survival rates and phenotype counts, nutritional requirements, cellular response to drugs, growth rates, mycelial growth in the presence of salivary peroxidase activity, rate of human hair deterioration, and change in whole cell phospholipid contents were attributed to spaceflight exposure. The Apollo MEED postflight studies continue to further identify change in living systems initially exposed to parameters of space. Because of the biomedical changes, the current study was designed to investigate foreign body reactions in animals caused by fungi after exposure to parameters of space.

Materials and Methods: Ascospores of Chaetomium globosum ATCC 6205, conidia of Trichophyton terrestre x285, and vegetative yeast cells of Saccharomyces cerevisiae y2439 and Rhodotorula rubra y1592 were housed in distilled water or dry in 0.05 ml volume square cuvettes within the MEED spaceflight hardware. Each cuvette contained a quartz window and a series of filters to regulate the ultraviolet light (UV) wavelength and intensity at exposure in space (Taylor, 1970). The MEED was deployed at a 90° angle to the sun for 10 min + 7 sec during the transearth Extra Vehicular Activity (EVA) of Apollo 16 (Volz, 1975). Fungi in the flight hardware were exposed to 254, 280, and 300 nanometers (nm) UV light at various energy levels during deployment and attachment of the MEED flight hardware on the television campole extension and Command Module hatch. After exposure, the flight hardware was stowed and returned to the lab at

splashdown (Volz, 1974). Fungal cells housed in the flight hardware were placed on Sabouraud maltose agar and initially studied for survival capabilities according to exposure levels in space (Volz and Dublin, 1973).

Phenotypes for the present study were obtained from viable cells collected in postflight studies. The phenotypes were selected in relation to wild type by colony morphology, growth rate, growth density, colony texture, and variation in sporulation and pigmentation (Volz, 1974). From 10 to 15 phenotypes of each fungal species in addition to the wild type or ground control were used in this study.

Swiss Flow DUB/KR Mice and Golden Syrian Hamsters from a random breed closed colony were pretreated with 20 mg/ml daily inoculations of hydrocortisone acetate suspension for one week prior to the introduction of the fungal test organisms to repress the defense system of the animals. Pretreated animals and control animals not receiving hydrocortisone acetate were inoculated with suspensions of the test fungi.

Mice received 0.2 ml cell suspension in 0.9% saline intraperitoneally, in the tail vein, and the epidermis while hamsters were injected with 0.9 ml cell suspension in the cheek pouch and gum area at a cell concentration of $1 \times 10^6 - 10^8$ cells per ml. Before inoculation, hamsters were anesthetized with 7.5 mg/ml sodium pentobarbital using 1 ml (50 mg/ml) per 100 g weight of animal. Animals remained anesthetized for a sufficient time to withdraw the buccal pouch and make the inoculations. Histological studies were made when changes in the normal behavioral activity in the animals were noted, about 4 to 6 weeks after inoculation. Approximately 0.25 g material from isolated lesions were inoculated on Sabouraud maltose agar for fungal recovery. Other lesion tissue was placed in Bouin's fixative, dehydrated in a alcohol series, Feulgen stained, embedded in Tissuemat, sectioned, and described. Replicates of 5 animals were used for each test phenotype and control.

Results: The spaceflight exposures received by the phenotypes are presented in Table 1. Greatest morphological diversification in phenotypes compared with the wild type or parent strain was the principal method in selection of test organisms for the current evaluations.

Viable cells were recovered from mouse tissue streaked on agar plates as shown in Table 2. Mouse lesions induced by Chaetomium globosum involved the subcutaneous area. The cellular response was lymphocytic. Ascospores and hyphae were seen external to the muscle sheath and a small wall of lymphocytes generally separated the fungal cells from the muscle sheath. Muscle tissue was not affected, but ascospores were seen between muscle sheaths.

Other involvements of C. globosum in mice included the liver, kidney, and spleen (Fig. 1). An abcess lesion in the liver originated in a central vein and involved an entire lobe. Liver involvements were circumscribed nonencapsulated areas of inflammation with a central necrotic core. Destruction of the liver parenchyma was

present and the mononuclear inflammatory cells were primarily lymphocytes. The central core of lesions contained tissue debris and liver cells in various stages of degeneration.

Trichophyton terrestre phenotypes and T. terrestre wild type produced diffuse subcutaneous lesions. A rudimentary wall around the areas, caused by a fibrocytic reaction, was present. The central area of the lesion appeared granulomatous, with necrotic cells and fungal conidia present. There were many polymorphonuclear cells in the center near the cellular debris and conidia.

Subcutaneous mouse lesions of Saccharomyces cerevisiae were large and fairly well circumscribed. They affected the subcutaneous region and did not affect the overlying skin. No ulceration occurred but lesions were intense inflammatory reactions. Centers were necrotic and infiltrates were a mixture of polymorphonuclear cells surrounded by monocytes. Budding yeast cells were very abundant. Lesions were well circumscribed and encapsulated. A large quantity of cellular infiltrate, including many lymphocytes and marcophages were present. This was an intense necrotic reaction with a large amount of cellular debris and some calcium deposits in response to the inflammation. In the periphery of the necrotic areas proliferating fibrocytes were found.

Liver lesions initiated by S. cerevisiae wild type and phenotypes were fairly well walled off with fibrocytes and macrophages (Fig. 2). It was an acute reaction, and liver tissue involved was necrotic. Older liver lesions were granulomatous and contained a mononuclear infiltrate at the periphery. In lesions much debris was present and no cellular detail was evident. Lesions originated near central veins.

With Rhodotorula rubra wild type and pheontypes a mild dermal reaction was seen in mice that was not walled off. However, a rudimentary wall was present since much fibrous proliferation took place which did not circumscribe the diffuse lesion (Fig. 3). Many polymorphonuclear cells were evident in the area of yeast cells. Some degenerating muscle tissue was present in lesions. Internal organs were not infected. A significantly higher number of viable cells were recovered from skin lesions of S. cerevisiae phenotypes compared with lesions induced by S. cerevisiae wild type control (Table 2).

Cortisone pretreated hamsters inoculated with the phenotypes elicited foreign body reactions. The invaded areas involved a large tissue area adjacent to the central lesion. Cellular response in the hamsters was similar to that found in mice with the respective fungal phenotypes. In general, S. cerevisiae in hamsters produced soft, highly inflamed, diffuse buccal pouch lesions with proliferation of the yeast cells. Rhodotorula rubra induced lesions were soft, mildly inflamed, and diffuse. Trichophyton terrestre initiated only small nodular lesions at the site of inoculation and C. globosum induced lesions were localized, small, hard, and nodular. Pretreated animals and animals with no hydrocortisone acetate produced no variation in tissue response.

Discussion: Varying degrees of inflammatory responses were noted with the test fungi. Order of reactivity observed in the mice and hamsters from the most severe to the least was Saccharomyces, Rhodotorula, Chaetomium, and Trichophyton. Phenotypes of S. cerevisiae gave very diffuse and very intense reactions sometimes to the point of being a true abcess. The S. cerevisiae cells would often proliferate in the host. The lesions were partially circumscribed and not encapsulated although fibrosis was evident. The cellular response was mainly mononuclear with macrophages and polymorphs usually in the area. There was seldom a central core of necrosis, although often scattered pycnotic nuclei were seen as well as a large amount of cellular debris. The gross lesion was relatively soft as compared to the hard nodular lesion of C. globosum, and large amounts of pus were always present.

The cellular and gross appearance of the response to R. rubra was similar to that of S. cerevisiae but less severe. Similarly with Saccharomyces, the Rhodotorula cellular response was mainly mononuclear with polymorphs and macrophages in the area. The lesions were diffuse but were more contained than those of S. cerevisiae. More fibrous proliferation and a more definite area of necrosis were present. In the lesion area many pycnotic nuclei and some cellular debris were commonly seen. The gross lesions of R. rubra were very similar to the gross lesions of Saccharomyces except slightly smaller and slightly less intense in adjacent tissue.

The cellular response to C. globosum was a circumscribed well defined area of approximately 95% lymphocytes that was well encapsulated with a thin fibrous sheath. Proliferation of the cells was never observed. Cellular debris, some pycnotic nuclei, and cells in various stages of degeneration were present inside the circumscribed area. The gross lesion was small, hard, and nodular, and the area adjacent to the lesion was not inflamed.

Trichophyton terrestre phenotypes were the least reactive, and seldom lesions were produced to combat their presence. When a lesion did form, it was moderately diffuse and there was a pronounced fibrocytic reaction that did not completely encapsulate the area. Necrotic cells and cellular debris were in the lesion area.

Variations between phenotypes within the same species were not as pronounced as foreign body reactions between the selected genera. Phenotypes of Saccharomyces cerevisiae showed more reactivity than other test fungi. In addition, more viable cells were recovered from the dermal lesions in mice induced by phenotypes than from lesions initiated by the wild type.

Summary: The cellular response to Chaetomium globosum, Rhodotorula rubra, Saccharomyces cerevisiae, Trichophyton terrestre and their spaceflight phenotypes was a foreign body reaction. Response variation in mice and hamsters was greater between genera and less evident between phenotypes of the same species. Cells of S. cerevisiae exposed to spaceflight parameters retained a higher recovery rate in dermal lesions compared with cells isolated from lesions induced by S. cerevisiae ground control.

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Table 1

Exposures in space of test fungi included in the foreign body reaction studies

Organism	UV wavelength	Energy level
Chaetomium globosum test*	full light of space	$1 - 5 \times 10^5$ ergs
C. globosum wild type	0	0
Trichophyton terrestre test	280 nm	$2 - 9 \times 10^4$
T. terrestre wild type	0	0
Saccharomyces cerevisiae test	254 - 300 nm	$7 \times 10^3 - 7 \times 10^4$
S. cerevisiae wild type	0	0
Rhodotorula rubra test	280 nm - full light	$2 \times 10^4 - 2 \times 10^5$
R. rubra wild type	0	0

*Data presents the range of exposure levels in space for each species, compiled from measured irradiations for each test phenotype.

Table 2

Average number of colony forming units per plate obtained from wild type and phenotypes recovered from mouse tissue.

Wild type	skin	liver	kidney	spleen
Saccharomyces cerevisiae	9	6	2	9
Rhodotorula rubra	1	0	0	1
Trichophyton terrestre	0	0	0	0
Chaetomium globosum	20	7	9	12
Spaceflight phenotypes*				
Saccharomyces cerevisiae	168	7	7	5
Rhodotorula rubra	4	0	0	0
Trichophyton terrestre	0	0	0	0
Chaetomium globosum	27	2	7	3

*Average of 10 phenotypes for each species.

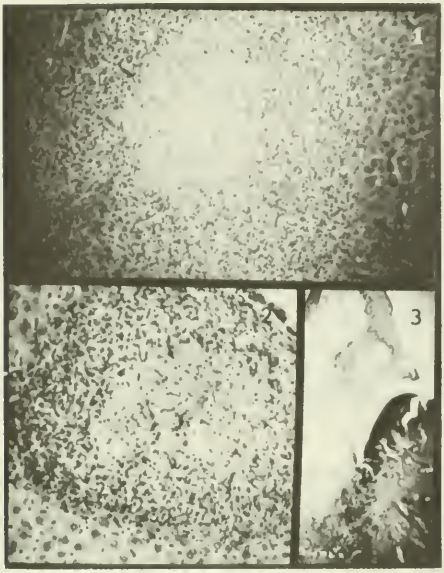

Figure legends

Fig. 1. Chaetomium globosum induced lesion in mouse liver (x 170).

Fig. 2. Saccharomyces cerevisiae initiated mouse liver lesion (x 220).

Fig. 3. Foreign body reaction of Rhodotorula rubra in mouse dermis (x 90).

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REALLY, WHO GIVES A DAMN?

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If one conducts a poll, or reads the results of polls professionally prepared, it quickly becomes obvious that everyone really does care about "The Ecology" — that new, now capitalized word which to many represents the entire concept of ecology, environmental studies, and preservation of life, although I strongly suspect that that word may grate on the nerves of most biologists now. There are few citizens in the United States of America, and even fewer biologists, who will openly state that they could care less about the preservation of life -- our own survival if you will -- and yet, merely verbally supporting a concept rarely can lead us to a successful end.

The big concern today is with endangered species of plants and animals. The preservation of endangered species, we all will admit as biologists, is essentially a self-centered activity. The plants and animals which make up the biological world are valuable and essential ingredients in our environment, for without them we cannot exist and therefore it follows that their preservation is a matter of basic concern for Man. But it does not follow that everyone will or can agree.

To a dam builder, a highway contractor, or a city planner, an endangered species is certainly an unwanted complication; it makes their jobs more difficult, and in some cases, probably impossible. The recent difficulties caused by *Pedicularis furbishiae* S. Wats. in Maine, as reported in THE WASHINGTON STAR (9 November 1976, p. A-6) and elsewhere, is an example, but only the first of many examples for as plants become listed by the United States government as "endangered" or "threatened" more, many more examples will be in your local newspaper. We can understand the need, but we, as biologists, should start now to make a real effort to make others less well informed as to the merits of endangered plants and animals understand the need for such unique biological entities to exist.

Let us remind the people of the world that we are roped together upon this tiny speck of swirling matter in a vast space we call earth, and that this speck is the only one we have an option on. To fail to comprehend this simple fact will ultimate lead to our own classification as an "endangered species."

The natural extinction of a species is part of the evolution of life, and we are certainly cognate of this fact. This activity

is a sound one and unquestionably one of the most basic aspects of life, for even man could not have come into being with the extinction of other species even within our own genus or family. The unnatural extinction of a species is not a part of the normal evolution of life. The bulldozer is certainly an unnatural predator!

Okay. So you care. And your friends care about the earth and the living things upon it, after all you are reading a botanical journal. Well, let's see.

Historically as man has struggled to open new lands he has constantly confronted environmentally induced challenges. It was understandable then -- we can say now -- that the confrontations of the earlier settlers who had to cut down trees in order to farm the land or to kill the deer and geese in order to eat had no other choice for if man was to survive, merely survive to reproduce -- his most basic natural drive -- then these environmental forces had to be conquered with force. This is an obvious observation, for even today, to some extent, man is still faced with environmentally induced challenges which can only be answered with man-imposed force. Granted, three centuries ago when much of the eastern seaboard of the United States was being settled a single man could farm only a few acres, cut down only a few hundred trees, and kill only a small percentage of the animal population so that he and his family could survive. Yet, it was less than two hundred years ago that a cry was coming from the scientific community in the United States -- that is, Thomas Jefferson wrote in his "Notes on Virginia" in 1782 -- that it was necessary to preserve and protect the natural environment in Virginia if future generations were to share in the bounties of the state. I must admit, I do not know if the general public supported his position for the Gallups and Harrises were not active in environmental surveys at that time, but it seems reasonable that the need for natural areas -- undisturbed by logging or farming -- might have been something that some of the landed gentry would have accepted as logical. At the start of the Nineteenth Century there were few people in the United States, and the western half of the American continent was still largely unknown, and yet we look up and down the eastern seaboard for undisturbed forest and we find none. Obviously something did not quite work out the way it was supposed to. Like perhaps no one really did bother to set aside a parcel of woodlands for preservation, not even Jefferson, so that we today could see what the eastern deciduous forest was like before the 1500s and the coming of the Europeans.

Could it have been that as the Nation grew more and more people were born unto the land, and more and more came to the Nation from other countries to settle and etch their place in American history? We know of course that that was exactly what happened, and while a single settler and his family needed only a few acres

to live on, and only a few pounds of wild game to survive on, and only a few simple necessities to be happy on, these resources were far more plentiful than other nations of the world, and it was the numbers of people that grew, each demanding his own from the environment. Too, as the people grew in numbers and as technology improved the standards of life for the people, the demands upon the natural resources of the Nation became greater and greater, and the voices of concern grew faint and hard to hear. THIS IS THE LAND OF PLENTY. And it was true.

This Nation was rich in natural resources. The climate was fair, the soil good, the plants and animals of Europe did well here, and even a few new plants and animals were to be found in use by the native peoples. Consider for a moment if you can what you might have felt like if you were poor and living in England, and saw a pamphlet published in London in 1666 entitled "A Brief Description of the Province of Carolina, on the Coasts of Floreda" and could read the following:

> The marshes and meadows are very large, from 1,500 to 3,000 acres and upwards, and are excellent food for cattle, and will bear any grain being prepared. Some cattle, both great and small, will live well all the winter, and keep their fat without fodder... The meadows are very proper for rice, rapeseed, linseed, &., and may many of them be made to overflow at pleasure with a small charge.
>
> Here are as brave rivers as any in the world, stored with great abundance of sturgeon, salmon, bass, plaice, trout, and Spanish mackerel, with many other most pleasant sorts of fish, both flat and round, for which the English tongue has no name. Also, in the little winter they have, abundance of wild geese, ducks, teals, widgeons, and many other pleasant fowl...
>
> Last of all, the air comes to be considered, which is not the least considerable to the well being of a plantation, for without a wholesome air all other considerations avail nothing. And this is it which makes this place so desirable, being seated in the glorious light of heaven brings many advantages, and His convenient distance secures them from the inconvenience of His scorching beams...

Could you not but wish to come to a land so fabulous, to bring your family, your friends, and settle near a meadow which will feed the cattle on a river filled with all kinds of fish in an area with a "little" winter? My father's family came shortly before this and settled in Virginia and so I guess I cannot fail but to understand what freedom, good land, and wholesome air would have meant (but why my father's early relatives were French and not English is far too difficult to explain here). This was the LAND OF OPPORTUNITY which so many people had failed to find in their own homelands.

The plight of the land was not restricted to the eastern coast of the United States. Consider this description of the Miami River Valley from Hamilton to the Ohio River just west of present-day Cincinnati in southwestern Ohio as described by James Smith in his journals of 1795:

> If you have a desire to raise great quantities of corn, wheat, or other grain, here is perhaps the best soil in the world, inviting your industry. If you prefer the raising of cattle or feeding large flocks of sheep, here the beautiful and green parara excites your wonder and claims your attention. If, wearied with toil, you seek the bank of the river as a place to rest; here the fishes sporting in the limpid stream invite you to cast in your hook and draw forth nourishment for yourself and your family. The most excellent fowl perch in the trees and flutter in the waters, while these immense woods produce innumerable quantities of the most excellent venison.

In his 1797 journal, Smith wrote the following description of the area what is now the city of Cincinnati, Ohio. Read it slowly and think of what is found there today:

> Grass of the meadow kind grows all over this country and white clover and bluegrass grow spontaneously wherever the land is cleared. A country so famous for grass must of course be excellent for all kinds of stock. Here I saw the finest beef and mutton that I ever saw, fed on grass. Hogs also increase and fatten in the woods in a most surprising manner. Exclusive of tame cattle, great numbers of wild beasts, as bears, buffalo, deer, elk, etc., shelter in these immense woods. The rivers produce an infinite number of fish; besides geese, ducks and the like, turkeys, pheasants, partridges, etc., are produced in great plenty and get exceedingly fat on the produce of the forest. Honey itself is not wanting to make up the rich variety. Incredible numbers of bees have found their way to this delightful region and in vast quantities deposit their honey in the trees of the woods, so that it is not an uncommon thing for the people to take their wagon and team and return loaded with honey.

And if you have been to Cincinnati recently, and seen the Ohio River or the Miami River nearby, and looked into the sky during the summer in that city, read even more slowly the following:

> The water of this country is generally very good. The rivers are clear as crystal and the springs are bold, good, and in considerable plenty.
>
> The air appears clear and serene, not subject to dampness and vapors which render a country unwholesome.

Perhaps the descriptions are imaginary. Perhaps that part of the Ohio River Valley was really never like that. Perhaps this was all part of a plot to encourage the unsuspecting to immigrate from the eastern seaboard into the Ohio Country. I do not know, but both of my father's parents families believe these words and moved into the Ohio Country about this time and no doubt added to the gradual alteration of the land from what it was then to what it is today.

It may seem that I am picking on an easy victim. The eastern half of the United States is an easy mark, but the Far West has too received its share of exploitation and human enforced destruction. It is an historical fact that when the railroad surveys were made in the early 1850s, grave concern was expressed even then about the rapid loss of undisturbed areas, vanishing species of large mammals and birds, and the introduction of exotic species which were rapidly replacing native plants and animals.

In the Intermountain Region, for example, we look out over the broad valley bottoms along the Wasatch Range and see great fields of sagebrush (*Artemisia tridentata*) and scattered woodlands of juniper (*Juniperus osteosperma*) and think that the area is well cared for. Little do we realize that in 1844 John C. Frémont found these same valley bottoms covered with perennial grasses, and the trees were restricted to the foothills. According to Christensen and Johnson, writing in Brigham Young University Science Bulletin in 1964, the early pioneers of Utah so totally overgrazed and abused the native vegetation and the land that by 1900 the perennial grasses had been replaced by sagebrush and juniper, with several exotic species dominating the annual vegetation. I have talked with my mother's father who worked on cattle ranches as a youth before 1900 in parts of Utah, and heard him tell stories he had heard about what the country was like when the early Mormon pioneers came to Utah in the 1850s. As a rancher and farmer he could not understand why the vegetation had changed, after all the buffalo had been replaced by cattle, and there was plenty of grass for the buffalo. It was always difficult for me to explain the difference between a buffalo herd of five hundred head versus cattle herds which number in the thousands, and sheep herds in the hundreds of thousands when it came to the long-term survival of rangelands in the arid West.

I once ran into a cowboy of sorts in southeastern Oregon who claimed the reason the range was so bad in Oregon was because the government had removed the wild horses. Horses, and to some extent cattle, when feeding in the winter, will kick the plants loose from the ground to get the snow off of them in order to eat the dried remains. The wild horses pawed the ground enough to 1) make a new seed bed for the grasses, 2) allowed the antelope to find enough grass to survive, and 3) carried off enough grass in their mouths to transport seeds to new areas. If you are ever out in southeastern Oregon in the winter, be sure to dig up a grass and see just

how many seeds remain on the spikelet, and just for kicks, dig up a few plants and come back in the summer and see how many of them are still alive! Such logic is telling of a mentality that still all too often effects the minds of some.

Any well-read student of Western American history knows that the vegetation has drastically changed since the early Spaniards came into New Mexico, California, and Arizona. Even when one reads the accounts of Jedediah Smith as told by Dale L. Morgan in his 1953 book on this most famous of early trappers and explorers, one is impressed by the many changes that have taken place in Utah, Nevada, and California. He wrote of beaver in the lakes in the Central Valley of California, and great marshes filled with birds of all kinds with deer and antelope in abundance. He does give a telling, though brief, portrait of central Nevada: "It contains a few miserable Indians, and but little Game." For someone who nearly starved in crossing the Great Basin in the summer of 1827, perhaps such a description is not too unusual, but it was unjustified. Frémont would later dispel many of the ideas about the Great Basin as fostered by the early fur trappers, and others would romaticize the area later far more than necessary for the Basin was and is a harse place.

I can continue to reflect upon what this country was once upon a time, and give you what can only seem like now as fairy book tales of the tall grass, open meadows, mountain sheep, huge trout, clear rivers, and roaming herbs of buffalo which once occupied the Intermountain Region between the Rocky Mountains and the Sierra Nevada, but it will serve us little today to do so. All of that is gone and shall never return. I can call your attention to the papers given at Harvard, in New York, and in Philadelphia before 1900 calling for the preservation of species of plants and animals in the United States, for such words have been common among the scientific circles for decades. Then a few people cared; today a far greater number actually care, and even a greater number say they do -- after all, they watch WILD KINGDOM and ANIMAL WORLD on television. Certainly isn't that so kind of commitment?

If you are reading these words it is probably because you do care about the preservation of endangered and threatened species. I do not have to urge the ideas of preservation of species upon you -- you believe this should be done. Nor do I need to tell you that endangered and threatened species exist -- you have read reports, seen articles in NEWSWEEK, THE WALL STREET JOURNAL, and a host of conservation magazines, and you have seen programs on television all showing the spectacular decline of species in the last two hundred years. But what I want to do is grab you and shake you hard and ask "well, if you really do care, then get with it for you are the major source of information, and you have tremendous political pressure which can be used to alter the events we see around us which continue to threaten our fellow living

organisms." But even if you are willing to help your local, state, and federal governmental agencies deal with endangered and threatened species, there is one more step that is now necessary. Your efforts are needed now to alter the minds of the few -- a mere handful really -- of those who control the fate of our lives so that we can survive in the world.

In the minds of many, government is a nasty word. People say and seem to be disillusioned with all forms of government, from the lowest to the highest. In part this is an after effect of the Watergate episode, but I can assure you that this feeling is not unique even within the history of the United States. The effects of Watergate will and have quickly mended, and politics -- perhaps slightly altered now -- will remain much as we have known it for centuries. It is still true that the only way to inform the government is to tell it. As a citizen you can, of course, but as a scientist, let's face it, you will garner more immediate attention. And that is now the question you must answer. Do you really care enough to participate with your fellow biologists, with your governments, and with the people of the world in dealing with the efforts and the laws associated with endangered species? Are you willing to change the public's view of what is an endangered species and why they are important? For zoologists this is not too difficult as can be attested by the fact that whole organizations have been formed to save the wolf, the grizzly bear, African wildlife, and so forth. How many groups can you name which have the sole purpose of saving a particular species of endangered or threatened plants?

We in botany have a most difficult challenge before us.

There are two considerations I would like to present to you. One deals specifically with the biologists of the world, while the second in a proposal for consideration by the new federal administration of Jimmy Carter.

First we must call upon the animal lovers of the world to take note that there is another group of organisms out there in the world -- PLANTS! Plants do not fly, run through the woods, have pectoral fins, or soft brown eyes. They cannot run or fly or swim to avoid danger, and the lack of these nice adaptations accounts for many of their problems in trying to survive. Few plants now compete in the public's attention, or pocketbook, with the spotted coat of a new-born fawn or the grace of a swan in flight.

It should come as no surprise to you that this is so. We grew up with the concept that animals are neat things, and force the same patterns onto our own children as we are all intrigued by things that move. I can be certain that you have been in a grassy meadow at some time in your life, and that meadow is filled with all kinds of grasses and wild flowers, and you are pointing out the single deer far off in the distance! Little should we wonder

then why someone doesn't get too excited about a lowly *Eriogonum* or even a *Pedicularis*.

It is this concept of public indifference to the plant kingdom that must be changed.

How? It is really not too difficult for it requires only a little education of certain people in limited areas to get our message about plants across to the general public. The vehicles already exist, and all we have to do is be willing -- "care" if you will -- to provide the information.

There are numerous excellent, general public magazines and periodicals which now discuss the endangered species problem. True they are almost totally devoted to animals, and I am not saying that this should not continue to be the case, but what I am saying is that such publications should be made aware that plants are in trouble too, and that you, the *botanists*, are the only ones who can provide articles of interest to the general public. Likewise, television programs should be encouraged to include within their current programing portions about plants; it should not be too difficult to discuss endangered tropical plants when talking about endangered tropical animals. I feel certain that producers of such animal-orientated programs would include segments on plants if they only had the information.

I say, if you care, really care, you can write about endangered species in your part of the world for a state-wide magazine, the local newspaper, or even a national magazine.

Being closely associated with the Washington, D.C. area, and having worked with certain members of the legislative arm of our national government, newspeople, and a small number of students, I can safely say that there is a problem of educating the general public about plants. However, there is a knowledge gap of phenomenonal proportions when it comes to Congressmen. In 1966, Congress passed an Endangered Species Act which did not even mention the word "plant." That -- thanks to the efforts of a few people in Washington -- is no longer the case in the Endangered Species Act of 1973. Plants are now recognized as existing out in the world, but only now, nearly three years after the Act was signed into law, is the law being amended to include a few operative sections for the members of the plant kingdom, and hopefully the Secretary of the Interior will propose a few species as "official" endangered in the near future.

To make it into the halls of Congress with the word "plant" was a major hurdle in 1972 and 1973, but even so the battle has just begun. Now we must aid in the formulation of policy regarding how the recognized endangered species of plants will be protected, and what I am proposing to you now is a concept which I

feel is about the only reasonable means that we can use whereby the plants themselves can be saved, and still take into account the total social needs of the people of the United States.

To most people -- and in particular a Congressman -- an endangered species is a goose that is finding it hard to reproduce and find a spot to spend the summer. So, the government believes, protect the goose wherever it goes; a point that the world governmental bodies concur with, and which is perfectly logical when it comes to a highly mobile organism. Only recently has it occurred to the government that it is necessary to protect the place where endangered organisms occur in a part (for most animals) or all of their range (for most plants).

For animals, which conveniently move around, people can say where the animals should go and wander around and reproduce. For plants the problem is a bit more complicated. One cannot make a nice seedbed and tell the plant to "grow" and expect it to do well where we want it to. Plants simply are not like that, especially those considered threatened or endangered. Plants, through eons of time and evolution, have selected those unique places where they can survive. Granted, many plants will do well almost anywhere, but these species are of no concern to us here; we are interested only in those few species that can grow in a single place because events of time and evolution have made that the case.

Congress will have to be aware that for full protection of many plants it is necessary to consider the plant in terms of its habitat, that is, that piece of land and its associated buffer zone where an endangered or threatened species occurs. As I see it, our major goal now is to introduce into the minds of our Congressmen that plants are directly concerned with their unique habitat, and it is the species total habitat that must be preserved if the plant is going to survive. Unlike the higher mammals, most birds, and some fishes which can successfully move out of the way of expanding cities, polluted air and water, and the friendly bulldozer, plants and many animals cannot move out of the way of such progress, nor can they find another place to make a home. If we are going to save our endangered plant (and many animal) species, we must protect the habitat where they occur as much as possible if, and note I said if, that is the only way the plant (or animal) can be saved from certain extinction.

To accomplish this policy of habitat protection, I propose that the new administration consider the establishment of a series of National Environmental Sites on federal lands and a National Register of Biological Places on private lands, which will be governed by an Advisory Council associated with the Department of the Interior. Such a bureaucracy should be patterned after the successful program established by the National Historic Preservation Act of 1966 which is responsible for the identification,

registration, and -- in some cases -- the actual preservation of historical buildings or sites of national significance in American history, architecture, archeology, and culture.

A National Environmental Site would be an area of unique biological makeup, either in terms of an unusual combination of flora and/or fauna, or in terms of unique species. Such an area could be small or large in terms of physical size, but such areas should be established so as to protect the entire site and provide a buffer zone around it as well. These sites would be particularly useful in preserving the habitats of endangered plant species. I would suggest that such sites be established only in areas where a plant is directly threatened with extinction by man-caused forces or where there is a number of endangered plants and/or animals in a particular area. Such sites should not be established around each endangered plant or animal for the vast majority of such organisms will require little or no direct protective management action to maintain them; as long as land managing officers keep the bulldozers out of an area, most plants will do just fine.

The National Environmental Sites would be restricted to federally owned lands. Such areas, whether they occur on land now managed by the military, the Forest Service, the Park Service, or the Bureau of Land Management, would remain in the management control of that agency. However, the use of the land for activities that could be detrimental of the survival of the flora and fauna would be prohibited. Similary, such sites would be either selected by the agency responsible for the land, or nominated by groups and organizations interested in protecting endangered plants and animals. The suitability of the site would be reviewed by a group of scientists, lay persons, and representatives of the agency, plus a representative of the Advisory Board, to determine the need for establishing a National Environmental Site at a particular locale.

Once a National Environmental Site was established, the land management agency -- which would retain control of the land -- would be required to review the land-use policies of the area and take the appropriate actions so as to prevent the loss or destruction of the area and its unique flora and/or fauna via man-caused actions. The biology of the species would need careful review for some species can only be maintained by fire or similar natural activities, and such knowledge will be needed for the long-term survival of the organisms.

The principle purpose of the National Environmental Site will be to preserve and protect the integrity of the area where unique plants and animals occur. Such sites can be looked upon as miniture national parks where even people are largely excluded.

A National Register of Biological Places would be a listing of areas where narrowly endemic species occur, or where small but

unique habitats of biological significance can be found, such as marshes, desert springs, hanging gardens, and such. While National Environmental Sites would be large and more or less discrete units, those places listed in the registery would not. As such, the land may be federally or privately owned, and while the federal land owner would continue to regulate the land so as to protect the habitat, the private land owner may, if so wished, donate the land to the federal government for management and protection. Some land owners may wish to retain control of the land and not transfer it to federal ownership. In such cases, the land owner would agree to enter into an agreement with the Secretary of the Interior to hold the land in perpetuity and in a natural state before a site could be entered onto the Registery.

It is unreasonable to expect any land owner or manager to keep a hungry cow from grazing a species of plant known to exist only on a single hillside, or a fish from eating a smaller endangered species. However, it is reasonable that if man-controlled management decision about the land can be made that such decision should be made with the best interest of the unique species in mind. In my opinion, a national register of such unique places would be a public notice that endangered and unique plants and animals exist in one particular place, and that area must be respected insofar as reasonably possible.

The major impact of such a program will be in the recognition that alternatives exist in land management programs at all levels of government and land ownership. We must now start to look to the land and those organisms associated with it and come to some understanding of how such lands and organisms should be managed and protected from extinction. For the most part reasonable alternatives exist which can be taken. The nature of those alternatives and a decision upon those alternatives would be a major role that the Advisory Council could play. Not only would the Council advise the Secretary of the Interior as to whether a particular site should be selected or not, the Council would aid the land owner in determining the alternatives available to him and in making suitable recommendations as to the type of action that should be taken. In this fashion, the Council would act -- admittedly in a bias manner perhaps toward the protection of the species or habitat -- in establishing reasonable alternative to the loss of the rich biological diversity we have in the United States.

What I am proposing in not ideal perhaps to extremists in either camp. In this proposal I am suggesting that it is possible to identify, describe, and advertise the existence of unique places in the United States which should not be causally destroyed out of ignorance. This will not stop the plant robber from digging up the last remaining individuals of some endangered species of cactus, but it should stop the unknowing destruction of this very same species by agencies or individuals who -- simply because they do not

know such a species exists, digs up the area for a garbage dump, or some other type of facility which could conceivably be located elsewhere.

Biologists are now in a period when we are going to be forced to play an expanding role in governmental decisions and policy making regarding biological organisms if we want to save those very organisms we wish to study and understand. I for one hope to aid in this role by educating students, my colleagues, the general public, and governmental officals, and by taking part in providing information to those in government who need data in order to make reasonable decisions. As I see it, we do have a ways to go in bring upward into the conscience of the general public the idea that plants really do exist, and that plants really are important.

We can do it if we will only make the effort to cooperate and aid such federal agencies as the Office of Endangered Species of the Department of the Interior. If you are interested in receiving information about endangered species, you should write the Endangered Species Program, United States Fish and Wildlife Service, Department of the Interior, Washington, D.C. 20240 and request that you be put on their mailing list so that you can receive the ENDANGERED SPECIES TECHNICAL BULLETIN, the office's monthly publication.

The Forest Service, the National Park Service, and the Bureau of Land Management are all making efforts now to survey their land holdings for endangered and sensitive plants, and contracts are available for this work, especially for plant taxonomists associated with university herbaria. Numerous articles are being published in conservation magazines, and more are needed if you will only write them. What is needed most of all is your help and understanding of the problems of protecting and preserving endangered plants, and the communication of these problems to the general public and local governments. Biologists, and in particular the botanist, must take a more active role if plants are to be given a fair share of the public concern.

No one but us will save a plant for it is the scientist who must provide the ground-truth data to support the placement of any species on a local, state, or federal list of endangered species. But the mere placement of a Latin name on a sheet of paper is only the start. After that is the logic and reasonableness that is so necessary to provide such an organism space and time to exist in, and that we can provide if we only will.

If we can only help ourselves, our colleagues, our government in the problems of endangered species, then our children and their children can enjoy the great biological diversity we see about us today. But if we fail, if you fail to participate, then you will only confirm to me, and the world, what a Congressman asked me once:

REALLY, WHO GIVES A DAMN?

HIBISCADELPHUS NUMBER KK-HX-1
AN INTERNATIONAL TREASURE IN HAWAII

Otto & Isa Degener
New York Botanical Garden

Until higher education larned us more better, we considered mallow flowers to be flat and open; lobelia flowers to be tubular and curved; and bird beaks, except those of hawks and owls, to be straight and pecky.

The genus Hibiscadelphus (Malvaceae), established by Rock in 1911, is a remarkable group of endemic species restricted to limited areas of the Hawaiian Islands. How many existed in the drier forests before man's coming thousands of years ago is guesswork. The normally increasing population from the original introduction probably, like the "brother" genus Hibiscus, "walked" more or less "dryshod" through the ancient archipelago as islands repeatedly rose from the depths, melted together with lava flows andor falling sea level, separated with erosion andor rising sea level, and drifted slowly westward on the Earth's crust. Today botanists recognize a species from Kauai, represented by about half a dozen trees in Waimea Canyon; one from East Maui, now extinct; one from northern Hawaii, now extinct; and two others from Hawaii. These last are H. hualalaiensis Rock (plate 1), now centering in greatly reduced numbers in a remnant forest about Puu Waawaa; and H. giffardianus Rock (plate 2), consisting so far as we know of a venerable tree officially labeled KK-HX-1, with its numerous semidomesticated offspring growing in Hawaii Volcanoes National Park in Kipuka Ki and Puaulu, and in a few State parks and gardens.

For readers unacquainted with the Islands, we wish to explain that the vernacular word "kipuka," certainly worth anglicising, refers to "the hole" according to the Hawaiians, formed by newer lava flows surrounding older ones. It is truly an oasis of richer terrain, such as are common on Maui and Hawaii where volcanoes are quiescent or active. These kipukas are famed for often harboring the Islands' rarest plants and the endemic animals depending on them for food and shelter.

The avian fauna of the Hawaiian Archipelago is famous for the endemic, nectar feeding "honeycreepers" IsicI, belonging to the Drepanididae (the proper orthographic ending for a Family in Zoology). Amadon in 1950 recognized nine genera consisting of 22 species and 24 subspecies. The State of Hawaii is truly infamous that about 40% of these remarkable taxa have been encouraged to become extinct. Modern ornithologists do not agree whether their ancient origin was Central American, Malaysian, or perhaps both disjunct regions. Being botanists and hence not prejudiced by ornithology, our snap judgment favors Malaysia as so many of Hawai'i's plant genera which produce indigestible seeds enclosed in fruits palatable to birds have their closest relatives there. We

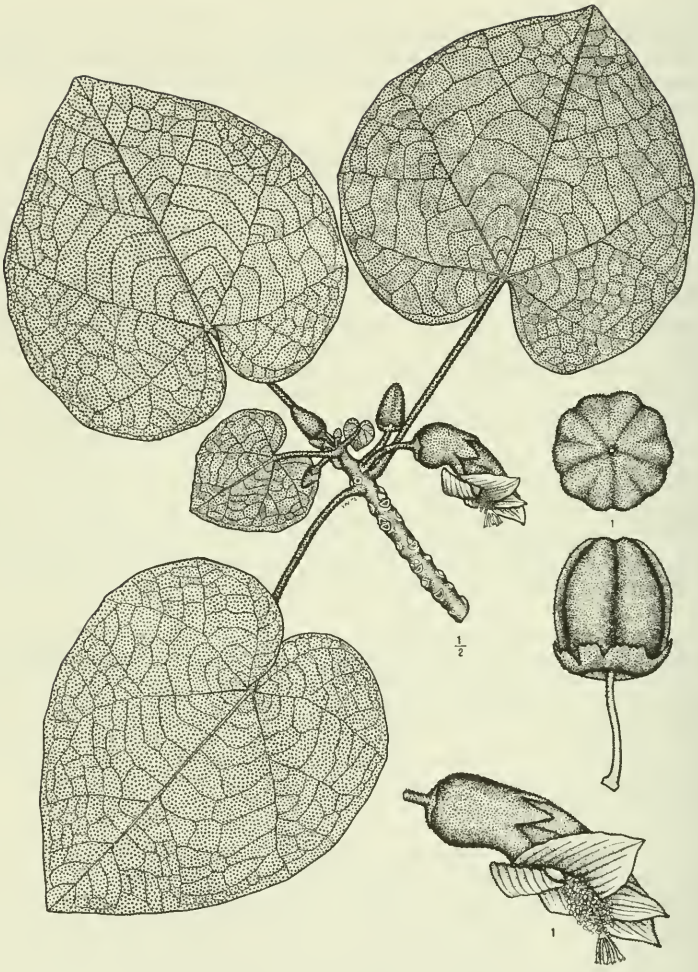

Plate 1. Hibiscadelphus hualalaiensis J.F. Rock
(After Degener)

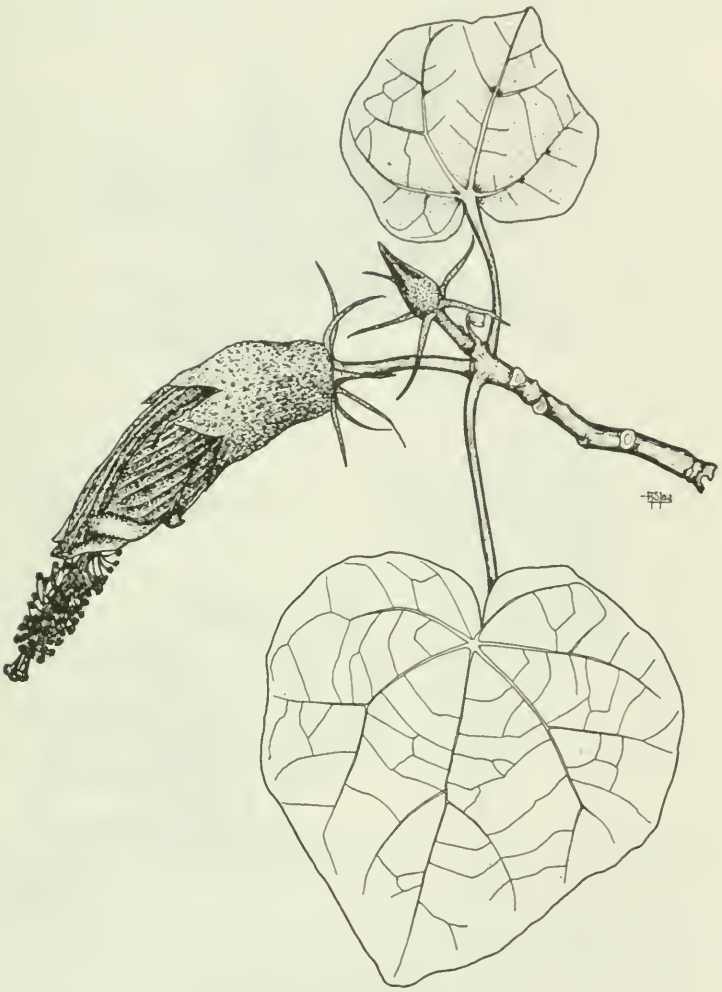

Plate 2. Hibiscadelphus giffardianus J.F. Rock
Twig of type tree, 1929. (After Degener)

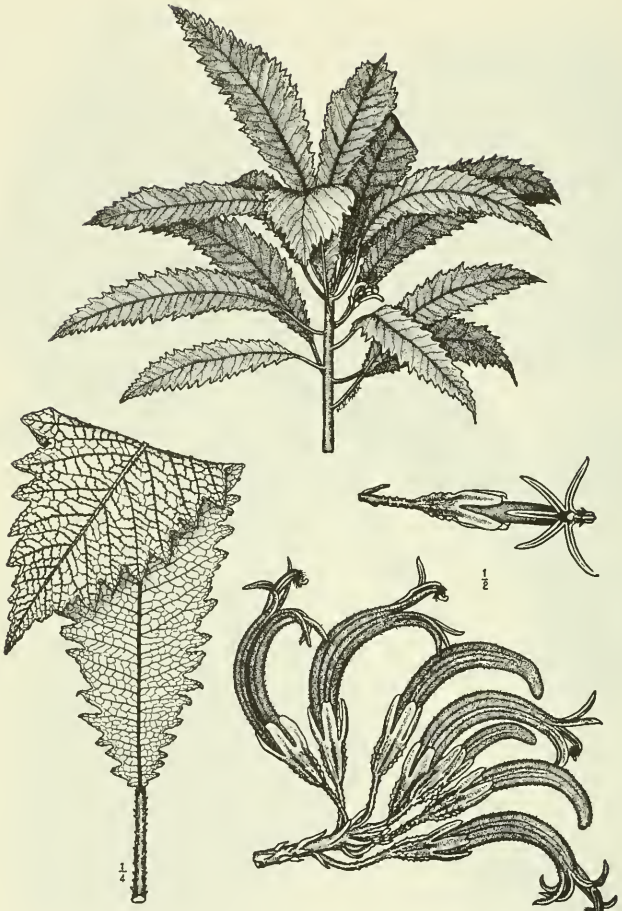

Plate 3. Cyanea baldwinii Forbes & Munro
(After Degener)

believe that if frugivorous birds were able, undoubtedly aided by numerous stepping-stone islands existing between the two land masses, to settle in the Hawaiian Islands, that the ancestors of the Drepanididae did also. Their nectar based droppings left us no visible legacy as evidence.

Drepanididae over millions of years intermeshed in an evolutionary way in development with Lobeliaceae, of which all but two small genera of the native nine, bear curved, tubular flowers. The lobelioids (the genus Lobelia is not native to the Islands), from sea level to all but the highest mountains on the Islands of Hawaii and Maui, in taxa and sheer numbers of individuals must have been enormous before man's unwitting extermination of the endemic biota began a few thousand years ago! Since 1778 when Captain Cook rediscovered the Islands, Gaudichaud, Hillebrand, Rock, Wimmer and a few others were able to describe about 275 surviving taxa scattered among Clermontia, Cyanea (plate 3), Delissea, Galeatella, Neowimmeria, Rollandia and Trematolobelia.

Into this environment crowded with curved, tubular Lobeliaceae flowers which the curious, slightly rubbery beaks of the drepanids entered like a hand into a glove, some mallow with spreading, actinomorphic flower similar to that of the hibiscus, arrived. This immigration was probably by floating seed or sealed capsule driven by some unusual southwesterly gale. With a curved corolla excreting nectar and secreting minute insects, and an efficient shape for pollination by birds with a bill similarly curved (plate 4); this ancient hibiscoid finally had evolved the peculiar corolla shape for which the genus Hibiscadelphus is famous. This may very well have taken eons; perhaps while such island as Midway arose from the deep where Hawaii now exists, grew to a considerable height and, as volcanism there died as it slowly floated westward, gradually eroded away to become the "low" atoll we know today. Believing in these developments in the fields of Botany, Zoology and Geology, both of us kane and wahine dreamers consider the genus a Sacred Creation of Nature, a true International Treasure.

While working on his Master's thesis about the gametophyte of Lycopodium cernuum in Kilauea's fumeroles in 1922 under the direction of Dr. James B. Pollock, Exchange Professor from the University of Michigan at the University of Hawaii, the kane writer first saw Rock's type plant of Hibiscadelphus giffardianus. It was growing beyond the boundary at 3,900 feet elevation of Hawaii National Park in Kipuka Puaulu, then considered part of Brown's Ranch. This last surviving tree was perched on the outer, southeastern rim of a collapsed lava tube in such a position that cattle were reluctant to risk browsing on it.

Become Naturalist of the Park in 1929, the kane frequently walked, motored and rode horseback to the tree, then ailing because of injury to its trunk, to gather fallen flowers and dried leaves. With a little soaking, he was able to furnish leading botanical institutions In America and elsewhere with authentic

Plate 4. The mamo, a nectar feeder.
(After Wilson & Evans)

specimens. He likewise broke off one twig so that his student artist, the late Hung Sun Lau, could draw it for the projected "Plants Hawaii National Park," published in 1930. There, plate 59, please note, is an illustration of part of the actual type tree. A popular description accompanies it; while a scientific one appears in Flora Haw., 9/10/32.

Though the type tree or at least its aerial part appeared to have died in 1930, the kane was delighted that two trees were growing on each side of the road leading into Walter M. Giffard's vacation home at Kilauea and Kalanikoa Streets, Volcano. Leaving the Island of Hawaii to botanize mainly on the other islands, thoughts of Hibiscadelphus waned until the Degeners purchased a home in 1966 catercornered from the one formerly owned by Giffard. Inspection of the premises showed the trees gone. Their sadness concerning the apparent extinction of this rare species turned to joy when Geologist Howard Powers, who had been employed at the Park at the same time as the kane in 1929, not only led them to a magnificent tree of the species forty feet tall and with a six and a half inch trunk along the Mauna Loa Strip Road in Kipuka Ki of the renamed

Hawaii Volcanoes National Park; but gave them a potted plant he had raised from a seedling to set out in their new garden. With this gift, in addition to gifts through Ranger Donald Reeser, and roadside seedlings growing near the tree as well as plants raised by them from seed, their garden may become a refuge for about a score of plants should a lava flow from Mauna Loa ever destroy the kipuka.

Complicating matters, specimens of H. hualalaiensis Rock, known from the Puu Waawaa area of the mountain Hualalai and not from the National Park, had been planted near Kipuka Ki in the 1950s or early '60s and at length began to flower. Purists, perhaps rightly so were the species common, maintain such trees should be destroyed as alien to the Park. We Degeners reason that so long as *exot-

*Gold and silver Pityrogramma ferns among dry lava and cinders particularly about the summit area of Kilauea; grasses, presumably introduced during World War II as grain in straw for Army mules and now posing a fire hazard in all but wet jungles - difficult to control biologically because of the potential danger of the parasite transferring to sugarcane; Bulbostylis capillaris in stramineous tufts in cinders about the Kau Desert; Hedychium coronarium, H. flavescens and H. gardnerianum spreading rapidly from Park and concessioner buildings to smother endemic herbs; Arundo bambusifolia in grassy and dry areas; Myrica faya, purposely introduced by foresters, remaining in small numbers in 1977 after heroic eradication work in forests and burned areas; Polygonum chinense along roadsides a distinct danger with its red leaves and pink flowers when it spreads into the Kau Desert to brighten the black lava unnaturally; Anemone hupehensis replacing silvery Astelia colonies as soon as these are destroyed by feral pigs; the white-fruited strawberry Fragaria chiloensis var. ananassa, abundant about Kipuka Puaulu and Kipuka Ki, usually misidentified for the endemic red-fruited F. c. var. sandwicensis; Rubus penetrans, R. rosifolius and the truly vicious R. ellipticus, being partially controlled biologically with some resulting injury to the endemic species; Abrus precatorius with its deadly bean about Wahaula; Fuchsia magellanica, beautifully festooning trees where the endemic Stenogyne calaminthoides used to thrive, about Thurston Lava Tube, and creating thickets strangling endemics; Nasturtium majus s. l., in Kipuka Puaulu; Raimannia along roads especially about Kilauea Crater and the Mauna Loa Strip; Eucalyptus where the endemic koa should tower; Heterocentron subtriplinervium near Kilauea-Iki; Linociera introduced into the old Ainahou Ranch area by the late Herbert Shipman who saved the endemic goose from extinction; Buddleja asiatica s. l., a pioneer on lava flows and persistent elsewhere so numerous that it requires biological control in spite of potential injury to some cultigens of the genus; Conyza along roads and drier localities requiring biological control as does its relative Pluchea odorata of somewhat more favorable areas; as well as others. Such weeds need eradication before time, effor and funds are expended in trying to justify the eradication of questionable taxa of the endemic genus Hibiscadelphus. The present administration, well aware of priorities, is engaging the services beginning March 1977 of the Plant Ecologist and Pathologist Dr. Donald Gardner. Had plants developed a nervous system, these noxious weeds would be trembling at their

ics are overrunning the National Park and feral pigs are causing havoc because of insufficient personnel, H. hualalaiensis should be the lowest taxon on the totem pole to be removed from National Park lands. The gene pool should be preserved for later and probably wiser generations. What the decision will be, no one now knows.

The stately H. giffardianus in Kipuka Ki flowers and fruits profusely, the abundant seed, we noted one early morning being avidly gathered by a feral pheasant. The seeds germinate readily under the tree in the leaf mold along and actually on the road. This one plant from which the Degener trees and the nursery stock grown at the Park originated, bears the metal tag No. KK-HX-1. In spite of our widely expressed conviction to colleagues and others regarding the tree in question being H. giffardianus, some individuals consider it a hybri between this species and H. hualalaiensis. Believing it a hybrid, they proposed it be felled as not worthy of existence in the Park. A lecture about the problem presented at the Hawaii Field Research Center at the Park in August 1976 did not change our views. Not only that; but letters, we have learned, have been sent to World Arboreta and Herbaria stating that the Degener identifications are faulty and their distributed specimens, being hybrids, should be destroyed.

Worried about the future of this remarkable genus, we casually wrote Dr. Powers, now retired and residing on Oahu, about the possible fate of the tree we so admired. Not realizing that he had remained at the National Park long after the kane's departure, we were dumbfounded by his answering letter postmarked December 6, 1976. It reads, in part:

"The seedling I gave you of the Hibiscadelphus Giffardianus was dug up from under the tree that Don Reeser is talking about. - - - I recently heard first hand from Jim Tobin, retired Park Service, that he had been a buck ranger assigned to Hawaii National Park in his early days [1942 onward]. The tree that you describe on page 211 - - - was still alive in Herbert Shipman's pasture just over the fence from the Park land. Young Jim had apparently learned about the fact that the tree was the only representative in the world, so he and a sympathetic companion would make forays across the fence to collect seeds (and I think he said take cuttings also) and propagated the Giffardianus. The two trees in Kipuka Ki are from Tobin's activities. They must be pure. There is also a planting of two or three H. Hualalaiensis in Kipuka Ki, below the road makai [oceanward] of the two H. Giffardianus - more than a hundred meters down slope as I remember - - -. They certainly weren't there when the pedigree of the H. Giffardianus specimens in Ki was determined." Dr. Powers then questions how fertilization in the genus takes place: "- - - what kind of bird or insect or wind power would move pollen from the H. Hualalai up to the H. Giffardianus? I don't know, so I can't say whether your H. Giffardianus is a hybrid or a 'pure' specimen." We Degeners likewise do not know if this maturing seedling is pure until it flowers, as we do not know the parentage of the pollen.

According to retired Forester Lester W. Bryan's records of April

Plate 5. J.F. Rock planting H. giffardianus.
(L.W. Bryan photo Sept. 1, 1940.)

1946 "The tree found by Rock in 1911 was then in poor condition, and within a few years, it finally succumbed. - - - Sometime after the discovery of the original tree, Mr. Giffard collected seeds and grew them at his mountain home near the Volcano Road at 29 Miles - - -. From this tree, cuttings were taken; one of which rooted and grew. After it became well established, it was taken up and in September 1940, transplanted inside a fenced area in the Shipman 'Keauhou Ranch.' where it is still growing today.

"Of interest is the fact that in September of 1940 when this tree was ready for transplanting, Prof. Joseph F. Rock, who originally discovered and named this tree was visiting here in Hawaii and had the pleasure of preparing the hole and transplanting the descendant of the parent tree which he had discovered nearly 30 tears before." (Plate 5.)

Retired Entomologist Cliften J. Davis, a Park Ranger in his youth, independently gave us essentially the same general information as did Powers and Bryan; in addition to explaining how he and others about 1940 propagated the species by seed and cuttings. These were planted out in various places in the Islands and on the Mainland. How many of these trees or their offspring survive today, we do not know.

Because of the statute of limitations regarding the fortunate act by two "buck rangers" of trespassing about twenty five years ago to air layer a remarkable species on the verge of extinction, we here add a few paragraphs from a letter dated February 11, 1977:

"Dear Dr. Degener:

Your letter of February 2 is most welcome. - - - As to my recollections of the Hibiscadelphus giffardianus, they are very clear as to how but not as to when we made the air layerings. The operation was carried out by Vernon R. 'Ross' Bender and myself sometime during the 1951-52 era. We slipped over to Keauhu Ranch under cover of darkness, made slanted cuts about two-thirds through a stem, inserted a toothpick or similarly sized sliver of wood in the cut and then wrapped the whole thing in a plastic bandage that contained wetted sphagnum moss. Ever so often thereafter we would return, check the 'bandage' for moisture, wet it a little if needed, and check for roots. When the layering showed roots of an inch or so we cut the rooted stem free, took it to the National Park Service greenhouse, potted it, and gave it regular care. There were several such cuttings (2 to 3 to perhaps 6) taken in a span of about one year. I am not certain they all lived.

"Ross Bender is now retired and lives at 43390 Alta Acres Drive, Three Rivers, California 93271. He may have notes from that time as he supervised the nursery and kept some records on the various plants we were trying to propagate.

"Later, perhaps during 1952-53, Elroy Bohlin took over the nursery project and I think he too worked with Hibiscadelphus giffardianus. By then relations between the NPS and ranch management had improved and surreptitious snitching of cuttings became unneces-

Hibiscadelphus giffardianus, Shipman Keauhou Ranch, June 1960. (L.W. Bryan photo)

sary. Bohlin lives at 7822 N.E. Point No Point Road, Hansville, Washington 98340.

"I certainly hope these clues are helpful. At the time Ross and I made the cuttings I understood the Keahou specimen was the last known. Incidentally I remember setting out rooted cuttings in Kipuka Puaulu and on the Mauna Loa Strip road. These were enclosed with hog wire and I regularly carried water to them in 5 gallon back pump tanks during dry spells.

[Signed] Daniel J. Tobin, Jr.
Superintendent
[Mount Rainier National Park]"

We are convinced tree No. KK-HX-1 originated from a self-fertilized seed of the type tree. The tree certainly resembles the type plant as the kane remembers it in Kipuka Puaulu; its flowering twigs resemble it in Kipuka Puaulu; its flowering twigs match Plate 58; and all seedlings, none of which have yet flowered as it takes the tree years to mature, are uniform in the vegetative state and resemble the species. None, as expected in a hybrid, show a dual ancestry. Furthermore, this venerable tree was growing in Kipuka Ki over a decade before the introduction of H. hualalaiensis to the Park from the latter's home at Puu Waawaa about fifty miles distant as the crow flies. It would be fantastic had it arisen by cross-fertilization from pollen coming from such a distance.

In summary, whether hybrids exist in the Park, whether some will be developed by artificial pollination or whether the two species of Hibiscadelphus are a bit confusing because of the occurrence of annectent forms (as in Santalum paniculatum H. & A., and S. pilgeri Rock

likewise growing about Kipuka Puaulu and Puu Waawaa respectively), we consider this old tree to be pure H. giffardianus.

The chronology of events begins with Rock's discovery of the type tree of Hibiscadelphus giffardianus in 1911 in Kipuka Puaulu. As no other tree of the species existed in the World nor even a plant of H. hualalaiensis Rock grew nearer than about fifty miles, seeds produced must have been the result of self-pollination and hence self-fertilization. A tree grown from such seed, and hence F_1 generation, was planted in Giffard's garden. A cutting from the resulting tree, and thus still F_1, was planted by Rock at Keauhou Ranch. Two rangers, making air layers of it, planted one of these along the Mauna Loa Strip Road in Kipuka Ki. This resulting tree, now forty feet tall, is F_1 or, more simply stated, a seedling and direct descendant of the type tree.

The binomial "HIBISCADELPHUS X PUAKUAHIWI K. Baker and S. Allen, Hybrid novum," in Phytologia 33(4):276. 1976 and represented by tree No. KK-HX-1 must be rejected. The name is a synonym of Hibiscadelphus giffardianus Rock in Haw. Bd. Agric. & Forestry Bull. 1:10, pl. 4. 1911.

We are convinced the forty foot tree marked Number KK-HX-1 must not be felled. Arn't you?

BOOK REVIEWS

Alma L. Moldenke

"BOTANY OF THE BLACK AMERICANS" by William Ed Grimé, xii & 230 pp., illus., Scholarly Press, Inc., St. Clair Shores, Michigan 48080. 1976. $15.00.

The television serialization of Haley's book "Roots", especially in the United States, provides an opportune increased awareness of slaves and slavery in the Americas from their inception in 1502 through the abolition of slavery in 1865. Such recent publicity should fortunately enlarge the readers' market for Grimé's book. For many years this author has been collecting data concerning plants which were employed by the Negro slaves either as a source of sustenance or for clothing, medicine, and pleasure, including 15 introduced by the slaves from Africa and about 230 already adventive or indigenous here. For each are given the scientific name, important scientific synonymy, common names, quotations from sources or translations of those not originally in English indicating uses, thus producing this highly valuable compendium of botanical and cultural information.

From Quassia amara L. a Negro 'servant' in Surinam developed a successful antipyretic against the bad fevers of his fellow slaves and/or 'servants'. His name was Quassi. Dr. Ed S. Ayensu, in the preface, mentions that Quassi probably came from his native land of Ghana where every male born on a Sunday is assigned the name Kwesi, an obvious variant of the same name. This book is dedicated to this man's memory in recognition of his therapeutic skills.

It is a pity that spelling "variations" for the same word appear in this book, exclusive of use in direct quotations: Scholarly Press loses an "l" in turning from the front to the back of the title page. Linnaeus loses the "a" that appears in the dedication in the bibliography and on p. 420, the persimmon species acquires an ungainly extra "i", Catesby loses its "e" in a few places, Clusia appears with "e" substituted for the "i" intentionally or accidentally. The species name for the yellow yam is misspelled. The attractive and informative advertising flier for the book uses the binomial Sorghum saccharatum, but the text reduces it into synonymy under the trinomial Sorghum vulgare var. saccharatum (L.) Boerl. Assuredly this book will have many readers other than those acquainted with taxonomic botany especially in the field of black studies in many schools at many levels. It is the first to appear in the Library of the Black Americans series, to be followed by others on medicine, legends, clothing and music.

"SEEDS AND FRUITS OF PLANTS OF EASTERN CANADA AND NORTHEASTERN UNITED STATES" by Frederick Howard Montgomery, xi & 232 pp., illus., University of Toronto Press, Toronto, Ontario, Canada M5S1A6 & Buffalo, N. Y. 14203. 1977. $25.00.

For "about 1100 species of native wild and introduced weedy plants from some 118 families" the seeds and seed-like structures are illustrated in clear black/white photographs often magnified up to 30x, described according to set criteria for shape, size, surface, etc. along with their scientific and common names. The Systematics Association Committee of the International Association for Plant Taxonomy developed the chart of symmetric plane figures to describe, measure and express mathematically and as uniformly as possible features by which unidentified seeds may be keyed out.

This is an excellent innovative work, very carefully prepared and presented. It will prove helpful to taxonomists, ecologists studying bog formations, seed analysts, archeologists analysing ancient remains, and others.

"SACRED NARCOTIC PLANTS OF THE NEW WORLD INDIANS - An Anthology of Texts from the Sixteenth Century to Date" compiled by Hedwig Schlieffer, 156 pp., illus., Hafner Press A Division of Macmillan Publishing Co., London, New York, N. Y. 10022. 1973. $5.95 paperbound.

This book reads almost like a very interesting text but it is composed only of a series of quotations from reliable sources. Richard Evans Schultes mentions that the use of narcotics is always somehow connected with escape from reality, that all narcotic plants have sometime been linked to religion and/or magic, and that when serious physical and/or psychological problems arise they develop only after the narcotics have passed from ceremonial to purely hedonic or recreational use as plagues many of today's young people.

Ingenious ways of administration of these plant narcotics vary from chewing, decoctions, infusions, licked or smeared thick syrups on tongue or gums, all forms of smoking and fume inhalation, snuffing, ointments on skin or membranes, and even as an enema.

The New World plants producing narcotics include Wasson's divine mushroom in the Agaricaceae, peyote, achuma, and San Pedro in the Cactaceae, ololiuhqui and tlitlitlzen in the Convolvulaceae, coca in the Erythroxylaceae, cohoba, yupa, paricá, yurema, etc. in the Leguminosae (s.l.), caapi, yajé and natéma in the Malpighiaceae, hakudufha, epéna, and nyakwana in the Myristicaceae, tlápatl, chamico, borrachero, tabaco, maikoa, latua, etc., in the Solanaceae.

There are valuable descriptions and detailed sources of refer-

ence for botanists of many persuasions, pharmacologists, ethnologists, psychologists, etc.

"GEOGRAPHIE FLORISTIQUE DU QUÉBEC-LABRADOR. Distribution des Principales Espèces Vasculaires" by Camille Rousseau, xiii & 799 pp., illus., Les Presses de l'Université Laval, Cité Universitaire, Québec GIK 7R4 & International Scholarly Book Services, Inc., Portland, Oregon 97208. 1974. $30.00.

This wonderfully rich storehouse of effectively arranged information is published as Volume 7 of the "Travaux et Documents du Centre d'Étude Nordiques". The Foreword is presented by the well-known Dr. Bernard Boivin under whose aegis Dr. C. Rousseau trained. Collating and verifying material in local floras, in local and major herbaria, and in the phytogeographic literature, preparing a very neat precise text with full references, indexing, and 1016 distribution maps for the plants treated in the text results in this excellent study which will be of great value to so many different advanced students, scientists and technicians in such fields as phytogeography, ecology, taxonomic and systematic botany, distributional map making, etc.

The Québec-Labrador area encompasses nine bioclimatic zones equivalent to (1) arctic tundra, (2) hemiarctic boreal sparsely forested tundra, (3) subarctic taiga, (4) and (5) colder temperate coniferous (spruce) forests, and (6), (7), (8), & (9) warmer temperate broadleaved deciduous forests. Emphasis is given to which of the plants are circumboreal, very limited locally, spread either northerly or southerly along Laurentian and Appalachian high ridges, or have followed early Amerinds or modern man in their respective explorations and/or expansions.

"UMBELLIFERAE" by Mildred E. Mathias and Lincoln Constance, Volume 5 of "FLORA OF ECUADOR" edited by Gunnar Harling & Bengt Sparre, 72 pp., illus., Swedish Natural Science Research Council, Stockholm S-10435. 1976. 50 Skr. [=ca. $12.00] paperbound.

This volume of the "Flora of Ecuador" is most carefully prepared by American authors both well known for their full professional botanical careers.

This botanical family in Ecuador is represented by 23 genera, 61 species and 4 varieties, some of which are shown on 5 plates with detailed drawings. The circum-australly distributed Hydrocotyle, with 16 of its ca. 75 species indigenous to or naturalized in Ecuador, is the largest genus of this family there.

The printing is immaculate — a good omen for this series which projects covering the 250 Ecuadorian vascular plant families.

"EARTH WATCH - Notes on a Restless Planet" by Jean & Daniel Shepard, 238 pp., illus., Doubleday & Co., Garden City, New York 11530. 1973. $8.95.

"The world is still undergoing change under the influence of natural forces as old as time, and of man-made forces in competition with them.....[generating sudden, significant occurrences that] are short-lived and highly valuable as objects of scientific study before they have subsided". The Smithsonian Institution's Center for Short-Lived Phenomena in Cambridge, Mass., has served since 1968 as "an early alert system and clearing house for the reception and dissemination of information on short-lived natural events." The unpredictable phenomena are divided into four categories: earth science, biological science, astrophysical and urgent anthropological events.

With the cooperation of the director and staff of this Smithsonian Center the authors have presented 44 accounts under these topics, written in really interesting accurate journalistic style, which is indeed a fortunate coincidence. There is a 17-page tabulation of the events occurring between 1968 and 1973, a bibliography and 26 color and black/white photographs.

How succinctly the introduction states the survival problem: "To the argument that man is a part of nature must be added the undeniable fact that he is the reasoning part, and therefore accountable. If his demands on earth's resources are so great and his contribution to their replenishment so negligible that he is a liability to both himself and his habitat, there is a remedy. It is the same one which his planet administered in ages past to the great reptiles and other life forms that lacked the ability to sustain themselves in the environment into which they had been born."

"THE CHEMICAL TREATMENT OF COOLING WATER" by James W. McCoy, iv & 237 pp., illus., Chemical Publishing Co. Inc., New York, N.Y. 10003. 1974. $18.50.

"This book has been [well] prepared for the benefit of chemists and engineers charged with the responsibility for selecting and administering water treatment programs, who would [and should] like to improve their understanding of the principles upon which the treatment of cooling water is based." For open recirculating cooling water systems, the principles are reasonably explained, also corrosion, scaling, fouling, microbiological infestations and controls, chemical treatments and analytical methods.

'Tis true that PHYTOLOGIA readers are not engineers ordinarily, but this topic deals with use and abuse of "their" and "our" water supply, the home of organisms of much living and study interest to us.

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A NEW MEMBER OF THE RUBIACEAE FROM PANAMA: GEOPHILA CROATII

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GEOPHILA CROATII Steyermark, sp. nov.

Herbacea serpens, caulibus glabris; stipulis lanceolatis vel late triangularibus subacutis vel acuminatis 3-4 mm. longis 1.5-3 mm. latis glabris; foliis petiolatis, petiolis glabris, eis surculorum sterilium elongatis 4-9 cm. longis uno latere pilosulo excepto, eis surculorum fertilium brevioribus 0.5-2.5 cm. longis; laminis late ovatis vel oblongo-lanceolatis apice acutis vel acuminatis basi cordatis 2.5-6 cm. longis 1.5-4.5 cm. latis ubique glabris pinnatinervatis, nervis lateralibus utroque latere 4-7 ante marginem 1-5 mm. anastomosantibus subtus paullo prominulis; inflorescentiis (4-)7-8-floris capitato-umbellatis pedunculatis, pedunculo glabro sub anthesi 1-2 mm. longo sub fructu 7-13 mm. longo, floribus breviter pedicellatis, pedicellis glabris sub anthesi 0.5-1 mm. longis sub fructu 2-3 mm. longis; bracteis duobus sub inflorescentiis oblongo-lanceolatis inaequaliter 3-lobatis 5-6 mm. longis 2-2.5 mm. latis omnino glabris; bracteis interioribus sub floribus oblongo-lanceolatis vel lanceolatis acutis vel acuminatis 3-4.5 mm. longis 1-1.5 mm. latis glabris integris; calyce hypanthioque 4.5-5.5 mm longo, hypanthio cylindrico-oblongo 2-2.5 mm. longo 1-1.1 mm. lato; calycis lobis 5 lineari-oblanceolatis vel anguste lanceolatis subcaudatis sub anthesi 2.5-3 mm. longis 0.5 mm. latis sub fructu 3.5 mm. longis 0.8-0.9 mm. latis omnino glabris; corolla glabra in alabastro praeter apicem pilis paucis ornatum; fructu ovoideo manifeste angulato 4 mm. longo 3.5 mm. lato glabro. PANAMA: Barro Colorado Island, Canal Zone, Zetek trail, 3 Oct. 1968, Thomas B. Croat 6647 (holotype, MO); same locality, Zetek trail 2280, 22 June 1970, Croat 10989 (paratype, MO).

This taxon is most closely related to G. gracilis (R. & P.) DC., with which it was recently confused by Dr. Louis O. Williams (Phytologia 26: 263. 1973). From that species, known only from Peru, Bolivia, and Brazil, it is distinguished by the glabrous upper leaf surface and longer calyx lobes. From G. macropoda (R. & P.) DC. it differs in the glabrous, much shorter peduncles, acute to acuminate stipules and leaf apex, glabrous outer surface of floral bracts, non-ciliate calyx-lobes, completely glabrous nerves

of the lower leaf surface, and the abundant cystoliths on the lower leaf surface.

An English description and further discussion will be provided in the Flora of Panama (John D. Dwyer) and the Flora of Barro Colorado Island (Thomas B. Croat). Both of these publications are expected in 1977 or 1978.

This publication was prepared with assistance from National Science Foundation Grant #DEB72-02441 A05, Thomas B. Croat, Principal Investigator.

A NEW MISTLETOE FROM THE CAYMAN ISLANDS

George R. Proctor
Institute of Jamaica
Kingston, Jamaica, W.I.

Recent exploration on the island of Little Cayman has revealed the presence of a species of *Dendropemon*, a genus hitherto not known to occur in the Cayman Islands.

Dendropemon caymanensis Proctor, sp. nov.

Caules usque 20 cm. longi, supra basin usque 2 mm. crassi, teretes, cinerascentes, ramosi; rami superne plus v. minus compressi glabri laeves, internodiis 0.7 - 1.5 cm. longis. Folia 1 - 1.5 mm. longe petiolata, oblonga usque oblanceolato-oblonga, inferne sensim in petiolum angustata, antice subacuta, apiculata, 0.5 - 2.5 cm. longa, 3 - 10 mm. lata, nervo medio praesertim subtus prominente, lateralibus paucis, prominulis v. obsoletis, margine plano integra, subcoriacea. Inflorescentiae 1.5 - 4.5 mm. longe pedunculatae, ipsae plerumque usque 1 cm. longae, rigidulae, 4-8 florae, glabrae, laeves; rhachis plus v. minus compressa; pedicelli 0.5 - 1 mm. longi; bracteola laevia, apice libera breviter triangularia. Calycodium truncatum. Alabastra oblonga obtusiuscula. Tepala ligulata c. 1.8 mm. longa, 0.5 - 0.6 mm. lata. Stamina non vidi. Stylus 0.9 - 1.1 mm. longus, stigmate subcapitato. Baccae obovoidae usque 5.5 mm. longae atropurpureae.

TYPE: Little Cayman, 0.5 km. west of Sparrowhawk Hill, parasitic on *Capparis cynophallophora*, collected August 11, 1975, *Proctor 35215*. The holotype is a unicate sheet deposited at the Institute of Jamaica (IJ). This species is known so far only from the type collection.

In its complete absence of indument this plant resembles *D. purpureus* (L.) Krug & Urban of the Bahamas, Cuba, Hispaniola, and Puerto Rico, the doubtful species *D. brevipes* Britton of the Bahamas, and also the rare and little-known *D. platypus* Urban of Cuba and *D. rigidus* Urban & Ekman of the Dominican Republic. However, it differs from all of these by the much smaller dimensions of all its parts.

I wish to express my thanks to Dr. David Stoddart and his colleagues of the Royal Society Expedition, and to Dr. Marco Giglioli of the Cayman Islands Mosquito Research and Control Unit, for the opportunity of collecting on Little Cayman during the summer of 1975.

Keys to the Flora of Florida -- 1, Introduction

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Perhaps 3,500 species of vascular plant are native, adventive, or naturalized from cultivation in the state of Florida. This flora is not equalled in richness by that of any other area in the eastern United States and is exceeded north of Mexico only by California and Texas. It is further distinguished by the presence of many tropical species that nowhere else reach the United States, and by a large number -- about 10% of the entire flora -- of endemics, plants that are found only within the limits of the state.

One long-standing objective of the Herbarium of the University of Florida has been the preparation of a single treatment that will bring together the information that presently exists on the vascular plants of Florida. Part of this information has been published, but is scattered and often in obscure and relatively inaccessible journals. Far more information exists in the form of herbarium materials and their accompanying data, and as communications from botanical investigators with expertise in some facet of the Florida flora; these sources are even less accessible.

The magnitude of this objective requires that a significant period of time passes before the task is completed. It is desirable that portions be made available in advance of completion of the entire study. A series of papers in the journal CASTANEA, under the title "Contributions to the Flora of Florida," was begun in 1963 and is being continued on an accelerated schedule; the format of these papers permits extended discussion of nomenclature and distribution (including Florida county-record maps), as well as morphology, but because of its inherent limits must be restricted to genera of exceptional interest or complexity. An additional interim outlet is needed, and will be met by a series of concise articles in PHYTOLOGIA under the above title, "Keys to the Flora of Florida,"

Amplified Key Format

The format to be used in the present series of articles is that sometimes known as the "amplified key" in which the basic morphological framework of a conventional dichotomous key is supplemented by data on habitat, frequency, and range. Exemplary floras that have utilized this format are G. N. Jones' Flora of Illinois (Univ. of Notre Dame Press, 3rd ed. 1963) and C. A.

Backer's compendious Flora of Java (Noordhoff, 1963, '65, '68). With the embellishment of illustrations, this is the structure of C. L. Hitchcock & A. Cronquist's Flora of the Pacific Northwest (Univ. of Washington Press, 1973).

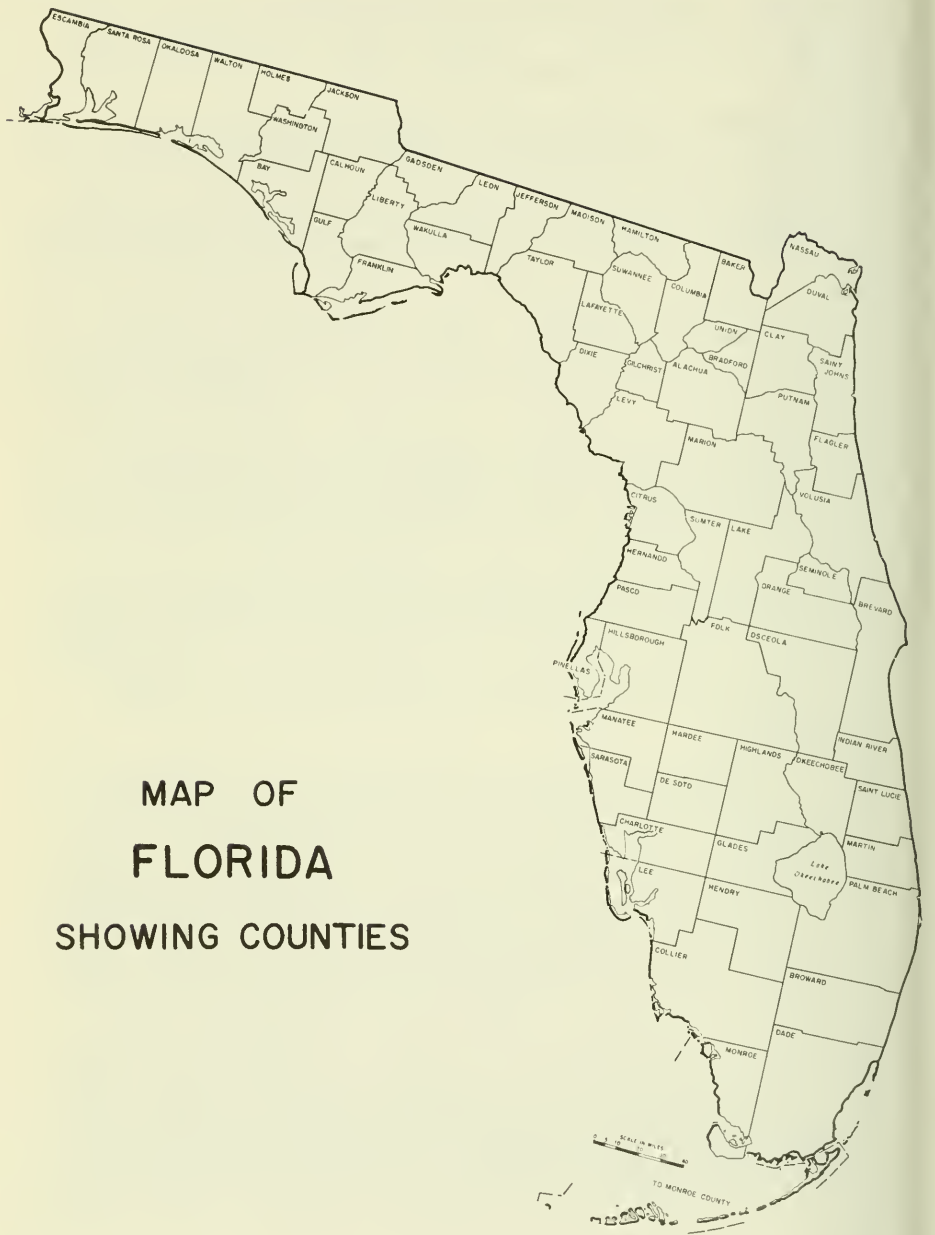
Examples of keys written in this amplified format have been available to professional and advanced botanists in Florida since 1965 as inclusions in the "Florida Flora Newsletter," an irregular and rather informal communication from the Herbarium of the University of Florida. The availability of these sample keys has encouraged suggestions from their users and has led to an expansion in the amount and type of information contained in the keys.

The present design of the amplified keys permits much supplementary information to be incorporated into their structure. Whenever the information permits, two or more discriminating characters are used in each couplet and are arranged, insofar as practicable, in a sequence of descending diagnostic power. In the final lead -- that line of a couplet describing a named taxon -- additional morphological information is usually given -- habit, flower color, etc. -- that, although not fully contrasting with the alternate lead of the couplet, is nevertheless of value in conveying a fuller image of the named plant.

In the final lead the morphological information is followed by statements as to frequency of the plant, its habitat, and its Florida range. Although these data are not to be thought of as part of the key structure, and no identifications should be made on their evidence alone, they nevertheless provide a supplemental confirmation of a judgment based on morphological grounds.

Frequency

Estimates of frequency are subjective. In the author's experience, scales that purport to convey numerical degrees of frequency are difficult to apply to field populations and are deceptive if based on number of collections. *Cirsium* or *Opuntia*, or for that matter *Sabal palmetto*, are inherently less amenable to herbarium documentation then easily collected, easily pressed genera. In the present keys the terms of frequency most often used are "rare," "infrequent," "frequent," and "common." Other terms or phrases are substituted where deemed more descriptive of the true pattern of distribution. In general, the overall abundance of the plant within the state is the factor most heavily influencing the choice of the term describing frequency. Thus, a plant restricted to a habitat of limited extent, as the tropical hammocks, would be unlikely to be called "common" even if ubiquitous within its habitat. Similarly, a plant of solitary proclivities, but generally to be found in stands of the very extensive pine flatwoods, would not be called "rare."



MAP OF

FLORIDA

SHOWING COUNTIES

Distribution

Except in unusual circumstances, distribution given within these keys will be restricted to the known range in Florida. No acknowledgment will be made of a broader range, although except in the case of endemics, such may be presumed to occur. Queries as to extraterritorial distribution are believed better addressed to other literature.

Within Florida, common use will be made of county-record distributional information, although often supplemental data will be provided as to towns, lakes, and other physical features. This information will usually be generalized by reference to the Panhandle or the Peninsula, the two major areas into which the state may be divided. The 67 Florida counties are portrayed on the accompanying figure.

Endemics

A special fascination exists for the plants known as endemics, those species restricted to a particular and usually narrow range. Florida is remarkable in being a state with an unusually large percentage of such plants. Perhaps as many as 10% of the vascular plants found in Florida are to be found only within the confines of the state, or with minor extensions beyond its political perimeter. No other state east of the Mississippi River appears to have more than 1 or 2% endemism, and in the West only California clearly exceeds the Florida figure.

Three studies are outstanding in the analysis of Florida endemics: R. M. Harper, A preliminary list of the endemic flowering plants of Florida. Quart. Jour. Florida Acad. Sci. 11:25-35, 39-57. 1949. 12:1-19. 1950; W. T. Neill, Historical biogeography of present-day Florida. Bull. Florida State Mus. 2:175-220. 1957; C. W. James, Endemism in Florida. Brittonia 13:225-244. 1961.

Notwithstanding these pioneer compilational and analytical efforts, the endemics of Florida are yet inadequately known as to their distribution and origin. Indeed, one of the major distributional patterns of Florida plant endemism was not recognized by the above authors. This is the proliferation of species within *Chrysopsis*, *Hypericum*, *Pinguicula*, among other genera, in the low country of the Florida panhandle coast. Endemism on the Apalachicola River bluffs, with *Torreya*, *Taxus*, *Croomia*, and other relics of great age, and endemism of species confined to or spreading from the "Orange Island" archipelago of south-central peninsula Florida, a Pleistocene interglacial-flooding refugium, are relatively better understood.

In the present keys, a taxon endemic to Florida (or with inconsequential range extensions beyond) will be so marked, with

the purpose of aiding the study and the preservation of these unique plants.

Plant Association

The wealth of permutations of soil and moisture and other edaphic factors, together with the stressful climatic conditions produced by the freeze line falling within the state, has yielded in Florida a large number of environmental situations characterized by particular combinations of plants. From the earliest days, when "hammock" became an accepted term for the partly evergreen but broadleaf Florida forests, to more recent intensive investigations of the energetics of the bountiful Florida springs, many of the plant associations of this state have attracted admiration and close study. The recognition of these associations is a critical part of Florida taxonomy, for the distribution and even the evolution of species is intimately involved with the other plants with which they grow. The names of these associations thus become much used in these keys, as a means of better characterizing the species described.

Yet the plant associations of Florida have not been placed in a stable and widely accepted hierarchical system. Terms such as "scrub," properly restricted to associations on wind-blown sands, usually with *Pinus clausa, Ceratiola ericoides, Quercus myrtifolia,* etc., are loosely applied to cut-over *Quercus laevis* stands. These latter, with the *Pinus palustris* which dominates them unless removed by cutting, are better known as "high pine" or "sand hill communities" and are on slightly heavier water-deposited sandy soils of greater age. "Bay heads," "spring heads," "galls" and "hells" of one form or another are widely recognized by the older residents of Florida, but their parameters are as variable as their observers.

Although other local analyses of vegetation types are available, three widely separated studies perhaps deserve mention: F. C. Craighead, The Trees of South Florida, Univ. of Miami Press. 1971; A. M. Laessle, The communities of the Welaka area. Univ. of Fla. Biol. Sci. Ser. vol. 4, no. 1. 1942; D. B. Ward (assisted by R. R. Smith), Ecological records on Eglin AFB Reservation, the second year. Air Force Armament Lab. Tech. Rep. AFATL-TR-68-147. 1968. A most excellent descriptive account of the state, written largely before the heavy impact of recent development, is provided by R. M. Harper: Geography and Vegetation of Northern Florida. Florida Geol. Survey, 6th ann. rep't. 1915. 289 pp.; Geography of Central Florida. Florida Geol. Survey, 13th ann. rep't. 1921. 237 pp.; Natural Resources of Southern Florida. Florida Geol. Survey, 18th ann. rep't. 1927. 180 pp.

But the only approach to comprehensive coverage of the state's plant associations has been by Dr. J. H. Davis. The following enumeration is a useful summation, as modified from Davis's General Map of Natural Vegetation of Florida (Florida Agric. Exp. Sta. Circ. S-178. 1967). Each association is ranked in the descending order of its geographic extent in Florida, with the percent coverage as mapped by Davis, without regard for the often significant modifications induced by man.

1. Pine Flatwoods (34.3%). Extensive level ancient sea bottoms, poorly drained and seasonally very wet, usually dominated by slash pine (*Pinus elliottii*), with a dense understory of saw palmetto (*Serenoa repens*), shrubs, small trees, and numerous herbs.

2. High Pine (19.3%). The longleaf pine - turkey oak (*Pinus palustris* - *Quercus laevis*) stands of well drained uplands, usually open and with a ground cover of wiregrass (*Aristida stricta*) and other fire-tolerant herbaceous species.

3. Saw Grass Marshes (8.0%). Extensive stands of saw-grass (*Cladium jamaicense*) with other herbs and occasional islands of shrubs and small trees, on seasonally flooded marl soils.

4. Hardwood Swamp Forests (7.4%). Bays, gums, and other trees in wet soil of stream and river banks and small depressions.

5. Grasslands (5.9%). Wet prairies on seasonally flooded lowlands, or dry prairies if seldom flooded.

6. Mixed Hardwoods and Pine Forests (5.5%). Mostly on uplands of clay soils in northwestern Florida.

7. Hardwood Hammocks (4.5%). Broadleaf and largely evergreen forests on rich upland soils.

8. Sand Pine Scrub (2.8%). Excessively drained deep sands of wind deposit, with sand pine (*Pinus clausa*), rose-mary (*Ceratiola ericoides*), several scrub oaks, and many endemics.

9. Lakes and Ponds (2.3%). Non-saline bodies of water, varying greatly in size, the largest being Lake Okeechobee, with abundant aquatic plants.

10. Coastal Strand (1.8%). A zoned vegetation on sand dunes or rock, composed of salt-tolerant pioneer herbs and shrubs near the shore, with scrub and forest zones more to the interior.

11. Mangrove Swamp Forests (1.7%). Coastal areas in southern Florida dominated by red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and buttonwood (*Conocar-pus erectus*).

12. Scrub Cypress (1.3%). Open stands of stunted cypress on rock or marl soils in southern Florida.

13. Coastal Marshes (1.2%). Periodically flooded stands predominately of black rush (*Juncus roemerianus*), on sea shores and at river mouths.

14. Freshwater Marshes (1.1%). Mixed marshes with many kinds of herbs and shrubs, along streams, on lake shores, and in shallow depressions.

15. Southern Slash Pine Forests (1.1%). Open woodlands of the South Florida variety of slash pine, mostly on rocklands, with an understory containing species of tropical origin.

16. Cypress Swamps (1.1%). Depressions and lake and stream margins dominated by often majestic bald cypress (*Taxodium distichum*).

17. Cabbage Palm Groves. Forests of abundant cabbage palms (*Sabal palmetto*) either inland or coastal.

18. Tropical Hammocks. Dense evergreen forests composed largely of tropical species, bearing many epiphytes.

19. Springs and Spring Runs. Clear constant-flowing springs, the bottoms of the runs densely covered with eelgrass (*Vallisneria neo-tropicalis*), tape-grass (*Sagittaria kurziana*), and other aquatic species.

Dates of Flowering

Florida, with an average frost-risk season of 0 days in the southern Peninsula and 118 days in the northern Panhandle, is exceptionally varied with respect to climate. The dates when a species is in anthesis often differ significantly in different parts of its range, and the limits of this flowering date are frequently broader in more southern populations. Commonly in Florida species of tropical origin, flowering is continuous throughout the year, with flushes of bloom correlated more closely with rainfall than with mean temperature. Such traits greatly reduce the utility of statements as to dates of flowering, at least relative to a climatically homogeneous northern area.

Yet flowering seasons in Florida are not to be thought of as absent. In the Panhandle and northern Peninsula species follow one upon the other in a predictable seasonal pattern. Even in the southern Peninsula, the probability that a given species will be found flowering abundantly in a particular season is greater than in another season, and collections as well as observations reflect this periodicity. It thus seems worthwhile to record in the present key the months when flowering is commonly observed, with the understanding that a degree of

judgment and possible error is involved in the exclusion of flowering dates that are believed atypical or otherwise outside the main season of bloom.

Common Names

Vernacular names will be provided for each species where such names are available and appropriate. This is an area where whimsy is of greater importance than logic, and where efforts at standardization come into conflict with stubborn non-botanist users of plant common names. There clearly are many more plants of interest or utility than there are distinct common names, and many common names are used in more than one context. Although it is unsettling to the professional botanist to hear the iridaceous *Sphenostigma coelestinum* referred to by Florida country folk as "violets" or "morning-glories," *Hypericum fasciculatum* called "golden-rod," or the red-and-black-seeded leguminous *Abrus precatorius* termed "black-eyed-susans," it is perhaps worth remembering that common names are, or should be, of "common" origin, and that consistency, lack of homonymy, and even good taste are merely goals to be striven for, not dogma to be achieved by imposition of autocratic common-name rules. To that end, the common names used in the present keys are selected to be appropriate and distinctive if possible, and to be intelligible to non-professional Florida users, insofar as those two often-conflicting objectives will allow.

Prefatory Comments

Each key of this series is accompanied, to whatever extent seems appropriate, by a prefatory discussion designed to include material that even the flexible format of these keys cannot encompass. Such matters as nomenclatural commentaries, ancillary historical details, and justifications for the taxonomic judgments employed in the accompanying keys, are placed here. New names and new combinations are given formal treatment here, providing them with nomenclatural legitimacy.

Standardization of the rank to which taxa are assigned will be attempted. Taxa treated as species will show, insofar as seems practical, a greater degree of difference from one another than those seen as subspecies; those taxa assigned to the status of variety will be yet less well defined. Such a goal is recognized to be a will-o'-the-wisp, but the objective appears worthy even though full implementation is unattainable. Accordingly, depending on the judgment of the author or authors, and tempered by experience in other Florida genera and species, frequent recourse will be made to unfamiliar taxonomic ranks employing pre-existing and, where other authors have not yet spoken, new combinations. The purported advantage of deleting one or another of these ranks is wholly rejected.

Supporting Herbaria

Any proper floristic treatment is buttressed and documented by specimens deposited in herbaria. Such specimens and their accompanying data make available the knowledge and energies of many collectors over many years and in many geographic area; they permit achievement that far surpasses what could be attained by any individual's personal experience. The present series of keys is very largely dependent upon the resources of the Herbarium of the Agricultural Experiment Station, University of Florida, Gainesville, Florida. In size and thoroughness of coverage this herbarium has provided an excellent substrate from which information could be drawn. Two other Florida herbaria, those of Florida State University, Tallahassee, and the University of South Florida, Tampa, have been used to a lesser extent, yet have provided substantial support in many critical instances. Other herbaria, mostly outside of Florida, have been consulted frequently, particularly where their resources were essential to the solution of a Florida-based problem.

For reasons of brevity, herbaria are conventionally referred to in this work by internationally-employed acronyms (F. A. Stafleu, ed. Index Herbariorum. Utrecht. 1974. pp. 303-354). Those cited most frequently are listed below.

BM	British Museum
BUS	University of Miami, Coral Gables, Florida
F	Field Museum of Natural History, Illinois
FLAS	Agricultural Experiment Station, University of Florida, Gainesville, Florida
FSU	Florida State University, Tallahassee, Florida
GA	University of Georgia, Athens, Georgia
GH	Gray Herbarium, Harvard University, Cambridge, Massachusetts
K	Royal Botanic Gardens, Kew, Great Britain
MO	Missouri Botanical Gardens, St. Louis, Missouri
NY	New York Botanical Gardens, Bronx, New York
US	National Herbarium, Smithsonian Institution, Washington, D.C.
USF	University of South Florida, Tampa, Florida

It should be understood without saying, that a herbarium is not only the product of the many persons who have contributed to its building, but is especially a reflection of its curators. The men and women who curate and staff the herbaria listed above

have contributed immeasurably to each facet of this project, in the ready loan of their specimens, in their generous response by providing answers to innumerable queries, and in their constant and wholehearted support of this work.

Authorship

In a series such as this, dependent upon the support and knowledge of many persons, the authorship of the separate units will vary. Where ever possible, the actual participation of the outside author will be enlisted in writing the unit or in adapting his previous work to the present format. Where this is not feasible, adaptations may be prepared by the staff of the Herbarium of the University of Florida, with appropriate acknowledgments. Authorship of and responsiblity for the entire series, however, resides with the writer of the present unit, and sponsorship is retained by the Florida Agricultural Experiment Station, Gainesville.

This paper is Florida Agricultural Experiment Station Journal Series No. 396.

Keys to the Flora of Florida -- 2, Paronychia (Caryophyllaceae) [1]

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ABSTRACT: A key is given to the 7 species of *Paronychia* (Caryophyllaceae) recognized for Florida. Habitat, distribution, and synonymy are included. *Paronychia baldwinii* (T. & G.) Fenzl in Walp. is seen as consisting of 2 subspecies, with ssp. riparia (Chapm.) Ward given a new status. *Paronychia erecta* (Chapm.) Shinners is treated as of 2 varieties, with var. corymbosa (Small) Ward in a new status. *Paronychia chartacea* Fern. is endemic to central peninsular Florida. Other species are *P. americana* (Nutt.) Fenzl in Walp., *P. herniarioides* (Michx.) Nutt., *P. patula* Shinners and *P. rugelii* (Chapm.) Chapm. *Paronychia fastigiata* (Raf.) Fern. is excluded.

The species here placed in the genus *Paronychia* have been assigned in the past to a plethora of segregate genera. J. K. Small (Manual of the Southeastern Flora, 1933) carried this fragmentation to a point close to its theoretical limit, with several genera represented by a single species. In Florida he recognized *Anychia, Anychiastrum, Gastronychia, Gibbesia, Nyachia, Odontonychia,* and *Siphonychia,* with true *Paronychia* restricted to areas farther north. Two more conservative treatments by E. L. Core (Jour. Elisha Mitchell Sci. Soc. 55:339-345. 1939; Amer. Midl. Nat. 26:369-397. 1941) reduced the Florida species to *Siphonychia* (including *Gibbesia* and *Odontonychia*) and *Paronychia* (containing the remaining segregates). L. H. Shinners (Sida 1:101-103. 1962), completing the final step of these generic reductions, pointed out the superficiality of the differentiating characters, and included *Siphonychia* in the comprehensive genus *Paronychia*.

Two new combinations are necessary, to give appropriate measure of the variability observed in two of the Florida species.

Paronychia baldwinii (T. & G.) Fenzl in Walp.

ssp. riparia (Chapm.) Ward, comb. & stat. nov.

Basionym: Paronychia riparia A. W. Chapman, Flora of the Southern United States, 2nd ed., 607. 1883.

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[1] This paper is Florida Agricultural Experiment Station Journal Series No. 397.

Paronychia baldwinii is best known as a delicate annual with strongly ribbed, marginally and dorsally ciliate sepals, that appears in woodland clearings, on river banks, or as an ephemeral weed in cultivated fields. Occasionally plants are encountered that are deep taprooted perennials with glabrous sepals, and both Chapman and Core considered these to constitute a related species, *P. riparia*. Although Shinners rejected even varietal recognition of this second form with the statement, "pubescence varies quite independently of apparent duration," this is definitely not the case in the specimens available for the present study. A map of *P. riparia* provided by Core shows an arc of stations from the Apalachicola area of western Florida, north and eastward through Georgia. This distributional pattern is similar to that of certain other southeastern taxa (e.g., *Helianthemum rosmarinifolium, Uvularia floridana*) and corresponds to a belt of sandy soils above 200 ft. elevation. *Paronychia baldwinii* is more widespread and is largely on the younger Coastal Plain soils. It is possible that the glabrous perennial known as *P. riparia* represents an old biotype from which the more vigorous and pubescent annual *P. baldwinii* has been derived. The magnitude and biological significances of these differences are more than varietal.

Paronychia erecta (Chapm.) Shinners

var. corymbosa (Small) Ward, comb. & stat. nov.

Basionym: Siphonychia corymbosa J. K. Small, Bull. Torrey Bot. Club 24:337. 1897.

Paronychia erecta is a species with variable pubescence. Small and Core formalized the differences in stem pubescence with specific epithets, while Shinners saw them as best-unnamed groupings of Mendelian characters. Yet in Florida all specimens examined in this study fell satisfactorily into one of two pubescence-states which have somewhat different ranges and reasonably merit recognition at the varietal level.

In 1933 Small recognized a supposed close relative of *P. erecta* with a bristly-pubescent calyx-tube, as a species under the name *Odontonychia interior*. He based it upon a specimen from along the Suwannee River, Dixie County, Florida. Core later treated this entity as *Siphonychia interior* and assigned it a range from near Lake City, Columbia County, southward to Citrus County. Shinners, without explanation, placed these names in synonymy under *P. rugelii*, a species whose distribution encompasses this range but which is morphologically quite distinct from *P. erecta*. Shinners' disposition of these names seems appropriate, for two of the sheets cited by Core as *S. interior* (Citrus Co.: *Hitchcock 1553* (F); Suwannee Co.: *Hitchcock 1552* (F)) have been examined by Richard Baker (*in litt.*) and have been found to be indistinguishable from *P. rugelii*.

Paronychia Adans. Whitlow-worts

1. Flowers about 0.5 mm. long; sepals deeply hooded at apex, the apical 0.1 mm. white or yellow, sharply delimited from the dark (drying maroon) basal portion; awn absent; small depressed annual; dry open scrub, local; central peninsular Florida (Orange, Polk, Highlands counties), endemic. June - September. [*Nyachia pulvinata* Small; *Paronychia pulvinata* (Small) Pax & Hoffm.]
P. chartacea Fern.

1. Flowers 1 - 2 mm. long; sepals plane or longitudinally inrolled or somewhat hooded at apex, uniformly colored or with indefinite longitudinal striping; awn present near sepal apex, or absent.

2. Sepals ciliate along margins or with pubescence irregularly scattered over back (in *P. baldwinii* ssp. *riparia*, nearly glabrous, but sepals with 3 longitudinal ribs).

3. Sepals not clearly ribbed, lanceolate, tapering uniformly to a terminal awn, rather evenly strigose; small sub-prostrate cushion-plant; dry sand ridges and scrub, local; peninsular Florida, from Gilchrist and Clay counties south to Highlands County. May - July. [*Gastronychia herniarioides* (Michx.) Small]
P. herniarioides (Michx.) Nutt.

3. Sepals strongly 3-ribbed, broadly ovate to oblong, abruptly tapering, with a short stout awn on dorsal surface near apex, coarsely and sparingly pubescent, or glabrous with only occasional cilia along margins; hammocks, river banks, sand dunes, and waste areas, frequent; north Florida, south to mid-peninsula (Polk County). June - September. [*Anychiastrum Baldwinii* (T. & G.) Small; *A. riparium* (Chapm.) Small; *Paronychia riparia* Chapm.]
P. baldwinii (T. & G.) Fenzl in Walp.

4. Annual; sepals pubescent dorsally; stems uniformly recurved-pilose; often a vigorous adventive; range as above.
ssp. baldwinii

4. Perennial, the herbaceous stems spreading from crown of a deep taproot; sepals nearly glabrous, with marginal cilia few or lacking; stems glabrous or pubescent only in longitudinal bands; in Florida apparently restricted to dry woods on bluffs along Apalachicola River, north-central panhandle.
ssp. riparia (Chapm.) Ward

2. Sepals glabrous, or pubescent only at the base, not ribbed.

5. Sepals glabrous to base; awn absent; cespitose perennial with ascending annual stems; coastal dunes, panhandle Florida (Escambia to Wakulla counties). March - November. [*Odontonychia erecta* (Chapm.) Small; *O. corymbosa* (Small) Small; *Siphonychia corymbosa* Small]
P. erecta (Chapm.) Shinners

6. Stems glabrous, often glaucous; range as above.
var. erecta

6. Stems minutely gray-pubescent; range east from Bay County.
var. corymbosa (Small) Ward

5. Sepals densely pubescent on basal portion, glabrous above; awn absent or reduced to a small tooth near apex of sepal.

7. Pubescent area of sepal limited to basal 1/3 or less; sepals narrowed toward apex, terminating in a short dorsal tooth or awn; stem uniformly pubescent with hairs descending.

8. Glabrous portion of sepal more than 1.1 mm. long; stem erect, branching symmetrical and dichotomous (the resulting plant often very square or rectangular); annual; high pineland and dry disturbed soils, frequent in northwest peninsular Florida (Taylor to Alachua counties), occasional south to Highlands County. July - October. [*Siphonychia Rugelii* Chapm.; *Gibbesia Rugelii* (Chapm.) Small; *Odontonychia interior* Small; *Siphonychia interior* (Small) Core]
SAND-SQUARES. P. rugelii (Chapm.) Chapm.

8. Glabrous portion of sepal 0.8 mm. long; stem spreading or ascending, with branching dichotomous but unevenly so; annual or rarely short-lived perennial; scrub, high pineland, and dry disturbed areas, frequent; north Florida, south to Highlands County. July - September. [*Siphonychia diffusa* Chapm.]
P. patula Shinners

7. Pubescent area of sepal nearly 1/2 of entire length; sepals broadly rounded and hooded, often rolled down and inward, the flower thus appearing truncated; awn absent; stem glabrous or one side with curled hairs;

sprawling annual; scrub, coastal dunes, and dry sandy areas, infrequent; peninsular Florida. March - October. [*Siphonychia americana* (Nutt.) T. & G.; *S. pauciflora* Small]

P. americana (Nutt.) Fenzl in Walp.

Excluded Species

P. fastigiata (Raf.) Fern. [*Anychia polygonoides* Raf.] No specimens have been seen from Florida. This northern species was reported for Florida by Core (Amer. Midl. Nat. 26:377. 1941), but no specimens were cited. The only near-by collection cited as *P. fastigiata* (Fishriver Bay, Baldwin Co., Ala.: *Mohr* (F)) is described by Richard Baker (*in litt.*) as appearing to be *P. baldwinii*, a reasonable identification since Core so named another collection (M) from the same location.

NOTES ON NEW AND NOTEWORTHY PLANTS. XCVIII

Harold N. Moldenke

PREMNA MACROPHYLLA var. THAILANDICA Moldenke, var. nov.

Haec varietas a forma typica speciei ramis pedunculisque foliisque densissime pubescentibus recedit.

This variety differs from the typical form of the species in having its stems, peduncles, and both leaf-surfaces very densely velvety-pubescent and the leaves mostly being ternate.

The type of the variety was collected by J. F. Maxwell (no. 76-274) in open glades in the dry dipterocarp forest near Kow Hin Dang Station, Huay Kha Kaeng Reserve, Bahn Rai District, Utaithani Province, Thailand, 15.30' N., 99.15' E., at 200 meters altitude, on April 22, 1976, and is deposited in the Herbarium Jutlandicum at Aarhus University. The collector describes the plant as an erect herb with a woody base, the inflorescence-axes and calyx green, and the corolla greenish, on lip with white hairs.

VITEX BUNGUENSIS Moldenke, sp. nov.

Arbor; ramulis adultis griseis tetragonis subglabratis; foliis decussato-oppositis trifoliolatis petiolatis; petiolis perspicue alatis 2.5—5 cm. longis supra glabris subtus puberulis; foliolis sessilibus chartaceis ellipticis ad apicem attenuatis integris, ad basin acutis vel subacuminatis, utrinque glabris vel subglabrescentibus; inflorescentiis terminalibus paniculatis.

Tree, about 6 m. tall; mature branches gray, more or less tetragonal, glabrous or subglabrescent; leaves decussate-opposite, petiolate, trifoliolate; petioles 2.5—5 cm. long, conspicuously winged to the base or almost to the base, the wings 0.5—1 cm. wide (in all), glabrous and shiny above, puberulent beneath, venose; leaflets 3, sessile, subequal, elliptic, entire, acuminate at the apex, acute or short-acuminate at the base, glabrous and shiny above, glabrate or subglabrescent beneath, venose; inflorescence terminal, paniculate, composed of 3—5 erect or ascending racemes; flowers not seen; fruiting-calyx shallowly cupuliform or patelliform, about 5 mm. wide, minutely puberulous outside, the rim apparently truncate and entire; fruit drupaceous, about 1 cm. long and wide, globose, black, with dark-blue juice.

The type of this distinctive species was collected by A. J. Minjas and M. D. I. Raya (DSM.1908) at T. 6, Bungu, about 105 km. along the Dar-Kilwa road, in closed bushland, at 1000—2000 m. altitude, on June 10, 1970, and is deposited in my personal herbarium.

ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXX

Harold N. Moldenke

SYNGONANTHUS CAULESCENS (Poir.) Ruhl.

Additional bibliography: Moldenke, Phytologia 35: 350—364. 1977.

Davidse and his associates found this plant in marshy areas in open grassland "in marsh with open water in center and grassy margins".

Additional citations: BRAZIL: Minas Gerais: Davidse, Ramamoorthy, & Vital 11590 (Ld). Paraná: Davidse, Ramamoorthy, & Vital 11352 (Ld).

SYNGONANTHUS CAULESCENS var. ANGUSTIFOLIUS Moldenke

Additional bibliography: Moldenke, Phytologia 35: 354, 357, 359, & 363—364. 1977.

Davidse and his associates describe this plant as 20 cm. tall, with white inflorescences, and encountered it "in marsh with standing water, grasses and sedges dominant", at altitudes of 910—1400 meters, flowering and fruiting in February.

Additional citations: PERU: Amazonas: Woytkowski 8133 (Ld). BRAZIL: Minas Gerais: Davidse & Ramamoorthy 10572 (Ld).

SYNGONANTHUS CAULESCENS var. DOURADENSIS Moldenke, Phytologia 21: 418. 1971.

Bibliography: Moldenke, Fifth Summ. 1: 172 (1971) and 2: 961. 1971; Moldenke, Phytologia 21: 418. 1971; Moldenke, Biol. Abstr. 53: 5252. 1972.

This variety differs from the typical form of the species in having its involucral bracts stramineous and more broadly lanceolate. It is known thus far only from the original collection.

Citations: BRAZIL: Goiás: Irwin, Souza, & Reis dos Santos 11753 (N—type).

SYNGONANTHUS CAULESCENS var. HATSCHBACHII Moldenke, Phytologia 31: 233. 1975.

Bibliography: Moldenke, Phytologia 31: 233 & 386. 1975.

This variety differs from the typical form of the species in its more or less incanous aspect and in having the leaves mostly erect or suberect on the stems, at least the uppermost younger ones more or less appressed to the stems, the older ones sometimes spreading, and the apex of all sharply acute. It has been found growing in berjo (sedge meadow) and in "das aguas razas de corrego", flowering and fruiting in September.

Citations: BRAZIL: Mato Grosso: Hatschbach & Kummrow 35037 (Z-type). Minas Gerais: Hatschbach 35590 (Ld).

SYNGONANTHUS CAULESCENS f. LONGIPES Moldenke, Phytologia 32: 336. 1975.

Bibliography: Moldenke, Phytologia 32: 336 (1975) and 34: 259. 1976; Anon., Biol. Abstr. 61: ACl.718. 1976; Moldenke, Phytologia 35: 359. 1977.

This form differs from the typical form of the species in having its peduncles during anthesis and fruiting up to 30cm. in length. The type collection was erroneously distributed in some herbaria as typical S. caulescens (Poir.) Ruhl. Thus far it is known only from the original collection.

Citations: BRAZIL: Distrito Federal: Irwin, Souza, & Reis dos Santos 8730 (Ld—isotype, N—type, W—2759057—isotype).

SYNGONANTHUS CAULESCENS var. OBTUSIFOLIUS Alv. Silv., Fl. Mont. 1: 358 [as "obtusifolia"]. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946.

Synonymy: Syngonanthus caulescens var. obtusifolia Alv. Silv., Fl. Mont. 1: 358. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 358 & 416. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106, 351, & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 635 & 961. 1971.

This variety is said to differ from the typical form of the species in having its stems erect, 10—25 cm. tall, and the leaves obtuse at their apex. It is based on A. Silveira 613 from "In humidis in Chapada do Couto in inter Serrinha et Itacambira", Minas Gerais, Brazil, collected in "1918 et 1926" and deposited in the Silveira herbarium. On page 614 of his work (1928) Silveira cites the 1918 collection only, so I feel that this is the one which should be designated officially as the type collection. Thus far the variety is known only from the two original collections.

SYNGONANTHUS CAULESCENS var. PROCERUS (Klotzsch) Moldenke, Bull. Torrey Bot. Club 68: 70. 1940.

Synonymy: Paepalanthus procerus Klotzsch in Schomb., Reisen Brit.-Guian. 3: [Faun. & Fl. Brit.-Guian.] 1115. 1848. Syngonanthus caulescens var. procerus (Klotzsch ex Schomb.) Moldenke apud J. A. Clark, Card-Ind. Gen. Sp. & Var. Pl. issue 170. 1942. Syngonanthus caulescens var. procerus (Kl.) Standl. ex Moldenke, Phytologia 25: 244, in syn. 1973. Eriocaulon giganteum Mart. ex Moldenke, Phytologia 31: 397, in syn. 1975 [not E. giganteum Afzel., 1856, nor Beauverd, 1909, nor (Beauverd) Beauverd, 1949, nor Riedel, 1959]. Paepalanthus splendens Kunth ex Moldenke, Phytologia 31: 405, in syn. 1975 [not P. splendens Mart., 1894].

Bibliography: Klotzsch in Schomb., Reisen Brit.-Guian. 3: [Vers. Faun. & Fl. Brit.-Guian.] 1115. 1848; Körn. in Mart., Fl. Bras. 3 (1): 466. 1863; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Ruhl. in Engl., Pflanzenreich 13 (4-30):

268. 1903; Moldenke, Bull. Torrey Bot. Club 68: 70. 1940; J. A. Clark, Card-Ind. Gen. Sp. & Var. Pl. issue 170. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Alph. List Cit. 1: 238. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 52, & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 302. 1953; Moldenke, Résumé 106 & 491. 1959; Moldenke, Résumé Suppl. 1: 22. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 589 & 961. 1971; Moldenke, Phytologia 25: 244 (1973), 26: 230 & 376 (1973), 31: 383, 386, 397, & 405 (1975), 33: 189 & 191 (1976), 34: 259 & 395 (1976), and 35: 354, 357, & 359. 1977.

This variety differs from the typical form of the species in having its stems greatly elongate, 12—25 or more cm. long, the leaves very dense, spreading, obtuse or subacute at the apex, the peduncles very much elongate, and with scattered peduncles arising from various portions of the stem.

Recent collectors refer to this plant as an herb, the stem stout, firmly erect, 12—20 cm. long, densely foliose, the leaves thick, firm, erect or widely divergent, 2—4.5 cm. long, 4—5 mm. wide, very conspicuously many-veined, abruptly acute, the lower ones brown-orange beneath, the peduncles in a terminal umbel and often also scattered in the leaf-axils or at the ends of very short axillary branchlets, mostly much elongated, 10—40 cm. long, and the flowers white.

The plant has been found growing in shallow water of wet campo slopes, at 300 meters altitude, flowering and fruiting in March, August, and October. Maguire and his associates refer to it as "frequent in morichal and lagunas".

The Eriocaulon giganteum of Afzelius, referred to in the synonymy above, is a synonym of Mesanthemum radicans (Benth.) Körn., that of Beauverd is Eriocaulon beauverdi Moldenke, and that of Riedel is Paepalanthus speciosus (Bong.) Körn. It should also be noted here that my original publication of this trinomial bears the date "1941" on its cover, but was actually validly published (and a copy received in at least the library of the New York Botanical Garden) on December 31, 1940.

Material of this variety has been distributed widely as typical S. caulescens (Poir.) Ruhl., Paepalanthus caulescens Kunth, and P. splendens Kunth. On the other hand, the Glaziou 19995, previously cited by me as this variety, and Mexia 5733, so distributed in some herbaria, are actually Paepalanthus coloides Ruhl.

Citations: VENEZUELA: Bolívar: Maguire, Wurdack, & Bunting 35909 (Mu). BRAZIL: Bahia: Martius s.n. [in arena humida ad fluv. Belmonte, 1818] (Mu). Distrito Federal: Irwin, Souza, & Reis dos Santos 11471 (N). Goiás: Lützelburg 357 (Mu, N), 1434 [N. Y. Bot. Gard. Type Photo, new ser., 8835] (Mu, N, N—photo, Z—photo). State undetermined: G. Gardner 2748 (W—936283, W—1440335); Glaziou 13282 (W—1124132).

SYNGONANTHUS CAULESCENS var. PROLIFERUS Moldenke, Phytologia 6: 329. 1958.

Bibliography: Moldenke, Phytologia 6: 329. 1958; Moldenke, Biol. Abstr. 33: 1215. 1959; Moldenke, Résumé 106 & 491. 1959; Hocking, Excerpt. Bot. A.5: 44. 1962; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 961 & 967. 1971; Moldenke, Phytologia 29: 321. 1974.

This variety differs from the typical form of the species in having many or most of the inner bractlets enlarged, foliaceous, green, to 7 mm. long and 1 mm. wide, glabrous, sharply attenuate at the apex, and often more or less scarious-margined. It is known thus far only from the original collection.

Purists will insist that the varietal epithet of this plant should be written "prolifer", but (as previously noted), Latin experts assure me that both this form and the one originally published are correct.

Citations: BRAZIL: Santa Catarina: Smith & Reitz 8681 (W—2248754—type).

SYNGONANTHUS CENTAUROIDES (Bong.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 277—278. 1903.

Synonymy: Eriocaulon centauroides Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 635. 1831. Eriocaulon centaureoides Bong. apud D. Dietr., Syn. Pl. 5: 268. 1852. Paepalanthus centauroides (Bong.) Körn. in Mart., Fl. Bras. 3 (1): 434. 1863. Paepalanthus centauroides Körn. in Mart., Fl. Bras. 3 (1): 434. 1863. Dupatya centaurodes (Bong.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya centaurodes Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Dupayta centauroides Kuntze apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 277, in syn. 1903. Syngonanthus centauroides Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Syngonanthus centaureoides (Bong.) Ruhl. apud Alv. Silv., Fl. Mont. 1: 416. 1928.

Bibliography: Bong., Ess. Monog. Erioc. 35. 1831; Bong., Mém. Acad. Sci. Imp. St. Pétersb., ser. 6, 1: 635. 1831; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 579 & 612. 1841; D. Dietr., Syn. Pl. 5: 268. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 280 & 333. 1855; Körn. in Mart., Fl. Bras. 3 (1): 434, 507, & 508. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877 (1893) and imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 276—278, 285, & 289. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 416. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877 (1946) and imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 29, 33, 46, & 57. 1946; Moldenke, Alph. List Cit. 3: 855 (1949) and 4: 1283. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 303 &

311. 1963; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 106, 279, 286, 324, 351, & 491. 1959; Moldenke, Résumé Suppl. 1: 6. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877 (1960) and imp. 3, 2: 401. 1960; Renné, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Résumé Suppl. 3: 35 (1962), 12: 12 (1965), and 18: 9. 1969; Moldenke, Phytologia 20: 108. 1970; Moldenke, Fifth Summ. 1: 172 & 479 (1971) and 2: 496, 579, 635, & 961. 1971; Moldenke, Phytologia 25: 230 (1973) and 34: 273 & 275. 1976.

This species is based on L. Riedel 1063 from "in pratis humidis paludosis Serra da Lapa", Minas Gerais, Brazil, and probably deposited in the Leningrad herbarium. An isotype at Berlin was photographed by Macbride as his type photograph number 10677. The plate "LXV", cited by Bongard (1831), apparently was never published and probably exists only in the Leningrad herbarium or library. Jackson (1893) cites it as pl. "45", as does Kunth (1841), but Bongard's reference is plainly to "Tabula LXV".

The original description of the species is "Acaule; foliis elongatis, basi dilatatis ciliatisque, linearibus, obtusiusculis; pedunculo dolitario, puberulo; vagina oblique fissa.....Bracteae capitulum involucrantes numerosae, obtusae, flavicantes, margine albo-scariosae. Praecedenti [S. xeranthemoides (Bong.) Ruhl.] affine, sed notis indicatis faciliter distinguendum."

Recent collectors have encountered this plant on wet sandy campos and damp swampy meadows, at altitudes of 425—1200 meters, flowering in December. Ruhland (1903) cites only the type collection; Silveira (1928) adds A. Silveira 215 from Minas Gerais.

Material of this species has been misidentified and distributed in some herbaria as S. tricostatus Gleason. On the other hand, the G. Gardner 704, distributed as S. centauroides, actually is Leiothrix flavescens (Bong.) Ruhl.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 27273 (Ft, S); A. Lutz 1582, in part [Herb. Lutz 1582, in part] (Ja); L. Riedel 1063 [Macbride photos 10677] (B—isotype, G—isotype, N—photo of isotype, Ut—397—isotype, W—photo of isotype). Pará: Egler & Raimundo s.n. [Egler 1225; Herb. Mus. Goeldi 24272] (Bm), s.n. [Egler 1249; Herb. Mus. Goeldi 24296] (Z); Murça Pires, Black, Wurdack, & Silva 6184 (N), 6552 (N). MOUNTED ILLUSTRATIONS: drawings by Körnicke (B).

SYNGONANTHUS CENTAUROIDES var. SUBAPPRESSUS Ruhl. in Engler, Pflanzenreich 13 (4-30): 278 [as "subappressa"]. 1903; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946.

Synonymy: Syngonanthus centauroides var. subappressa Ruhl. in Engl., Pflanzenreich 13 (4-30): 278. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 278 & 293. 1903; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Phytologia 2: 374 (1947) and 2: 494. 1948; Moldenke, Alph. List Cit. 4: 1283. 1949; Moldenke, Known Geogr. Distrib.

Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 303. 1953; Moldenke, Résumé 106, 351, & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 635 & 961. 1971; Moldenke, Phytologia 25: 230. 1973.

This variety differs from the typical form of the species in having the "bracteis involucrantibus planiusculis, subappressis, griseolo-flavicentibus" and is based on Sena s.n. [Herb. Schwacke 14567] from the Serra do Cipó, Minas Gerais, Brazil, flowering in August, and deposited in the Berlin herbarium. Thus far it is known only from the original collection. The Leite 432, distributed as S. centauroides var. subappressus and so cited by me in an earlier installment of these notes, actually is Eleocharis mutipes (Kunth) Palla in the Cyperaceae.

SYNGONANTHUS CENTAUROIDES var. TERETIPES Alv. Silv., Fl. Mont. 1: 395—396. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 395—396 & 416. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 961. 1971.

This variety differs from the typical form of the species in having "pedunculis teretibus et valde tortis. Pedunculi 40 cm alti, folia duplo superantes." It is based on A. Silveira 652 from "In pratis montis Serra do Cipó", Minas Gerais, Brazil, collected in April, 1905, and deposited in the Silveira herbarium. On page 416 of his work (1928) Silveira cites a Silveira 565 from the same locality, but whether this represents a second collection or is intended as a correction of the original citation or is a typographic error is not clear. The taxon has otherwise not been collected again.

SYNGONANTHUS CHAPADENSIS Alv. Silv., Fl. Mont. 1: 330—331. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 330—331 & 416. 1928; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 961. 1971.

This species is based on A. Silveira 660 from "In campis in Chapada do Couto", Minas Gerais, Brazil, collected in April, 1918, and deposited in the Silveira herbarium. Thus far it is known only from the original collection and Silveira (1928) says of it "A S. heterotricho Alv. Silv. foliorum indumendum facile distinguitur".

SYNGONANTHUS CHRYSANTHUS (Bong.) Ruhl. in Engl., Pflanzenreich 13: (4-30): 256. 1903.

Synonymy: Eriocaulon chrysanthum Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 628. 1831. Paepalanthus morulus Kunth, Enum. Pl. 3: 533. 1841. Eriocaulon morulum Kunth ex Steud., Syn.

Pl. Glum. 2: [Cyp.] 281. 1855. Paepalanthus chrysanthus (Bong.) Körn. in Mart., Fl. Bras. 3 (1): 454. 1863. Paepalanthus chrysanthus Körn. in Mart., Fl. Bras. 3 (1): 454. 1863. Dupatya chrysantha (Bong.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Eriocaulon morulum Steud. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 878, in syn. 1893. Dupatya chrysantha Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus chrysanthus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Syngonatnhus chrysanthus (Bong.) Ruhl. ex Reitz, Sellowia 7: 124, sphalm. 1956.

Bibliography: Bong., Ess. Monog. Erioc. 28. 1831; Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 628. 1831; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 533, 575, 613, & 625. 1841; D. Dietr., Syn. Pl. 5: 262 & 267. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 279, 281, 333, & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 454 & 506. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877 & 878 (1893) and imp. 1, 2: 401 & 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 245, 256, 285, 286, 289, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877 & 878 (1946) and imp. 2, 2: 401 & 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 29, 33, 37, 46, 51, & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Rambo, An. Bot. Herb. Barb. Rodr. 1: 128 (1949) and 2: 128. 1950; Moldenke, Phytologia 4: 303 & 311. 1953; Rambo, Sellowia 6: 130. 1954; Reitz, Sellowia 7: 124—125 (1956) and 11: 31 & 131. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 106, 279, 286, 290, 324, 326, & 491. 1959; Moldenke, Résumé Suppl. 1: 6. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877 & 878 (1960) and imp. 3, 2: 401 & 402. 1960; Reitz, Sellowia 13: 52, 53, 72, & 90. 1961; Moldenke, Résumé Suppl. 10: 7. 1964; Moldenke, Phytologia 20: 108. 1970; Reitz, Sellowia 22: 137. 1970; Moldenke, Fifth Summ. 1: 172 & 479 (1971) and 2: 496, 506, 579, 586, 638, & 961. 1971; Moldenke, Biol. Abstr. 56: 3000. 1973; Moldenke, Phytologia 25: 230 (1973) and 34: 276. 1976.

This species is based on a collection from Rio de Janeiro, cited by Bongard (1831) in his original description without designation of collector but received from Lindley, who, in turn, received it from the important and heterogeneous old D. Prescott herbarium. Bongard's original description is "acaule: foliis vagina brevioribus linearibus acuminatis subpubescentibus; pedunculo solitario pubescente; vagina oblique fissa apice lacimulata. Tab. XLIII. Habit. prope Rio-Janeiro. Flor. Decembri. ⊙ Ex herbario D. Prescott, cui cel. Lindley." The plate to which he here refers was apparently never published and probably exists only in the Leningrad library or herbarium. The type specimen is also to be looked for in the Leningrad herbarium.

Kunth's Paepalanthus morulus is based on Sellow collections

["d", D.2404, and s.n.] from "Brasilia meridionalis" and Gaudichaud 104 from Santa Catarina Island, Brazil, deposited in the Berlin herbarium. It is of interest to note that Jackson (1893) reduces both Eriocaulon morulum and E. chrysanthum to Paepalanthus chrysanthus, but in the following year (1894) reduces Paepalanthus chrysanthus to P. morulus!

Recent collectors have encountered this plant in "banhado", campos, swamps, and wet sandy places in general, at altitudes of 2—5 meters, flowering and fruiting from November to February, in flower also in October, and describe the plant as an annual herb with cream-colored flowers. Lindeman and Porto found it in "zona pantanosa na beira da lagoa na restinga atrás" and in a "lugar úmido na restinga atrás das dunas primárias".

Rambo (1950) comments that "O fato de ter sido esta espécie, a mais comum e mais abundante das Eriocauláceas do litoral, encontrada únicamente por Sellow (n. 2.404), bem demonstra a deficiência das pesquisas nestra região. Frequente em Sombrio, cresce aos milhares sem conta de exemplares nos terrenos húmidos, graminosos ou pantanosos entre as dunas fixadas pela vegetação. Parece escassear ràpidamente em diração sul, pois não a encontrei na linha Viamão -- Cidreira; nem Malme a cita para os arredores da cidade do Rio Grande."

Vernacular names recorded for this plant are "capim manso", "capitoatinga", "gravatá manso", and "semprevivas do campo". In habit and general appearance it seems very close to Leiothrix arechavaletae (Körn.) Ruhl., distinguishable only by the shape of the involucral bractlets, the 5- or 6-costate pilose peduncles, and, of course, the essential floral characters.

In the index to the Steudel (1855) work there is mention of page "181" as bearing a reference to this species, but this appears to be a typographic error for page 281, on which Eriocaulon morulum is described. Ruhland (1903) cites only Gaudichaud 104, Sellow 2404, and Ule 581 & 1386.

Material of S. chrysanthus has been misidentified and distributed in some herbaria as S. gracilis (Bong.) Ruhl., Leiothrix flavescens (Bong.) Ruhl., and Paepalanthus sp.

Additional citations: BRAZIL: Rio Grande do Sul: Leite 142 (Ja—43994), 307 (Sp—47132), 1284 (A, A); Lindeman ICN.9094 (Ut—320396); Lindeman & Porto ICN.9123 (Ut—320395); Pabst 10157 (Ja—77109, Ja); Rambo 56191 (Rd—12292), 63540 (S); A. R. Schultz 324 (W—1978445); Sehnem 3005 (B); Sellow D.2404 (B), "d" (B), s.n. [Brasilia] (N—photo); J. Vidal IV.339 [Herb. Mus. Nac. Rio Jan. 105081] (Ca—1114719, Ld), IV.481 [Herb. Mus. Nac. Rio Jan. 126557] (Ac). Santa Catarina: Collector undetermined 409 (Ja—126558); Occhioni 4700 [Herb. Cadeira Bot. 11269] (Ld); Rambo 56850 (Rd—12291); Reitz 4825 [Herb. Barb. Rodr. 6345] (N, N), 5567 (N), 5604 (N); Reitz & Klein 661 (Cb), 1355 [Herb. Barb. Rodr. 8786] (N, Z);

Sehnem 3005 (Rd—12290); Smith & Reitz 5874 (Z); Ule 1386 (B, Hg, N—photo, Z—photo). Santa Catarina Island: Gaudichaud 104 (B, G, P); Klein & Bresolin 6279 (Ac); Klein, Souza, Sobrinho, & Bresolin 6476 (Ld). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

SYNGONANTHUS CHRYSANTHUS var. CASTRENSIS Moldenke & Smith ex Moldenke, Phytologia 25: 431. 1973.

Bibliography: Moldenke, Phytologia 25: 431. 1973; Moldenke, Biol. Abstr. 56: 3000. 1973.

This variety differs from the typical form of the species in having only 3-costate peduncles. Thus far it is known only from the original collection.

Citations: BRAZIL: Paraná: Vidal III.74 [Silva Araujo s.n.; Herb. Mus. Nac. Rio Jan. 77012] (Ja—77012—type, Z—photo of type).

SYNGONANTHUS CHRYSOLEPIS Alv. Silv., Fl. Mont. 1: 390—391, pl. 249. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 390—391 & 416. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 172 (1971) and 2: 961. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 249. 1928.

This species is based on an unnumbered collection by Dr. J. Michaeli from sandy campos in the Serra do Cipó, Minas Gerais, Brazil, collected in August, 1921, and deposited in the Silveira herbarium. On page 416 of his work (1928) Silveira cites also an A. Silveira 719 from the Serra do Cipó, also collected in 1926 — whether this is a second collection of the species or merely a herbarium number assigned to the type collection is not clear. In his text Silveira refers to a plate "CCL" as illustrating this species, but S. chrysolepis is actually depicted on plate 249 [plate 250 is lacking]. Silveira comments that the "Species ob pilositatem foliorum vaginarumque valde distincta".

SYNGONANTHUS CILIATUS Alv. Silv., Fl. Mont. 1: 391—392, pl. 261. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 391—392 & 416, pl. 261. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 261. 1928.

This species is based on A. Silveira 546 from "In campis arenosis in Serra do Cabral", Minas Gerais, Brazil, collected in May, 1910, and deposited in the Silveira herbarium. In his text Silveira (1928) refers to "Tabula CCLI" as illustrative of the species and both Wangerin (1937) and Worsdell (1941) refer to it as plate "250", but the plate is actually labeled "CCLXI". Silveira notes that the "Species magnitudine foliorum pedunculorum que et foliis ciliatis facile distinguenda".

SYNGONANTHUS CIPOËNSIS Ruhl. in Engl., Pflanzenreich 13 (4-30): 278. 1903.

Synonymy: Syngonanthus cipoensis Alv. Silv., Fl. Mont. 1: 416. 1928. Syngonanthus cipoënsis Alv. Silv. ex Moldenke, Résumé 351. 1959.

Bibliography: Ruhl. in Engl., Pflanzenreich 14 (4-30): 276, 278, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Phytologia 2: 498. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106, 351, & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 636 & 961. 1971; Moldenke, Phytologia 34: 277. 1976.

This species is based on an unnumbered Sena collection [Herb. Schwacke 12288], collected in June, 1896, in the Serra do Cipó, Minas Gerais, Brazil, and deposited in the Berlin herbarium. I am assuming that the "S. cipoensis Alv. Silv." of Silveira (1928) is the same taxon as the S. cipoënsis of Ruhland, the name for which he felt should be accredited to him rather than to Ruhland, but since the only collection he cites (A. Silveira 735, collected in 1905 in the same Serra do Cipó) is not the same one which Ruhland cites, and since I have not as yet been able to see Silveira's collection, the name is placed in this synonymy tentatively. Ruhland (1903) cites only the original 1896 collection and comments that the "Species perbene distincta. Forma et indumentum foliorum et vaginarum insignia".

Citations: BRAZIL: Minas Gerais: Sena s.n. [Herb. Schwacke 12288] (B—type).

SYNGONANTHUS CIRCINNATUS (Bong.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 279. 1903.

Synonymy: Eriocaulon circinnatum Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 633. 1831. Eriocaulon circinatum Bong. apud Kunth, Enum. Pl. 3: 613. 1841. Paepalanthus circinnatus (Bong.) Körn. in Mart., Fl. Bras. 3 (1): 429—430. 1863. Paepalanthus circinnatus Körn. in Mart., Fl. Bras. 3 (1): 299 & 429. 1863. Dupatya circinnata (Bong.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya circinnata Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus circinnatus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Bibliography: Bong., Ess. Monog. Erioc. 331. 1831; Bong., Mém.

Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 633. 1831; Kunth, Enum. Pl. 3: 578, 585, & 613. 1841; D. Dietr., Syn. Pl. 5: 268. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 280 & 333. 1855; Körn. in Mart., Fl. Bras. 3 (1): 299, 429—430, 507, & 508. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 878 (1893) and imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 276, 279, 285, 289, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 878 (1946) and imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 29, 33, 46, & 57. 1946; Moldenke, Alph. List Cit. 3: 855. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 303 & 311. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 106, 279, 287, 324, & 491. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 878 (1960) and imp. 3, 2: 401. 1960; Moldenke, Résumé Suppl. 12: 12. 1965; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 148. 1969; Moldenke, Fifth Summ. 1: 173 & 479 (1971) and 2: 497, 580, 636, & 961. 1971.

This species is based on L. Riedel 1044 from "In lapidosis glareosis Serra da Lapa", Minas Gerais, Brazil, deposited in the Leningrad herbarium. An isotype was photographed in Berlin by Macbride as his type photograph number 10678. Bongard's original description is "Acaule; pusillum; foliis radicalibus pedunculum subaequantibus, linearibus, pubescentibus, circinnatis; pedunculis subsolitariis, pubescentibus; vagina obliqua fissa." The "Tab. XXXIX" to which he refers apparently was never published and is probably only to be found in the Leningrad library or herbarium. The plant has been collected in flower in November. Ruhland (1903) cites only the original collection.

Additional citations: BRAZIL: Minas Gerais: L. Riedel 1044 [Macbride photos 10678] (B—isotype, Ut—398—isotype, W—photo of isotype). MOUNTED ILLUSTRATIONS: drawings by Kornicke (B).

SYNGONANTHUS COMOSUS Alv. Silv., Fl. Mont. 1: 372—373, pl. 236. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 372—373 & 416, pl. 236. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Phytologia 31: 386 (1975), 34: 257 & 259 (1976), and 35: 31. 1976.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 236. 1928.

This species is based on A. Silveira 753, collected in June, 1925, "Sub rupibus, locis umbrosis, in Serra Geral inter Diamantina et Serro", Minas Gerais, Brazil, and deposited in the Silveira herbarium. On page 416 of his work (1928) Silveira gives only "Diamantina" as the type locality. In his text he refers to

"Tabula CCXXXVII" as illustrative of this species, but the plate in question is labeled "CCXXXVI" — plate 237 illustrates S. glaucus Alv. Silv.

Bunting and his associates encountered what may be this species in Venezuela and describe it as "common.....a delicate herb in wet sand and in standing water, peduncles nearly white-buff", growing at 125—140 meters altitude apparently in close association with Paepalanthus saxicola var. conicus Moldenke.

Citations: VENEZUELA: Amazonas: Bunting, Akkermans, & Van Rooden 3738b (Ut—320385).

SYNGONANTHUS COMOSUS var. HARLEYI Moldenke, Phytologia 31: 233—234. 1975.

Bibliography: Moldenke, Phytologia 31: 233—234 & 386. 1975.

This variety differs from the typical form of the species in having its leaves, sheaths, and peduncles (except the latter in age) rather densely and very conspicuously spreading-hirsute with rather long, stiffish, light-brownish hairs. Thus far it is known only from the original collection.

Citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15952 (Z—type).

SYNGONANTHUS COMPACTUS Ruhl. ex Ule in Engl., Bot. Jahrb. 40: 162, nom. nud. 1907.

Synonymy: Syngonanthus uleanus Ruhl. ex Moldenke, Résumé Suppl. 1: 23, in syn. 1959.

Bibliography: Ruhl. ex Ule in Engl., Bot. Jahrb. 40: 162. 1907; Prain, Ind. Kew. Suppl. 4, imp. 1, 231. 1913; Alv. Silv., Fl. Mont. 1: 416. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Phytologia 2: 492. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 303. 1953; Prain, Ind. Kew. Suppl. 4, imp. 2, 231. 1958; Moldenke, Résumé 106 & 491. 1959; Moldenke, Résumé Suppl. 1: 23 (1959) and 7: 5. 1963; Moldenke, Fifth Summ. 1: 143 & 173 (1971) and 2: 638 & 961. 1971.

This species (as well as S. uleanus) is based on Ule 6175 from Amazônas, Brazil, deposited in the Berlin herbarium where it was photographed by Macbride as his type photograph number 10679. Woytkowski encountered it in wet, sandy, open places, at 1400 m. altitude, flowering in January, and describes it as 10—15 cm. tall, with white flowers. Silveira (1928) cites A. Silveira 219 from Manaos, Amazônas, Brazil. That the same species should grow in the low Amazonian rainforest at Manaos and also on the very high altitudes in Peru seems difficult to believe and demands further study. The Hutchison & Wright 5556, Segástegui 6062, and Wurdack 1338, distributed as S. compactus, are actually S. peruvianus Ruhl.

Citations: PERU: San Martín: Woytkowski 6204 (Z). BRAZIL: Amazônas: Ule 6175 [Macbride photos 10679] (B—type, N—photo of type, N—photo of type, W—photo of type, Z—isotype).

SYNGONANTHUS COSTATUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 252—253. 1903.

Synonymy: Syngonanthus niveus var. rosulatum Kunth ex Moldenke, Phytologia 4: 303, in syn. 1953. Paepalanthus costatus Ruhl. ex Moldenke, Résumé Suppl. 1: 20, in syn. 1959. Leiothrix lindavii Ruhl. ex Moldenke, Résumé 309, in syn. 1959. Syngonanthus nivens var. rosulatus Kunth ex Rennó, Levant. Herb. Inst. Agron. Minas 72. 1960. Leiothrix lindovii Ruhl. ex Rennó, Levant. Herb. Inst. Agron. Minas 69. 1960.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 244, 252—253, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 416. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Alph. List Cit. 2: 412 (1948) and 3: 935. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 303. 1953; Moldenke, Résumé 106, 309, 352, & 491. 1959; Moldenke, Résumé Suppl. 1: 20. 1959; Rennó, Levant. Herb. Inst. Agron. Minas 69, 71, & 72. 1960; Moldenke, Résumé Suppl. 3: 35. 1962; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 547, 580, 638, & 961. 1971.

This species is based on H. de Magalhães 1366, collected in moist places in the Serra de Ibitipoca, Minas Gerais, Brazil, in June, 1896, and is deposited in the Berlin herbarium. Ruhland (1903) cites only the original collection, but Silveira (1928) adds A. Silveira 219, collected in "Ibitipoca", in 1902. The type collection of Leiothrix lindavii is Magalhães Gomes 3108.

Additional citations: BRAZIL: Minas Gerais: Magalhães Gomes 1364 (B), 1366 (B—type); A. Silveira 520 [Herb. Marie-Victorin 12434] (N—photo, Z—photo).

SYNGONANTHUS COWANI Moldenke, Mem. N. Y. Bot. Gard. 8: 99—100. 1953.

Synonymy: Syngonanthus cowanii Moldenke, Phytologia 31: 408, in syn. 1975.

Bibliography: Moldenke, Mem. N. Y. Bot. Gard. 8: 99—100. 1953; Moldenke, Phytologia 4: 303. 1953; Moldenke, Résumé 69, 73, & 491. 1959; G. Taylor, Ind. Kew. Suppl. 12: 138. 1959; Moldenke, Fifth Summ. 1: 120 & 127 (1971) and 2: 961. 1971; Moldenke, Phytologia 31: 408. 1975.

This species is based on Maguire, Cowan, & Wurdack 30466 from on "sabita" 500 m. southeast of Savanna III, at 125 m. altitude, in the Cerro Yapacanna, Río Orinoco, Amazonas, Venezuela, collected on December 31, 1950, and deposited in the Britton Herbarium at the New York Botanical Garden. Recent collectors refer to the species as "common", "locally frequent", or "locally occasional" in sand od savannas, at altitudes of 100—150 m., flowering in February, March, and November, and fruiting in March. They refer to the flowers as white.

Additional citations: VENEZUELA: Amazonas: Maguire & Wurdack 34532 (N), 34569 (N); Maguire, Wurdack, & Bunting 36596 (N), 36596a (N), 36740 (N), 37640 (Mu).

SYNGONANTHUS COWANI var. LONGIPEDUNCULATUS Moldenke, Mem. N. Y. Bot. Gard. 9: 282. 1957.

Bibliography: Moldenke, Mem. N. Y. Bot. Gard. 9: 282. 1957; Moldenke, Résumé 69 & 491. 1959; Moldenke, Fifth Summ. 1: 120 (1971) and 2: 961. 1971.

This variety differs from the typical form of the species in having its filiform peduncles 8—13 mm. long, surpassing the uppermost leaves. It is based on Maguire, Wurdack, & Bunting 36290 from a savanna 1 km. west of Cacagual (Piedra Cacaguti), on the Río Atabapo, at 100 meters altitude, Vaupés, Colombia, collected on November 19, 1953, and deposited at the New York Botanical Garden. Thus far it is known only from the original collection.

Citations: COLOMBIA: Vaupés: Maguire, Wurdack, & Bunting 36290 (N--type).

SYNGONANTHUS CRASSINERVIUS Alv. Silv., Fl. Mont. 1: 345—346, pl. 219. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 345—346, 416, & 417, pl. 219. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 219. 1928.

This species is based on A. Silveira 653 from "In campis arenosis prope Barauna", Minas Gerais, Brazil, collected in April, 1918, and deposited in the Silveira herbarium. On page 416 of his work (1928) Silveira gives "Baraunas" as the type locality. Thus far the species is known only from the original collection.

SYNGONANTHUS CRASSINERVIUS var. GLABRESCENS Alv. Silv., Fl. Mont. 1: 346—347. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 346—347 & 417. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971.

This variety differs from the typical form of the species in having its sheaths glabrous. It is based on A. Silveira 654 from "In campis arenosis prope Diamantina", Minas Gerais, Brazil, collected in April, 1918, and deposited in the Silveira herbarium. On page 417 of his work Silveira (1928) cites a no. "854" from Diamantina, 1918 — whether this is a second collection, a typographic error, or a correction of the number given in the original description is not clear. It should also be noted here that the notation "Tabula CCXIX" appears in his text on p. 347 immediately after the description of the variety, not on p. 346 after the specific description; yet the illustration itself is labeled as representing the typical form and is so cited by Wan-

gerin (1937), Fedde (1938), and Worsdell (1941). Thus far the variety is known only from the original collection.

SYNGONANTHUS CRISPUS Alv. Silv., Fl. Serr. Min. 77. 1908.

Bibliography: Alv. Silv., Fl. Serr. Min. 77. 1908; Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 5. 1924; Alv. Silv., Fl. Mont. 1: 358—359 & 417, pl. 226. 1928; A. W. Hill, Ind. Kew. Suppl. 8: 231. 1933; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 226. 1928.

This species is based on H. de Magalhães s.n. [Herb. Silveira 225] from "In campis arenosis in Serra da Ibitipoca", Minas Geraais, Brazil, collected in June, 1906, and deposited in the Silveira herbarium. Silveira (1908) says of it: "Species praeter folia leviter crispa certe insignis". It is known thus far only from the original collection. Wangerin (1937) cites the illustration as "CCXXVIa"; Silveira (1928) refers to it in his text as "CCXXVII", but the plate itself is plainly labeled "CCXXVI" and is so cited by Worsdell (1941).

SYNGONANTHUS CRISPUS var. ITACAMBIRENSIS Alv. Silv., Fl. Mont. 1: 359. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 359 & 417. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971.

This variety is described by Silveira (1928) as "Vaginis ab initio glabris a specie typica differt" and is based on A. Silveira 845 from "In campis arenosis prope Itacambira", Minas Geraais, Brazil, collected in July, 1926, and deposited in the Silveira herbarium. Thus far it is known only from the original collection.

SYNGONANTHUS CURRALENSIS Moldenke, Phytologia 31: 487—489. 1975.

Bibliography: Moldenke, Phytologia 31: 386 & 487—489 (1975) and 34: 259. 1976; Anon., Biol. Abstr. 61: AC1.718. 1976.

Illustrations: Moldenke, Phytologia 31: 488. 1975.

Citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16661 (Z—type, Z-drawings of type).

SYNGONANTHUS DEALBATUS Alv. Silv., Fl. Mont. 1: 385—386, pl. 245. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 385—386 & 417, pl. 245. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2:

426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Alph. List Cit. 2: 412 (1948) and 3: 935. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 303. 1953; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 245. 1928.

The type of this species was collected by Álvaro Adolpho da Silveira (no. 571) "In pratis siccis arenosisque prope Corrego da Pedra Pintada, in serra do Cabral", Minas Gerais, Brazil, in May, 1910, and is deposited in the Silveira herbarium. Silveira (1928) says of it "Species dealbata ob arcte appressos pilos, valde insignis et affinibus perbene distincta". He refers to his illustration of it as "Tabula CCXLVI", but the plate itself is plainly labeled "CCXLV" and is so cited by Worsdell (1941). On page 417 of his work Silveira cites a no. "581" from the same mountains; if this is a second collection, a typographic error, or is meant to correct an error in the number given in the original description is not clear. The species is thus far known only from the original collection(s).

SYNGONANTHUS DEALBATUS var. MINOR Alv. Silv., Fl. Mont. 1: 386. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 386 & 417. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57, 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenkem Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971.

This variety is based on A. Silveira 744 from "In campis arenosis prope Itacambira", Minas Gerais, Brazil, collected in July, 1926, and deposited in the Silveira herbarium. It is described as "Foliis (2—5 cm longis), pedunculis (usque 20 cm altis) minoribus ac glabrioribus, et capitulis etiam minoribus (7 mm latis) a specie typica differt". On page 417 of his work Silveira (1928) cites his no. "844" from the same locality and date; if this is a second collection, a typographic error, or a correction of a previous typographic error is not clear.

SYNGONANTHUS DECORUS Moldenke, Phytologia 32: 485—487, fig. 2. 1976.

Bibliography: Moldenke, Phytologia 32: 485—487, fig. 2 (1976), 34: 259 (1976), and 35: 320. 1977.

Illustrations: Moldenke, Phytologia 32: 486, fig. 2. 1976.

This plant has been encountered on sandy campos and the wet sandy margins of sandstone outcrops, flowering in April and May.

Material has been misidentified and distributed in some herbaria as S. anthemiflorus (Bong.) Ruhl.

Citations: BRAZIL: Goiás: Dawson 14631 (Z); Hatschbach 36804 (Z—type, Z—drawings of type).

SYNGONANTHUS DENSIFLORUS (Körn.) Ruhl. in Engl., Pflanzenreich 13: (4-30): 263—264. 1903.

Synonymy: Paepalanthus densiflorus Körn. in Mart., Fl. Bras. 3 (1): 450. 1863. Dupatya densiflora (Körn.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya densiflora Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus densiflorus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 450—451 & 507. 1863; Benth. & Hook. f., Gen. Pl. 3 (2): 1023. 1883; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 401. 1894; Kuntze, Rev. Gen. Pl. 3 (2): 329. 1898; Malme, Bih. Svensk Vet. Akad. Handl. 27 (3), no. 11: 31. 1901; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 3, 246, 263—264, 289, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 41. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 29, 47, & 57. 1946; Moldenke, Alph. List Cit. 1: 223 (1946) and 2: 627. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 212. 1949; Moldenke, Phytologia 4: 303—304. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 106, 279, 324, & 491. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 401. 1960; Renné, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Résumé Suppl. 8: 2 (1964) and 12: 5 & 12. 1965; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 166, 167, 174, & 189. 1969; Anon., Biol. Abstr. 52 (19): B.A.S. I.C. S.248. 1971; Moldenke, Biol. Abstr. 52: 10547. 1971; Moldenke, Fifth Summ. 1: 173 & 479 (1971) and 2: 580, 636, & 961. 1971; Moldenke, Phytologia 21: 352 (1971), 23: 435 (1972), and 24: 499. 1972; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1161—1162, map 1782 [bis], & ind. 20 & 28. 1972; Hocking, Excerpt. Bot. A.21: 211. 1973; Moldenke, Biol. Abstr. 56: 1243. 1973; Moldenke, Phytologia 25: 120 & 230. 1973.

This species is based on Weddell 2132, 2141, & 2383 from near Salinas, Goiás, L. Riedel 2348 & s.n. and Lund s.n. [Villa Franca, July] from Minas Gerais, and G. Gardner 2966 from Piauí, Brazil. Macbride photographed the Riedel 2348 cotype in the Berlin herbarium as his type photograph number 10680. Ruhland (1903) cites, in addition, Glaziou 22316 from Goiás and Lund s.n. from São Paulo. He cites the Riedel 2348 collection from São Paulo, not Minas Gerais.

Recent collectors describe this plant as an herb to 1.25 m. tall (to the tops of the inflorescence), the heads cream-color, gray, or gray-brown, and the flowers themselves white or creamy-white. They have found it growing in swamps, close to lakes, in cerrado seeps, on grassy or wet campos, in wet sandy soil, wet places in cerrado, and wet ground by streamlets, on palm islands in wet campos, and in swampy ground at the edge of "campo alogado" and gallery forest, at altitudes of 500—1150 meters, flowering in January, March, and May to August, and fruiting in March, May to August, and October. Ratter & Ramos encountered it in

"tussocky campos now barely dry but very wet in the rainy season"; Irwin and his associates found it "in wet campo between gallery forest and cerrado", "in dense stands of grasses and sedges in boggy depressions in campos", "in wet ground at gallery margin in an area of cerrado and gallery woods", and "locally common among grasses on wet grassy slopes". Hunt & Ramos report the "length of scapes very variable".

It should be noted here that the Malme (1901) reference in the bibliography above is sometimes cited as "1903" and the Angely (1972) work is sometimes cited as "1970", the erroneous titlepage date. Malme (1901) cites Malme 1456C from Mato Grosso and notes that the "Capitula nondum bene evoluta".

The Kuntze s.n. [Velasco, VII.92], distributed as S. densiflorus and so cited by me in my 1953 work, is now better regarded as representing var. glabrescens Moldenke.

Additional citations: BRAZIL: Distrito Federal: Duarte 10365 [Herb. Cadeira Bot. 14079] (Ld); Héringer 6782 (B); Irwin & Soderstrom 5232 (Ac, N, W—2759016); Murça Pires, Silva, & Souza 9506 (Z), 9591 (B); Sucre 798 (Ac). Goiás: Andrade 486 [Emmerich 478] (Bd—15507); M. A. Chase 11753 (Mi); Glaziou 22316 (W—1124172); Hatschbach 34247 (Ld); Irwin, Grear, Souza, & Reis dos Santos 13837 (Ld, N, W—2759059); Irwin, Maxwell, & Wasshausen 21414 (Ld, N, N); Irwin & Soderstrom 7647 (Ld, N); Macedo 1835 (S). Mato Grosso: Arlé 5 [Herb. Brad. 14702] (Lw); Goldsmith 63 (K); Harley 11553 (Ld); Hunt & Ramos 5658 (N), 5737 (N); Irwin, Grear, Souza, & Reis dos Santos 16408 (Ac, N, W—2759060); Philcox & Ferreira 4561 (K, N, S); Ratter & Ramos R.245 (Ld, N); Ratter, Santos, Souza, & Ferreira R.1593 (Ld, N); P. W. Richards R.476 (Ac, N). Minas Gerais: Irwin, Onishi, Fonsêca, Souza, Reis dos Santos, & Ramos 25757 (Ac, N, S); L. Riedel 2348 [Type Photo Coll. N. Y. Bot. Gard. new ser. 8844; Macbride photos 10680] (B—cotype, Mu—cotype, N—photo of cotype, N—photo of cotype, W—photo of cotype, Z—photo of cotype), s.n. [Franca] (Ut—399—cotype). Piauí: G. Gardner 2966 (W—936276). MOUNTED ILLUSTRATIONS: drawings by Körnicke (B).

SYNGONANTHUS DENSIFLORUS var. GLABRESCENS Moldenke, Phytologia 21: 352. 1971.

Synonymy: Syngonanthus densiflorus var. gabreso Anon., Biol. Abstr. 52(19): B.A.S.I.C. S.248, sphalm. 1971.

Bibliography: Anon., Biol. Abstr. 52 (19): B.A.S.I.C. S.248. 1971; Moldenke, Biol. Anstr. 52: 10547. 1971; Moldenke, Fifth Summ. 1: 184 (1971) and 2: 961 & 968. 1971; Moldenke, Phytologia 21: 353 (1971) and 23: 435. 1972; Hocking, Excerpt. Bot. A.21: 211. 1973.

This variety differs from the typical form of the species in having its leaves and sheaths glabrous or subglabrate. It is based on Irwin, Souza, Grear, & Reis dos Santos 17022 from peri-

odically flooded campo, at 400 meters altitude, about 30 km. south of Xavantina, Mato Grosso, Brazil, collected on June 12, 1966, and deposited in my personal herbarium. The collectors note that the inflorescences are to 1 m. tall, the heads gray-brown, and that the plant is locally frequent. It has also been encountered in open moist sandy ground near the edge of cerrado, at altitudes of 200--400 meters, flowering in June and July, and fruiting in July. The Kuntze collection cited below was previously inaccurately cited by me (1953) as the typical form of the species.

Citations: BRAZIL: Mato Grosso: Argent in Richards 6471 (Ld, N); Irwin, Souza, Grear, & Reis dos Santos 17022 (N--isotype, Z--type). BOLIVIA: Santa Cruz: Kuntze s.n. [Ost Velasco, VII.92] (N, W--701891).

SYNGONANTHUS DENSIFLORUS var. GLABRIFOLIUS Moldenke, Phytologia 25: 120. 1973.

Bibliography: Moldenke, Biol. Abstr. 56: 1243. 1973; Moldenke, Phytologia 25: 120 & 230. 1973.

This variety differs from the typical form of the species in having only its leaves always glabrous on both surfaces. It is based on Irwin, Anderson, & Lee 34606 from in a sedge meadow (brejo) at 1000 m. altitude in an area of "campo sujo", sedge meadow, and adjacent cerrado in the Serra dos Pireneus about 21 km. east of Pirenópolis, on the Planalto do Brasil, Goiás, Brazil, collected on January 19, 1972, and deposited in my personal herbarium. Thus far it is known only from the original collection.

Citations: BRAZIL: Goiás: Irwin, Anderson, & Lee 34606 (N--isotype, Z--type).

SYNGONANTHUS DENSIFOLIUS Alv. Silv., Fl. Mont. 1: 319--320, pl. 203. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 319--320 & 417, pl. 203. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971; Moldenke, Phytologia 23: 418 (1972), 24: 499 (1972), and 25: 230. 1973; Anon., Biol. Abstr. 55 (9): B.A.S. I.C. S.250. 1973; Hocking, Excerpt. Bot. A.23: 292. 1974; Moldenke, Phytologia 29: 203 (1974) and 35: 348. 1977.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 203. 1928.

This species is based on A. Silveira 545 from "In campis arenosis in Serra do Cipó", Minas Gerais, Brazil, collected in April, 1909, and deposited in the Silveira herbarium. It bears great superficial similarity to S. anthemiflorus (Bong.) Ruhl., S. flaviceps Alv. Silv., and S. canaliculatus Alv. Silv. Silveira (1928) comments that the species is "Ab affinibus, S. canaliculato Alv. Silv. excepto, praecipue distinguitur bracteis involucrantibus a-

cutis dorsoque pubescentibus. A S. canaliculato forma ac colore bractearum involucrantium, antheris albis et aliis characteribus differt. A S. anthemidifloro (Bong.) Ruhl. ob stamina exserta et formam pilositatem perigonii praecipue distinguitur. A S. densifolio Alv. Silv. forma bractearum involucrantium et colore perigonii floris masculi praecipue differt." What the last sentence is supposed to mean is not clear — possibly Silveira meant to contrast it with S. flaviceps Alv. Silv., a species to which he states elsewhere that S. densifolius is related.

Irwin and his associates found S. densifolius in wet sand adjacent to campo with cerrado on outcrops, at 1000 m. altitude, flowering and fruiting in March. They describe the heads as gray. It has been misidentified and distributed in some herbaria as var. pilosior Alv. Silv.

Citations: BRAZIL: Goiás: Irwin, Reis dos Santos, Souza, & Fonsêca 24648 (Ac, N).

SYNGONANTHUS DENSIFOLIUS var. MAJUS Moldenke, Phytologia 24: 499. 1972.

Bibliography: Moldenke, Phytologia 24: 499. 1972; Anon., Biol. Abstr. 55 (9): B.A.S.I.C. S.250. 1973; Moldenke, Phytologia 25: 230 (1973) and 29: 203. 1974; Hocking, Excerpt. Bot. A.23: 292. 1974.

This variety differs from the typical form of the species in having its basal leaves mostly to 6 cm. long and the peduncles 12—17 cm. long. It is based on Irwin, Harley, & Smith 32982 from a campo in an area of campo with cerrado on outcrops, about 25 km. north of Alto de Paraíso, altitude 2150 m., in the Chapada dos Vedeiros, Goiás, Brazil, collected on March 22, 1971, and deposited in my personal herbarium. The collectors describe it as a rosette herb, the inflorescence up to 20 cm. tall, and the heads white. The Irwin, Harley, & Onishi 29319, distributed as this variety, is actually Eriocaulon ligulatum (Vell.) L. B. Sm.

Citations: BRAZIL: Goiás: Irwin, Harley, & Smith 32982 (Z—type).

SYNGONANTHUS DENSIFOLIUS var. PILOSIOR Alv. Silv., Fl. Mont. 1: 320—321. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 320—321 & 417. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke in Dawson, Los Angeles Co. Mus. Contrib. Sci. 7: 5 & 6. 1957; Moldenke, Résumé 106 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971.

Illustrations: Moldenke in Dawson, Los Angeles Co. Mus. Contrib. Sci. 7: 5. 1957.

This variety differs from the typical form of the species in "Folia ramea utrinque pilosa et vaginas molliter et glanduloso pubescentes". It is based on A. Silveira 663 from "In campis arenosis prope Diamantina", Minas Gerais, Brazil, collected in

April, 1908, and deposited in the Silveira herbarium. Hatschbach encountered it on sandy campos, at 1200 m. altitude, flowering and fruiting in May.

The Irwin, Reis dos Santos, Souza, & Fonsêca 24648, identified as var. pilosior and so distributed in some herbaria, actually represents the typical form of S. densifolius Alv. Silv.

Citations: BRAZIL: Goiás: E. Y. Dawson 14639 (Z); Hatschbach 36814 (Ld). Minas Gerais: Hatschbach 27407 (Ld, S).

SYNGONANTHUS DENSUS (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 253. 1903.

Synonymy: Paepalanthus densus Körn. in Mart., Fl. Bras. 3 (1): 464. 1863. Dupatya densa (Körn.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya densa Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus densus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 299, 462, 464—465, & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 244, 253, 289, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 417. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 29, 47, & 57. 1946; Moldenke, Phytologia 2: 492. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Phytologia 3: 277 (1950) and 4: 304. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 106, 279, 324, & 491. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 401. 1960; Moldenke, Résumé Suppl. 12: 12. 1965; Moldenke, Fifth Summ. 1: 173 & 479 (1971) and 2: 580, 636, & 961. 1971.

This species is based on G. Gardner 4385 from somewhere in Goiás and Weddell 2127 from sandy marshy places near Salinas, Goiás, Brazil, deposited in the herbarium of the Botanischer Garten und Museum in Berlin where Macbride photographed the Gardner collection as his type photograph number 10681. Ruhland (1903) cites only these two collections and comments that the "Species cum S. gracili valde affinis, sed robustior quam illa, foliorum indumento et forma anguste spathulata insignis". Silveira (1928) cites A. Silveira 612 from Piauí.

Recent collectors describe S. densus as an acaulescent tufted herb, 6—8 cm. tall, "green at base, stems fertile, brown-white at tip", with cream-colored heads, and have encountered it on exposed white sand, "on terra firme of open campina", "in campina caatinga", "in white sand campinas", and in wet sand by streams in areas of rocky hillsides with wet sandy meadows in depressions, the area cut by streams, at an altitude of 1180 meters, flowering and fruiting in March, April, June, and September.

Material has been misidentified and distributed in some herbar-

ia as S. kuhlmannii Moldenke.

Additional citations: BRAZIL: Amazônas: Ongley & Ramos P.21771 (Ld); Prance, Berg, Bisby, Steward, Monteiro, & Ramos 17932 (Ld); Prance, Coêlho, Harley, Kubitzki, Maas, Sastra, & Smith 11688 (Ld, N); Prance, Coêlho, & Monteiro 14843 (Ac, N); Prance, Pena, Forero, Ramos, & Monteiro 4790 (Ld, N); Prance, Philcox, Rodrigues, Ramos, & Farias 5144 (N, S, Z); Prance, Ramos, Farias, & Philcox 4834 (Ac, N, N, S). Goiás: W. R. Anderson 8220 (Ld, N); G. Gardner 4385 [Macbride photos 10681] (B—cotype, M—cotype, N—cotype, N—photo of cotype, W—936282—cotype, W—1066875—cotype, W—photo of cotype). Pará: Campbell, Ongley, Ramos, Monteiro, & Nelson P.22552 (Ld). MOUNTED ILLUSTRATIONS: notes & drawings by Körnicke (B).

SYNGONANTHUS DENSUS var. PUMILUS Moldenke, Phytologia 3: 277. 1950.

Bibliography: Moldenke, Phytologia 3: 277 (1950) and 4: 304. 1953; Moldenke, Résumé 107 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971.

This variety differs from the typical form of the species in having leaves only to 1 cm. long and peduncles to 5.5 cm. long. It is based on Lützelburg 20568, in part, from Passarão on the Rio Araricuera, Amazônas, Brazil, deposited in the Rio de Janeiro herbarium. Thus far the variety is known only from the original collection.

SYNGONANTHUS DIAMANTINENSIS Alv. Silv., Fl. Mont. 1: 315—317, pl. 200. 1928.

Synonymy: Syngonanthus diamantinus A. Silveira apud Worsdell, Ind. Lond. Suppl. 2: 426. 1941.

Bibliography: Alv. Silv., Fl. Mont. 1: 315—317 & 417, pl. 200. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Résumé 107 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971; Moldenke, Phytologia 34: 277. 1976.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 200. 1928.

This species is based on A. Silveira 638 from "In campis siccis arenosisque prope Diamantina", Minas Gerais, Brazil, collected in September, 1916, and deposited in the Silveira herbarium. Silveira (1928) notes that the "Species ob varios caracteres distinctissima". On page 417 of his work he cites "Baraunas" as the type locality. Thus far the species is known only from the type collection.

SYNGONANTHUS DROUETII L. B. Sm., Contrib. Gray Herb., ser. 2, 117: 34—35, pl. 2, fig. 41—43. 1937.

Synonymy: Paepalanthus drouetii L. B. Sm. ex Moldenke, Résumé

Suppl. 3: 34, in syn. 1962.

Bibliography: L. B. Sm., Contrib. Gray Herb., ser. 2, 117: 34-35 & 43, pl. 2, fig. 41—43. 1937; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 224. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Phytologia 4: 304. 1953; Moldenke, Résumé 107 & 491. 1959; Moldenke, Résumé Suppl. 3: 34. 1962; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 961. 1971; Moldenke, Phytologia 31: 386. 1975.

Illustrations: L. B. Sm., Contrib. Gray Herb., ser. 2, 117: pl. 2, fig. 41—43. 1937.

This species is based on Drouet 2112 from sandy banks and flats 4 km. south of Vigia, Pará, Brazil, and deposited in the Gray Herbarium of Harvard University. Smith (1937) comments that "The strikingly large inner bracts of its involucre distinguish Syngonanthus Drouetii from such near relatives as S. simplex and S. gracilis. In fact its habit much more closely resembles that of S. niveus in the Section Eulepis than it does that of any species in its own section." I would add that it is most disconcertingly similar in habit and general appearance to S. tenuis (H.B.K.) Ruhl., with which taxon I united it in a previous publication (1962), but the latter does not have the capitate-glandular hairs on the uppermost part of its peduncles.

Recent collectors describe S. drouetii as an herb, with white flower-heads, and have found it growing in wet sand and on sandy floodplains with scattered shrubs and small trees, partly inundated by runoff water in season and on wet campos in areas of sandy cerrado and adjacent marshy campo near streams, at altitudes of 140—200 meters, flowering and fruiting in February. Material has been misidentified and distributed in some herbaria as S. tenuis (H.B.K.) Ruhl. and as Paepalanthus sp.

Citations: BRAZIL: Amazônas: Murça Pires, Cavalcante, Magnago, & Silva 14452 [Murça Pires & al. 14434] (W—2740220), Pará: W. R. Anderson 10683 (Ld, N), 10929 (N, Z); Drouet 2112 (Mi—isotype, Z—isotype).

SYNGONANTHUS DUIDAE Moldenke, Phytologia 2: 352 & 381, nom. nud. 1947; Fieldiana Bot. 28: 127—128. 1951.

Bibliography: Moldenke, Phytologia 2: 352 & 381. 1947; Moldenke, Alph. List Cit. 3: 975. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 65 & 213. 1949; Moldenke, Fieldiana Bot. 28: 127—128. 1951; Moldenke, Phytologia 4: 304. 1953; J. A. Steyerm., Fieldiana Bot. 28: 1158. 1957; Moldenke, Résumé 73 & 491. 1959; G. Taylor, Ind. Kew. Suppl. 12: 138. 1959; J. A. Steyerm., Act. Bot. Venez. 1: 247. 1966; Moldenke, Fifth Summ. 1: 127 (1971) and 2: 961. 1971.

This species is based on J. A. Steyermark 58199 from around a small stream on dry rocky slopes, summit of Mount Duida, at 1700—1800 m. altitude, Brocchinia Hills, Amazonas, Venezuela, collected on September 1, 1944, deposited at the New York Botanical Garden.

Thus far the species is known only from the original collection.

SYNGONANTHUS EBURNEUS Körn.) Ruhl. in Engl., Pflanzenreich 13 (3-40): 278. 1903.

Synonymy: Paepalanthus eburneus Körn. in Mart., Fl. Bras. 3 (1): 430. 1863. Dupatya eburnea (Körn.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya eburnea Kuntze apud Durand & Jacks., Ind. Kew. Supp. 1, imp. 1, 145. 1902. Syngonanthus eburneus Ruhl. apud Prain, Ind Kew. Suppl. 3: 175. 1908.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 430—431 & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 276, 278, 289, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 29, 47, & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 107, 280, 324, & 491. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 401. 1960; Moldenke, Fifth Summ, 1: 173 & 480 (1971) and 2: 581 & 962. 1971; Moldenke, Phytologia 34: 259. 1976.

This species is based on Blanchet 2441 from Bahia, Brazil, deposited in the herbarium of the Botanisches Museum in Berlin. An isotype in the Delessert Herbarium at Geneva was photographed there by Macbride as his type photograph number 25166. Ruhland (1903) cites only the original collection. More recent collectors describe the species as a plant with small rosettes of dark-green leaves and the flower-heads white or "off-white". They have found it growing in restingas by the sea, at sealevel, flowering and fruiting in March and also fruiting in November. Hatschbach encountered it "nas pedras da base do salto". Belém & Pinheiro assert that the plants are only "4 cm. tall", but actually their own specimens have peduncles to 18 cm. tall.

Ruhland's key (1903) to this species and what he regarded as its closest relatives is well worth repeating here:

1. Pedunculi stricti.
  2. Folia densissima.
    3. Pedunculi glabri; folia supra albido-pubescentia, ibique leviter canaliculata.....S. eburneus.
    3a. Pedunculi appresso-pubescentes.
      4. Vaginae oblique fissae; folia supra canaliculato-concava, glabra, subtus leviter convexa et densissimo lanugine alto-tomentosa.....S. cipoënsis.
      4a. Vaginae transverse truncatae; folia margine pubescente excepto glabra, plana.....S. caespitosus.
  2a. Folia pauca, elongata; pedunculi juventute levissime puberuli, cito glabri.....S. circinnatus.
1a. Pedunculi flexuosi; vaginae late costatae.....S. imbricatus.

Citations: BRAZIL: Bahia: Belém & Pinheiro 2441 (N); Blanchet 2441 [Macbride photos 25166] (N—photo of isotype, N—photo of isotype, W—photo of isotype); Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 17149 (Z). Mato Grosso: Hatschbach 37620 (Ld).

SYNGONANTHUS EGLERI Moldenke, Phytologia 7: 121—122. 1960.

Bibliography: Moldenke, Biol. Abstr. 35: 2177. 1960; Moldenke, Phytologia 7: 121—122. 1960; Moldenke, Résumé Suppl. 2: 5 & 15. 1960; Hocking, Excerpt. Bot. A.4: 593. 1962; G. Taylor, Ind. Kew. Suppl. 13: 132. 1966; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 962. 1971.

Citations: BRAZIL: Pará: Egler & Raimundo s.n. [W. A. Egler 818; Herb. Mus. Goeldi 23634] (Bd—12291—isotype, Z—type).

SYNGONANTHUS ELEGANS (Bong.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 275. 1903.

Synonymy: Eriocaulon elegans Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 635. 1831. Paepalanthus elegans (Bong.) Kunth, Enum. Pl. 3: 527. 1841. Paepalanthus elegans Kunth apud Körn. in Mart., Fl. Bras. 3 (1): 435. 1863. Paepalanthus elegans var. α Körn. in Mart., Fl. Bras. 3 (1): 435. 1863. Dupatya elegans (Bong.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya elegans Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus elegans (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 293. 1903. Syngonanthus elegans Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Syngonanthus elegans Kunth ex Moldenke, Phytologia 4: 304, in syn. 1953. Paepalanthus elegans Mart. ex Moldenke, Résumé 324, in syn. 1959. Syngonanthus elegans var. rufescens Ruhl. ex Moldenke, Résumé 351, in syn. 1959. Syngonanthus elegans var. superbus Glaz. ex Moldenke, Résumé Suppl. 12: 12, in syn. 1965.

Additional bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 635. 1831; Bong., Ess. Monog. Erioc. 35 (1831) & 62—63, pl. 13. 1832; Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 2 (3): 225—226, pl. 13. 1832; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 527, 579, 613, & 624. 1841; D. Dietr., Syn. Pl. 5: 262. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 281 & 333. 1855; Körn. in Mart., Fl. Bras. 3 (1): 285, 309, 435, 437, & 507. 1863; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 877 & 878 (1893) and imp. 1, 2: 401. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 271, 274, 275, 285, 290, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Alv. Silv., Fl. Mont. 1: 417. 1928; Stapf, Ind. Lond. 3: 90. 1930; E. J. Alexander, Journ. N. Y. Bot. Gard. 36: 221. 1935; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Abbiatti, Rev. Mus. La Plata Bot., ser. 2, 6: 312, 319, 322, & 336—340, fig. 9 & 10. 1946; Jacks. in

Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 877 & 878 (1947) and imp. 2, 2: 401. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 29, 34, 47, & 57. 1946; Moldenke, Phytologia 2: 377, 380, & 381. 1947; Abbiatti, Notas Mus. La Plata Bot. 13: 311. 1948; Moldenke, Alph. List Cit. 3: 731. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Phytologia 4: 304 & 311—312. 1953; Hocking, Dict. Terms Pharmacog. 284. 1955; Mendes Magalhães, Anais V Reun. Anual Soc. Bot. Bras. 276—277, 280—281, 293, & 302, fig. 15. 1956; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 107, 222, 280, 287, 324, 351, & 491. 1959; Moldenke, Résumé Suppl. 1: 20. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 877 & 878 (1960) and imp. 3, 2: 401. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Moldenke, Résumé Suppl. 12: 12. 1965; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 149, 160—163, 173, 174, 186, 187, & 189. 1969; Forstner, Verh. Zool.-bot. Ges. Wien 112: 89—91. 1972; Moldenke, Phytologia 26: 247. 1973; Wedge, Pl. Names, ed. 1, 18 (1973) and ed. 2, 24 & 26. 1974; Widder, Excerpt. Bot. A.24: 329. 1974; Anon., Biol. Abstr. 61: AC1.718. 1976; Moldenke, Phytologia 33: 25 (1976) and 35: 303, 337, 342, & 349. 1977.

Illustrations: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 2 (3): [Ess. Monog. Erioc.] pl. 13. 1832; Abbiatti, Rev. Mus. La Plata Bot., ser. 2, 6: [337] & 338, fig. 9 & 10. 1946; Mendes Magalhães, Anais V Reun. Anual Soc. Bot. Bras. fig. 15. 1956; Forstner, Verh. Zool.-bot. Ges. Wien 112: 90. 1972.

This species is based on L. Riedel 1035 from sandy rather moist places in the Serra da Lapa, Minas Gerais, Brazil, flowering in November, and probably deposited in the Leningrad herbarium. This collection is also the type of Paepalanthus elegans var. α Körn.; var. β is a synonym of var. elanatus Ruhl. It is interesting to note that Kunth (1841) cites the type collection as from "In arenosis siccis Serra da Lapa", but Bongard (1831) says "Habitat in arenosis subhumidis Serra da Lapa". The type of var. superbus is Glaziou 20012, also from Minas Gerais.

The dried and dyed inflorescences of this species are exported from Brazil in large quantities and are sold in American and European markets for use in dried flower arrangements under the names, "Brazilian everlasting", "star-flower", "sky-rocket", and "Glixie"; in Brazil they are called "flore de Diamantina", "sempreviva", "sempreviva de Diamantina", "sempre-viva mini-saia", "sempre-viva pé liso", "sempre-viva pé-de-ouro", or "sempervarium". They became common in Vienna flower-shops in 1969.

Recently Rhynchospora globosa is appearing in the trade and is treated there very much like S. elegans with a remarkable superficial resemblance to it. The Syngonanthus material is marketed as "dyed-dry-bouquet" material by Associated Marketing Products, Broomfield, Colorado, and is alleged (correctly) to come from Minas Gerais. It takes vegetable dyes well and is sold in many colors. In Canada it was sold (in 1969) at the rate of 50 cents for 100 stems in novelty flower-shops in Ottawa supplied "by a wholesaler

in Montreal".

Ruhland (1903) cites from Minas Gerais Glaziou 20012, Riedel 1035, Schwacke 8502, and Sena s.n. [Herb. Schwacke 14552]. Silveira (1928) cites A. Silveira 449 from the Serra do Cipó, also in Minas Gerais, collected in 1905.

Recent collectors have found S. elegans growing on sandy campos and in sand and fine gravel on open summits, at altitudes of 400—1300 meters, flowering and fruiting in March, April, August, and December, flowering also in November. They refer to the plant as a perennial tufted or cespitose herb, 20—50 cm. tall, the peduncles to 50 cm. long, and the flower-heads white. It bears close habital similarity with S. barbatus Alv. Silv., S. candidus Alv. Silv., S. elegantulus Ruhl., and S. niveus (Bong.) Ruhl.

Herbarium material of S. elegans has been misidentified and distributed in some herbaria as S. elegantulus and S. niveus. On the other hand, the M. A. Chase 10369, distributed as S. elegans, is actually var. elanatus Ruhl., while Mendes Magalhães 6023 [Herb. Jard. Bot. Belo Horiz. 48280] is S. elegantulus Ruhl.

Additional citations: BRAZIL: Minas Gerais: M. A. Chase 10355 (Mi, W—1495687); Glaziou 20012 (W—1124167); Hatschbach 30210 (Ld); Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28211 (Ld, N, W—2759022); A. Lutz 1580 [Herb. Lutz 1580] (Le); Maguire, Mendes Magalhães, & Maguire 49135 (N); Mexia 5735 (Ca—509145, Go, Mi, Mu, Ut—502414, W—1571899); L. Riedel 1035 (B—isotype, M—isotype, Ut—400-isotype); R. E. Russell s.n. [December 1969] (Bl—243439); J. B. Silva 568 [Herb. Set. Lag. 705] (Ba), 584 [Herb. Set. Lag. 721] (Ac, Ba), 594 [Herb. Set. Lag. 731] (Ba, Ld); Vauthier 63 (B, Mi); L. O. Williams 8145 (W—1933086); Williams & Assis 6911 (Ca—744434, N, Vi, W—1932844). COMMERCIALLY MARKETED: Austria: Forstner s.n. [Vienna, Feb. 6, 1970] (Ac). Brazil: Moldenke & Moldenke 19938 (Cb, Fy, Hk, Le, Sm, Ss). Canada: Dore s.n. [18 Nov. 1969] (Ac). MOUNTED ILLUSTRATIONS: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 2 (3): pl. 13. 1832 (N, Z); drawings by Körnicke (B).

SYNGONANTHUS ELEGANS var. CANESCENS Alv. Silv., Fl. Mont. 1: 365. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 365 & 417. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Résumé 107 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 962. 1971.

This variety differs from the typical form of the species in having the leaves densely covered with white spreading-erect hairs and the sheaths conspicuously longer than the leaves.

The type of the variety is A. Silveira 650, collected "In cam-

pis arenosis in serra do Cipó", Minas Gerais, Brazil, in April, 1918, and deposited in the Silveira herbarium. On page 417 of his work (1928) Silveira gives "1915" as the date of collection. Thus far the variety is known only from the original collection.

SYNGONANTHUS ELEGANS var. ELANATUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 275. 1903.

Synonymy: Paepalanthus elegans var. β Körn. in Mart., Fl. Bras. 3 (1): 435. 1863. Syngonanthus elegans var. elanata Ruhl. ex Alv. Silv., Fl. Mont. 1: 417. 1928.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 435. 1863; Ruhl. in Engl., Pflanzenreich 13 (4-30): 275 & 290. 1903; Alv. Silv., Fl. Mont. 1: 417. 1928; Moldenke, Known Geogr. Distrib. Erioc. 17, 47, & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Phytologia 4: 312. 1953; Moldenke, Résumé 107, 324, 351, & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 581, 636, & 962. 1971.

Ruhland's original description of this taxon is "Differt a typo foliis basi non rufescenti-lanatis ibique glabriusculis vel albo-puberulis". He based it on G. Gardner 5283 and Glaziou 20013 from Minas Gerais, Brazil.

Recent collectors refer to this plant as cespitose, the inflorescence to 15 cm. tall [but on one specimen seen by me of the Irwin & al. 22019 collection whose label is so inscribed the inflorescences are at least 34 cm. tall!], and the heads white or cream-color. They have found it growing at 1050—1700 m. altitude, flowering in December and January and in fruit in January, and record the vernacular name, "sempre-viva" or "sempreviva". Mrs. Chase encountered the plant "in moist sand under overhanging rock on open rocky slope", while Irwin and his associates report it from "wet campo in area of sandy and gravelly campos and cerrado on outcrops" and "campo in area of grassy meadows and adjacent sandy campos". Silveira (1928) cites A. Silveira 649 from the Serra do Cipó, collected in 1909.

Material has been misidentified and distributed in some herbaria as typical S. elegans (Bong.) Ruhl. as well as S. elegantulus Ruhl., and S. niveus (Bong.) Ruhl. and even as "Paepalanthus sp. nov." On the other hand, the Hatschbach & Ahumada 31286 and Irwin, Harley, & Onishi 29129, distributed as S. elegans var. elanatus, are actually S. elegantulus Ruhl., while G. Gardner 5282 and L. Monteiro de Sousa 39 [Herb. Cent. Pesq. Florest. 6209] are S. niveus (Bong.) Ruhl.

Additional citations: BRAZIL: Minas Gerais: M. A. Chase 10369 (W—1495694); A. P. Duarte 7569 [Herb. Brad. 27317] (Bd—27317, N); G. Gardner 5283 (N—cotype); Glaziou 16395 (N, N—photo), 16398 (N); Irwin, Onishi, Fonsêca, Souza, Reis dos Santos, & Ramos 25459 (N); Irwin, Reis dos Santos, Souza, & Fonsêca 22019 (N); Windisch & Ghillány 214 [Herb. Brad. 61220] (Bd, Ja—61220, (Ld).

SYNGONANTHUS ELEGANTULUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 273--274. 1902.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 271, 273--274, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Mem. Inst. Oswaldo Cruz 7: 31. 1915; Moldenke, Known Geogr. Distrib. Erioc. 17 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Phytologia 4: 312. 1953; Mendes Magalhães, Anais V Reun. Anual Soc. Bot. Bras. 293. 1956; Moldenke, Résumé 107 & 491. 1959; Moldenke, Résumé Suppl. 12: 4. 1965; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 962. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 1162 & ind. 28. 1972; Moldenke, Phytologia 35: 349. 1977.

This species was based by Ruhland (1903) on four collections: Glaziou 16396, 17839, & 17840 from dry campos "nahe dem Gipfel der Serra de São João d'El Rei", Minas Gerais, and Schwacke 12108 from sandy places in the same locality, altitude 980 m., where it is said to be very abundant, collected in December, 1895, all deposited in the Berlin herbarium.

Recent collectors describe this plant as cespitose, the inflorescences to 15 cm. tall, and the heads white, and have found it growing in sandy soil among rocks, in wet places, and in wet, flat, sandy places with sparse grass cover. Irwin and his associates found it in campo "In an area of grassy meadows and adjacent sandy campo" and "in sand beneath overhanging rocks on a sandstone summit with soil-filled cracks and depressions and adjacent precipices and a steep valley". Mendes Magalhães encountered it "in sandy soil with quartz fragments with carpet of herbs and sparse shrubs"; Hatschbach & Ahumada found it "de solo arenoso junto as rochas do alto de morro". Ascencão comments that it is a "planta herbácea de pequeno porte, flores brancas, folhas tenras e pequenas", while Occhioni found it in a "restinga parte alagada". It has been found growing at altitudes of 980--1950 m., flowering from December to February, April, June, August, and September, and fruiting in January, February, and August.

Ruhland (1903) comments that the "Species vaginis rutilantibus farinaceo-puberulis insignis, S. eleganti proxima, sed jam pr. c. statura humiliore, indumento persistentiore, foliis basi non lanatis ab illo differt". It certainly seems closely related also to S. candidus Alv. Silv. and S. niveus (Bong.) Ruhl.

It is worth noting here that the Angely (1972) publication referred to in the bibliography above is often cited as "1970", the title-page date, which is erroneous.

Material of this species has been misidentified and distributed in some herbaria as S. elegans (Bong.) Ruhl., S. elegans var. elanatus Ruhl., S. niveus (Bong.) Ruhl., S. pauper Ruhl., S. tenuis (H.B.K.) Ruhl., Paepalanthus fischerianus Körn., and P. niveus Kunth. On the other hand, the Glaziou 16398 and Irwin, Onishi, Fonsêca, Souza, Reis dos Santos, & Ramos 25459, distributed as S. elegantulus, are actually S. elegans var. elanatus Ruhl.,

while Mendes Magalhães 6022 [Herb. Jard. Bot. Belo Horiz. 48279] is S. niveus (Bong.) Ruhl.

Additional citations: BRAZIL: Guanabara: Ascenção s.n. [Herb. Fac. Nac. Farmac. 7992] (Ld); Occhioni 2266 [Herb. Fac. Nac. Farmac 7969] (Ld). Minas Gerais: Emygdio, Duarte, Becker, & Silva Santos 3554 (N); Glaziou 16396 [Macbride photos 10682] (N—photo of cotype, W--photo of cotype), 17839 (B—cotype), 17840 (B—cotype), 17841 (W--1124157); Hatschbach & Ahumada 31286 (Ld, N, W—2706691); Irwin, Harley, & Onishi 29129 (Ld, N); Irwin, Reis dos Santos, Souza, & Fonsêca 22019 (N, Z); A. Lutz 135 (Ja); Magalhães Gomes 66 [Herb. Jard. Bot. Belo Horiz. 26610, in part] (N); Mendes Magalhães 6023 [Herb. Jard. Bot. Belo Horiz. 48280] (Ld); E. Pereira 3157 [Pabst 3992; Herb. Brad. 3833] (Ld, Z); Segadas-Vianna 6006 (Ja); Schultes & López 10308 (N); Souza Araujo 43 [Herb. Lutz 2107] (Ja). São Paulo: Glaziou 15549 (W—1123532); Regnell III.1265 [3/1857] (W—2007144).

SYNGONANTHUS ENSIFOLIUS Alv. Silv., Fl. Mont. 1: 383—385, pl. 244. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 383—385 & 417, pl. 244. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Résumé 107 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 962. 1971; Moldenke, Phytologia 35: 337. 1977.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 244. 1928.

This species is based on A. Silveira 580 from "In campis arenosis prope Bandeirinhas, in Serra do Cipó", Minas Gerais, Brazil, collected in April, 1909, and deposited in the Silveira herbarium. Silveira (1928) notes that the "Species propter folia ensiformia dense rosulata valde insignis". It should be noted that in his text Silveira refers to "Tabula CCXLV" as illustrating this species, but the plate that actually does so is labeled "TABULA CCXLIV" — plate 245 depicts S. dealbatus Alv. Silv.

Thus far, S. ensifolius is known only from the original collection.

SYNGONANTHUS ERECTIFOLIUS Alv. Silv., Fl. Mont. 1: 365--366, pl. 231. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 365—366 & 417, pl. 231. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew, Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Résumé 107 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 962. 1971; Moldenke, Phytologia 35: 335. 1977

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 231. 1928.

This species is based on A. Silveira 666 from "In campis arenosis ad Pico do Itambé", Minas Gerais, Brazil, collected in April, 1918, and deposited in the Silveira herbarium. On page 417 of his work (1928) Silveira gives "Diamantina" as the type locality. It should also be noted that in his text he refers to plate 232 as illustrating this species, while the plate that actually does so is labeled "CCXXXI" — plate 232 illustrates S. venustus Alv. Silv. He comments that S. erectifolius "A. S. venusto Alv. Silv. foliis 5-nervis obtusissimisque praecipue differt."

SYNGONANTHUS ERIOPUS Alv. Silv., Fl. Mont. 1: 362—363, pl. 229. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 362—363 & 417, pl. 229. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Résumé 107 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 962. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 229. 1928.

This species is based on A. Silveira 667 from "In campis arenosis prope Barauna", Minas Gerais, Brazil, collected in April, 1918, and deposited in the Silveira herbarium. In his text Silveira (1928) refers to "Tabula CCXXX" as illustrating this species, but the plate which does so is labeled "TABULA CCXXIX" — plate 230 actually represents S. arthrotrichus Alv. Silv. On page 417 he cites "Baraunas" as the type locality. Thus far the species is known only from the original collection.

SYNGONANTHUS ERIOPUS var. APPRESSUS Alv. Silv., Fl. Mont. 1: 363 [as "appressa"]. 1928.

Synonymy: Syngonanthus eriopus var. appressa Alv. Silv., Fl. Mont. 1: 363. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 363 & 417. 1928; Moldenke, Known Geogr. Distrib. Erioc. 18 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Résumé 107, 351, & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 636 & 962. 1971.

This variety "Differt pedunculis appresso-pubescentibus" from the typical form of the species and is based on A. Silveira 668 from "In campis prope Diamantina", Minas Gerais, Brazil, collected in April, 1918, and deposited in the Silveira herbarium. Silveira (1928) comments that it "A. S. arthrotricho Alv. Silv. indumento pedunculorum, foliis multo longioribus et ejus basi longe ciliata praecipue differt". Thus far it is known only from the original collection.

SYNGONANTHUS EUSCHEMUS Ruhl. in Engl., Pflanzenreich 13 (4-30): 274. 1903.

Synonymy: Paepalanthus euschemus Ruhl. ex Moldenke, Résumé Suppl. 1: 20, in syn. 1959.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 3, 271, 274, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 41. 1930; Moldenke, Known Geogr. Distrib. Erioc. 18 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Phytologia 4: 312. 1953; Moldenke, Résumé 107 & 491. 1959; Moldenke, Résumé Suppl. 1: 20. 1959; Moldenke, Phytologia 20: 306. 1970; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 582 & 962. 1971; Moldenke, Phytologia 26: 483 (1973), 33: 39 (1976), and 35: 24. 1976.

This species is based on Glaziou 22300 and 22301 from "zwischen Rio Torto und Ponte de Paranana, auf trockenen Campos...blühend im Mai und November", Goiás, Brazil, deposited in the herbarium of the Botanisches Museum in Berlin where the former was photographed by Macbride as his type photograph number 10683. It should be noted that Ruhland (1903) cites only these two cotype collections — he does not cite Glaziou 22303, annotated by him as S. euschemus in the Berlin herbarium, but which (at least as to the Brussels specimen) is Paepalanthus albo-villosus Alv. Silv.

Recent collectors describe S. euschemus as an herb having inflorescences to 20 cm. tall and white flower-heads and have found it growing in "campo and cerrado" and in "campo limpo on sandy soil wet in some places", at an altitude of 1250 m., flowering from March to May and in November. The Irwin, Grear, Souza, & Reis dos Santos 13298, cited below, is a mixture with Paepalanthus elongatus f. graminifolius Herzog.

Additional citations: BRAZIL: Goiás: W. R. Anderson 8039 (Ld, N); Glaziou 22300 [Macbride photos 10683] (B--cotype, N--photo of cotype, W--photo of cotype), 22301 (B--cotype, W--1112538--cotype); Irwin, Grear, Souza, & Reis dos Santos 13253 (N, W--2759021, Z), 13298, in part (Ld, N).

SYNGONANTHUS FERRENSIS Alv. Silv., Fl. Mont. 1: 355--356, pl. 225. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 355--356 & 417, pl. 225. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Résumé 107 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 962. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 225. 1928.

This species is based on A. Silveira 736, which, apparently, consists of two separate collections: (1) from "In humidis prope Lagoa do Ferro, altitudine 1.050 m. in vicinia urbis Patrocinio" and (2) "in humidis prope Milho Verde, in Serra do Espinhaço", Minas Gerais, Brazil, the former collected in September, 1924, and

the latter in June, 1925, both deposited in the Silveira herbarium. Curiously, on page 417 of his work Silveira (1928) cites his no. 736 as only from Lagoa do Ferro, collected in 1924. Worsdell (1941) cites plate "224" as illustrating this species, crediting 225 to S. pauciflorus Alv. Silv., but both in his text and under the plate Silveira plainly gives "CCXXV" as the number of the illustration of S. ferrensis. He comments that the "Species a S. inundato caespite foliorum in apice caulis praecipue differt; a S. paraensis foliis angustioribus, sepalis floris masculis acutis (haud obtusis), pedunculis multo majoris et aliis characteribus distinguitur". Thus far it is known only from the original collections.

SYNGONANTHUS FERTILIS (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 263. 1903.

Synonymy: Paepalanthus fertilis Körn. in Mart., Fl. Bras. 3 (1): 448--449, pl. 58, fig. 1. 1863. Dupatya fertilis (Körn.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya fertilis Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus fertilis Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908.

Additional bibliography: Körn. in Mart., Fl. Bras. 3 (1): 448-449, 500, & 507, pl. 58, fig. 1. 1863; Benth. & Hook. f., Gen. Pl. 3 (2): 1023. 1883; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 3, 246, 263, 290, & 293. 1903; Prain, Ind. Kew. Suppl. 3: 175. 1908; Stapf, Ind. Lond. 4: 518. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 18, 29, 48, 57, & 60. 1946; Moldenke, Phytologia 2: 352. 1947; Moldenke, Known Geogr, Distrib. Verbenac., [ed. 2], 65, 91, & 213. 1949; Moldenke, Phytologia 4: 312—313. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Resumé 73, 107, 280, 325, & 491. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Moldenke, Résumé Suppl. 3: 14. 1962; Moldenke, Fifth Summ. 1: 127, 173, & 480 (1971) and 2: 582 & 962. 1971; Moldenke, Phytologia 28: 437 (1974), 34: 257 (1976), and 35: 358. 1977.

Illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl. 58, fig. 1. 1863.

Anderson refers to this plant as an herb and found it in wet sand of grassy hillside campo, while Oldenburger and his associates report it "common" on a "savanna in transition of fine white sand to moist fine sand and clay" and report the vernacular name, "türepanaimo". It has been found growing at 300—1250 m. altitude, flowering in April, July, November, and December and fruiting in November. Duke 8009 is very similar in habit and appearance to S. humboldtii (Kunth) Ruhl., an obviously very closely related species. Ruhland (1903) cites only the original cotypes, G. Gardner 2960 and 4062 from Piauí and Weddell 3397 from Mato Grosso,

Brazil, commenting that the species "Habitu quasi inter duas praecedentes [S. verticillatus (Bong.) Ruhl. and S. humboldtii (Kunth) Ruhl.] media".

Gardner 2960 is cited by Körnicke (1863) under what he called Paepalanthus caulescens var. b subvar. ζ Körn., a taxon now reduced to synonymy under typical Syngonanthus caulescens (Poir.) Ruhl.

Material has been misidentified and distributed in some herbaria under the name Paepalanthus caulescens Kunth. On the other hand, the Oldenburger, Norde, & Schulz ON.558, distributed as S. fertilis, seems better placed as S. humboldtii (Kunth) Ruhl.

Additional citations: BRAZIL: Amazônas: Murça Pires 80 [Herb. IPEAN 15059] (Ld). Goiás: W. R. Anderson 8130 (Ld, N); Mattos 364 [Herb. Fac. Nac. Farmac. 7741] (Ld); Murça Pires & Mattos 9843a (Lw); Murça Pires, Silva, & Souza 9843a (N); Onishi, Barroso, & Maia 104 (Ld); A. Saint-Hilaire C1.712 [U. S. Nat. Herb. photo 5901] (N--photo, P, P). Mato Grosso: Malme 3342 (Ca--524502, W--1483484). Piauí: G. Gardner 2960 (B--cotype, N--cotype). Pará: Ducke 8009 (Gl), 11328 (Bs), 12025 (Z); W. A. Egler 275 (Bs); Egler & Raimundo s.n. [W. A. Egler 948; Herb. Mus. Goeldi 23630] (Bd--12295, Mm); Fróes 29815 (Be--79771, Le); Goeldi 15065 (Bs); Murça Pires, Black, Wurdack, & Silva 6078 (N), 6108 (N), 6188 (N); Sick B.667b [Herb. Brad. 4617] (Bd), B.669a [Herb. Brad. 4613] (Bd), s.n. [Herb. Brad. 4705] (Bd); Travessos s.n. [Serra do Cachimbo, VI.1956; Herb. Brad. 21100] (Lw). MOUNTED ILLUSTRATIONS: Körn. in Mart., Fl. Bras. 3 (1): pl. 58, fig. 1. 1863 (B, N, Z); drawings by Körnicke (B, B).

SYNGONANTHUS FILIPES Alv. Silv., Fl. Mont. 1: 323--324, pl. 205. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 323--324 & 417, pl. 205. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 477--478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Worsdell, Ind. Lond. Suppl. 2: 426. 1941; Moldenke, Known Geogr. Distrib. Erioc. 18 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91 & 213. 1949; Moldenke, Résumé 107 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 962. 1971.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 205. 1928.

This species is based on A. Silveira 547 from "In campis arenosis in Serra do Cipó", Minas Gerais, Brazil, collected in April of 1909 and deposited in the Silveira herbarium. Silveira (1928) says of it: "Ab affinimus forma et colore bractearum involucrantium praecipue differt".

Citations: BRAZIL: Minas Gerais: Murça Pires & Black 3310 (Be--63756).

SYNGONANTHUS FISCHERIANUS (Bong.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 256—257. 1903.

Synonymy: Eriocaulon fischerianum Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 627. 1831. Paepalanthus nardifolius Kunth, Enum. Pl. 3: 532. 1841. Eriocaulon nardifolium Kunth ex Steud., Syn. Pl. Glum. 2: [Cyp.] 281. 1855. Paepalanthus fischerianus (Bong.) Körn. in Mart., Fl. Bras. 3 (1): 455. 1863. Paepalanthus fischerianus Körn. in Mart., Fl. Bras. 3 (1): 455. 1863. Dupatya fischeriana (Bong.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Eriocaulon nardifolium Steud. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 878, in syn. 1893. Dupatya fischeriana Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902 [not D. fischeriana Kuntze, 1903]. Syngonanthus fischerianus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Syngonanthus breviramosus C. Diogo, Bol. Mus. Nac. Rio Jan. 1: 28—29. 1923. Paepalanthus vaginatus Mart. ex Moldenke, Phytologia 4: 313, in syn. 1953 [not P. vaginatus Körn., 1863]. Syngonanthus fischerianus var. hatschbachii Moldenke, Phytologia 28: 403. 1974.

Bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., ser. 6, 1: 627. 1831; Bong., Ess. Monog. Erioc. 27. 1831; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 532, 575, 613, & 625. 1841; D. Dietr., Syn. Pl. 5: 262 & 267. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 279, 281, & 334. 1855; Körn. in Mart., Fl. Bras. 3 (1): 279, 455, 456, & 507. 1863; Körn. in Warm., Vidensk. Meddel. Naturh. Foren. Kjöbenh. 23: 315. 1871; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 878 (1893) and imp. 1, 2: 402. 1894; Kuntze, Rev. Gen. Pl. 3 (2): 329. 1898; Malme, Bih. Svensk Vet.-Akad. Handl. 27 (3), no. 11: 31. 1901; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 2, 28, 29, 245, 256—257, 285, 286, & 293. 1903; Beauverd, Bull. Herb. Boiss., ser. 2, 8: 299. 1908; Prain, Ind. Kew. Suppl. 3: 175. 1908; C. Diogo, Bol. Mus. Nac. Rio Jan. 1: 28—29. 1923; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 40. 1930; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 878 (1946) and imp. 2, 2: 402. 1946; Moldenke, Known Geogr. Distrib. Erioc. 17, 18, 29, 34, 37, 48, 51, 56, & 57. 1946; Moldenke, Phytologia 2: 374. 1947; Moldenke, Lilloa 14: 66. 1948; Moldenke, Alph. List Cit. 2: 460 & 627 (1948), 3: 956 & 968 (1949), and 4: 1015. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 91, 97, & 213. 1949; Moldenke, Phytologia 4: 313. 1953; Angely, Fl. Paran. 10: 15. 1957; Anon., U. S. Dept. Agr. Bot. Subj. Index 5: 4227. 1958; R. C. Foster, Contrib. Gray Herb. 184: 39. 1958; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Moldenke, Résumé 106, 107, 115, 280, 288, 290, 325, 326, 328, & 491. 1959; Angely, Fl. Paran. 16: 77. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 878 (1960) and imp. 3,

2: 402. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Angely, Fl. Paran. 17: 24. 1961; Angely, Fl. Anal. Paran., ed. 1, 201. 1965; Moldenke, Résumé Suppl. 12: 12 (1965) and 15: 5. 1967; Moldenke, Fifth Summ. 1: 173 & 480 (1971) and 2: 500, 507, 582, 586, 592, 636, & 962. 1971; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 6: 1162 & Ind. 20 & 28. 1972; Moldenke, Phytologia 25: 244 (1973), 28: 403 & 440 (1974), 31: 386 & 408 (1975), and 35: 260 & 448. 1977.

The type of this species is a D. Fischer unnumbered collection from Minas Gerais, Brazil, deposited in the Leningrad herbarium. Bongard's original (1831) description is "acaule; foliis caespitosis vagina brevioribus, linearibus acutis glabris; pedunculo solitario pubescente; vagina apice trifida. Tab. LIX. Habitat in provincia Minas Geraes. Floret..... ⊙ Mecum benevole communicavit cel. D. Fischer." The plate 59 to which he refers was never actually published and probably exists now only in the Leningrad library or herbarium.

Recent collectors describe this plant as an herb with white flowers and have encountered it on wet and on wet sandy campos, in swamps and soggy marshes, in swales and in berjo (wet sedge meadows), at altitudes of 700—1300 meters, flowering from September to February, and fruiting in February, May, September, November, and December. Hatschbach found it growing on a "campo alagadico", while Klein reports it from a "banhado de campo".

The type of Paepalanthus nardifolius is Sellow 4957 from "Brasilia meridionalis", deposited in the Berlin herbarium; that of Syngonanthus breviramosus is F. Müller 36 in the Rio de Janeiro herbarium and that of S. fischerianus var. hatschbachii is Hatschbach 32760 in the Moldenke herbarium. Jackson (1894), following the DeCandolle code of nomenclature, reduced S. fischerianus to synonymy under Paepalanthus nardifolius Kunth.

It should be noted that the Angely (1972) publication listed in the bibliography above is often cited as "1970", the title-page date, but was not actually published until 1972; similarly, the Malme (1901) work is sometimes cited as "1903". Angely gives the overall distribution of S. fischerianus as "Brasilia: do Amazonas até S[anta] C[atarina]". Foster (1958) records it from Bolivia, without citing a confirming specimen; Malme (1901) cites Regnell III.1263 [16/11/1864] from Minas Gerais; Körnicke (1871) cites Lund s.n. from São Paulo. Ruhland (1903) cites the following: Goiás: Glaziou 22298. Minas Gerais: Burchell 3782, Lhotzky s.n., Lund s.n., Mendonça 318, Raben s.n., Regnell III.1263, Sellow s.n., Widgren 823. Pernambuco: Martius s.n. São Paulo: Glaziou 7997, Lund s.n., L. Riedel 1478.

The R. S. Santos s.n. [12.9.63] collection, cited below, is a mixture with something non-eriocaulaceous. Material of S. fischerianus has been misidentified and distributed in some herbaria as S. widgrenianus (Körn.) Ruhl. [a species which it closely resembles] and as Eriocaulon sp. On the other hand, the Regnell

III.1265 [3/1857], distributed as S. fischerianus, actually is S. elegantulus Ruhl., while Herb. Jard. Bot. Belo Horiz. 32594 & 45187, Kuntze s.n. [Ost Velasco, 200 m., VII.92] & s.n. [Mattogrosso, 200 m., VII.92], Mendes Magalhães 162, J. E. Oliveira 1317, Spruce s.n. [In vicinibus Santarem, Aug. 1850], J. Steinbach 5507, and Ule 7665 are S. gracilis var. aureus Ruhl.

Additional citations: BRAZIL: Minas Gerais: Lhotzky s.n. (B); Regnell III.1263 [16/11/1864] (W--200758); R. S. Santos s.n. [12.9.63] (Bd--28641); Sellow 4835 (B), 4957 (B), s.n. (B); Widgren 823 [6/12/1845] (W--936249). Paraná: A. Castellanos 21868 (Ja-126564); Dombrowski 2087 [Kuniyoshi 1812] (Ac), 2212 [Kuniyoshi 1956] (Ld); Dombrowski, Saito, & Pereira 826/616/210 (Ac); Hatschbach 1138 (N, Sp--84603), 5548 (Mm), 22510 (Ac, N), 30989 (Ld), 32760 (Z), 33474 (Ld); Hatschbach, Smith, & Klein 28247 (Ld); Mattos 4328 (N). Santa Catarina: Klein 3612 (Ld); Mello Filho 682 [Herb. Mus. Nac. Rio Jan. 49607] (Ld); F. Müller 36 (Ja--4819, Z--photo); Reitz & Klein 6104 [Herb. Barb. Rodr. 16289] (N, S, Sm), 10445 (Ac), 14230 (Ld); Smith & Klein 8260 (Z), 8536 (Ok), 13451 (W--2451594), 13685 (Ac), 13984 (W--2451597), 15476 (Ac); Smith & Reitz 8707 (N, Ok), 8911 (W--2248755). São Paulo: Bailey & Bailey 850 (Ba); Brade 6582 [Herb. Inst. Biol. S. Paulo 6582; Herb. Coll. 5532] (Mu, N); W. Hoehne 766 (N); Leite 3901 (N), s.n. [Campos do Jordão, V.1950] (N); Martius s.n. [ad aquas puras prope Ypanema, Decembri 1817] (Mu); Moldenke & Moldenke 19644 (B, Es, F, Fy, Lg, Lm, Mg, Mr, N, No, Ot, Rs, S, Sm, Ss), 19909 (Es, N); Pabst 5777 [Pereira 5950; Herb. Brad. 21960] (Lw); L. Riedel 1478 [Macbride photos 10684] (B, B, M, Mu, N--photo, Ut--401, W--photo). MOUNTED ILLUSTRATIONS: drawings by Kunth & Körnicke (B).

SYNGONANTHUS FLAVICEPS Alv. Silv., Fl. Mont. 1: 328--330, pl. 209. 1928.

Bibliography: Alv. Silv., Fl. Mont. 1: 328--330 & 417, pl. 209. 1928; Wangerin in Just, Bot. Jahresber. 57 (1): 478. 1937; Fedde in Just, Bot. Jahresber. 57 (2): 895. 1938; A. W. Hill, Ind. Kew. Suppl. 9: 271. 1938; Moldenke, Known Geogr. Distrib. Erioc. 18 & 57. 1946; Moldenke, Known Geogr. Distrib. Verbenav., [ed. 2], 91 & 213. 1949; Moldenke, Résumé 107 & 491. 1959; Moldenke, Fifth Summ. 1: 173 (1971) and 2: 962. 1971; Moldenke, Phytologia 35: 348, 438, & 439. 1977.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 209. 1971.

This species is based on A. Silveira 574 from "In campis arenosis in Serra do Cabral", Minas Gerais, Brazil, collected in May, 1910, and deposited in the Silveira herbarium. Silveira (1928) says of it: "A S. anthemidifloro (Bong.) Ruhl. praecipue differt colore capitulorum, indumento foliorum et forma bractearum involucrantium". It also has much the genetal appearance of S. canaliculatus Alv. Silv. and S. densifolius Alv. Silv. Irwin and his

associates assert that its inflorescences rise to 50 cm. and the flower-heads are white. They encountered it "on wet campo in summit gray sandy soil", at 1200 m. altitude, flowering in March.

It is of interest to note that Silveira's illustration of the species is omitted from the "Index Londinensis Supplement" of Worsdell (1941).

Citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27123 (N, W—2759020, Z).

SYNGONANTHUS FLAVIDULUS (Michx.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 256. 1903.

Additional & emended synonymy: Eriocaulon flavidulum Michx., Fl. Bor.-Am., imp. 1, 2: 166. 1803. Eriocaulon spathaceum Raf., Atl. Journ. 1: 121. 1832. Eriocaulon flavidulum var. cinereum Raf., Autikon Bot., imp. 1, 189. 1840. Paepalanthus flavidulus (Michx.) Kunth, Enum. Pl. 3: 532. 1841. Eriocaulon flavidum Michx. ex A. Gray, Man. Bot., ed. 2, 489, in syn. 1856. Paepalanthus flavidus Kunth ex A. Gray, Man. Bot., ed. 2, 489. 1856. Paepalanthus flavidulus Kunth apud A. W. Chapm., Fl. South. U. S., ed. 1, imp. 1, 503. 1860. Paepalanthus borealis Körn. in Mart., Fl. Bras. 3 (1): 508, nom. nud. 1863. Paepalanthus flavidulus (Steud.) Kunth apud Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 27. 1888. Dupatya flavidula (Michx.) Kuntze, Rev. Gen. Pl. 2: 745. 1891. Dupatya flavidula (Michx.) Morong, Bull. Torrey Bot. Club 18: 359. 1891. Dupatya flavidula Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Syngonanthus flavidulus Ruhl. apud Prain, Ind. Kew. Suppl. 3: 175. 1908. Syngonanthus flavidus (Michx.) Ruhl. ex A. C. Martin, Am. Midl. Nat. 36: 533. 1946. Dupotya flavidula (Michx.) Kuntze ex Moldenke, Résumé 282, in syn. 1959. Eriocaulon caespitosum Cabanis ex Moldenke, Résumé Suppl. 1: 16, in syn. 1959 [not E. caespitosum Poepp., 1863, nor Wikstr., 1820]. Dupataya flavidula (Michx.) Kuntze ex Moldenke, Résumé Suppl. 3: 31, in syn. 1962. Syngonanthus flavidus Michx. ex Moldenke, Résumé Suppl. 3: 35, in syn. 1962. Paeplanthus flavidulus Kunth ex Moldenke, Résumé Suppl. 16: 26, in syn. 1968. Duptaya flavidula (Michx.) Kuntze ex Moldenke, Fifth Summ. 1: 487, in syn. 1971. Syngonanthus dupatya Mart., Phytologia 34: 277, in syn. 1976.

Additional & emended bibliography: Michx., Fl. Bor.-Am., imp. 1, 2: 166. 1803; Roem. & Schult. in L., Syst. Veg., ed. 15 nova, 2: 868. 1817; Steud., Nom. Bot. Phan., ed. 1, 313. 1821; S. Ell., Sketch Bot., imp. 1 & 2, 2: 566—567 & 728. 1824; Spreng. in L., Syst. Veg., ed. 16, 3: 776. 1826; Bong., Ess. Monog. Erioc. 4. 1831; Raf., Atl. Journ. 1: 121. 1832; Raf., Autikon Bot., imp. 1, 189. 1840; Steud., Nom. Bot., ed. 2, 1: 585. 1840; Kunth, Enum. Pl. 3: 532, 613, & 625. 1841; D. Dietr., Syn. Pl. 5: 262. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 281 & 334. 1855; A. Gray, Man. Bot., ed. 2, imp. 1, 489. 1856; Körn., Linnaea 27: 584, 590—592,

& 596. 1856; A. Gray, Man. Bot., ed. 2, imp. 2, 489 (1858) and ed. 2, imp. 3, 489. 1859; A. W. Chapm., Fl. South. U. S., ed. 1, imp. 1, 503. 1860; C. Müll. in Walp., Ann. Bot. Syst. 5: 925 & 928 (1860) and 6: 1171. 1861; A. Wood, Class-book, [ed. 42], imp. 1, 730 (1861) and [ed. 42], imp. 2, 730. 1862; A. Gray, Man. Bot., ed. 3, 489 (1862) and ed. 4, imp. 1, 489. 1863; Körn. in Mart., Fl. Bras. 3 (1): 279, 297, 300, 456, 503, 504, & 508. 1863; A. Gray, Man. Bot., ed. 4, imp. 2, 489. 1864; A. W. Chapm., Fl. South. U. S., ed. 1, imp. 2, 503. 1865; A. Wood, Class-book, [ed. 42], imp. 3, 730 (1865) and [ed. 42], imp. 4, 730. 1867; A. Gray, Man. Bot., ed. 5, imp. 1, 550 (1867) and ed. 5, imp. 2, 550. 1868; A. Wood, Class-book, [ed. 42], imp. 5, 730 (1868), [ed. 42], imp. 6, 730 (1869), and [ed. 42], imp. 7, 730. 1870; A. Gray, Man. Bot., ed. 4, imp. 3, 489. 1870; A. Wood, Am. Bot. & Flor., ed. 1, imp. 1, 355 (1870), ed. 1, imp. 2, 355 (1871), and ed. 1, imp. 3, 355. 1872; A. W. Chapm., Fl. South. U. S., ed. 1, imp. 3, 503. 1872; A. Wood, Class-book, [ed. 42], imp. 8, 730. 1872; A. Wood, Am. Bot. & Flor., ed. 1, imp. 4, 355 (1873), ed. 1, imp. 5, 355 (1874), and ed. 1, imp. 6, 355. 1875; A. Wood, Class-book, [ed. 42], imp. 9, 730. 1876; A. Gray, Man. Bot., ed. 5, imp. 8, 550 (1878) and ed. 5, imp. 9 ["8"], 550. 1880; A. Wood, Class-book, [ed. 42], imp. 10, 730. 1881; A. W. Chapm., Fl. South. U. S., ed. 2, imp. 1, 503 (1883), ed. 2, imp. 2, 503 (1884), and ed. 2, imp. 3, 503. 1887; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 27. 1888; A. W. Chapm., Fl. South. U. S., ed. 2, imp. 4, 503. 1889; S. Wats. & Coult. in A. Gray, Man. Bot., ed. 6, imp. 1, 757 (1889) and ed. 6, imp. 2, 757. 1890; Kuntze, Rev. Gen. Pl. 2: 745. 1891; Morong, Bull. Torrey Bot. Club 18: 359. 1891; A. W. Chapm., Fl. South. U. S., ed. 2, imp. 5, 503. 1892; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 878 & 879 (1893) and imp. 1, 2: 402. 1894; Britton & Br., Illustr. Fl., ed. 1, 1: 372—373, 602, & 604, fig. 902 (1896) and ed. 1, 3: 536, 537, & 545. 1896; A. W. Chapm., Fl. South. U. S., ed. 3, 530. 1897; N. L. Britton, Man., ed. 1, imp. 1, 237—238 & 1067. 1901; Holm, Bot. Gaz. 31: 18. 1901; Mohr, Contrib. U. S. Nat. Herb. 6: 429. 1901; N. L. Britton, Man., ed. 1, imp. 2, 237—238 & 1067. 1902; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 29, 31, 33, 117, 215, 245, 256, 257, 285, 287, 290, & 293. 1903; J. K. Small, Fl. Southeast. U. S., ed. 1, 235. 1903; N. L. Britton, Man., ed. 2, 237—238, 1099, & 1101. 1905; Baerecke, Anal. Key Ferns & Flow. Pl. Atl. Sect. Middl. Fla. 25. 1906; R. M. Harper, Ann. N. Y. Acad. Sci. 17: 268. 1906; N. L. Britton, Man., ed. 3, 237—238, 1099, & 1101. 1907; M. A. Day, Check List 39. 1908; Prain, Ind. Kew. Suppl. 3: 175. 1908; Robinson & Fern. in A. Gray, New Man. Bot., ed. 7, 260, 261, & 922. 1908; Britton & Br., Illustr. Fl., ed. 2, imp. 1, 1: 455 & 680, fig. 1144. 1913; J. K. Small, Fl. Southeast. U. S., ed. 2, 235. 1913; Britton & Br., Illustr. Fl., ed. 2, imp. 2, 1: 455 & 680, fig. 1144. 1923; M. F. Baker, Fla. Wild Fls. 122. 1926; Uphof, Am. Journ. Bot. 14: 44. 1927; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Stapf, Ind. Lond. 6: 248. 1931; J. K. Small, Man. Southeast. Fl. 257. 1933.

[to be continued]

SOME TAXA OF RED-FLOWERED HIBISCUS ENDEMIC TO THE HAWAIIAN ISLANDS

Otto & Isa Degener

After receiving a specimen of a red hibiscus from Mr. Rene *Sylva from the Island of Maui last October, we dusted off our manuscript concerning the genus Hibiscus and here publish our opinions regarding some of its red-flowered taxa. Unlike more conservative workers we, like Sister Margaret James Roe, exclude the genus Pariti Adans., from Hibiscus L., for reasons explained **elsewhere. With this in mind, we recognize four cohorts of Hibiscus as endemic to the Hawaiian Archipelago. Besides other more important features, these groups can be distinguished from afar by flower color. The yellow is represented by such a species as the māo-hau-hele or H. brackenridgei Gray, mostly of arid lowlands; the pink by the hualele or H. youngianus Gaud., mostly of swampy lowlands exposed to salt ocean breezes; the white by such a species as the fragrant pā-makani or H. arnottianus Gray; and the red, the most difficult and most numerously represented on Kauai, by such a species as the enigmatic kokio-ula or H. kokio Hillebr. These two last groups thrive at low and middle elevations often in rainforests and ledges or streambanks exposed alternately to sun and mist. The suspicion expressed that H. kokio might actually represent a white-flowered taxon we dismiss as absurd as the specific name kokio and the vernacular name kokio-ula clearly refer to its flower color.

A "red" published as a new endemic for the Islands is ***H. fauriei Lévl. This unhappy binomial as ****Rock indicated, can be ignored as a Hawaiian plant. Bought from Abbé Faurie with other specimens for the College of Hawaii herbarium and soon deposited on permanent loan at the Bishop Museum by Legislative fiat, this specimen proved to be the African native coral hibiscus H. schizopetalus (Mast.) Hook. f., grown in gardens in most tropical countries!

H. clayi Deg. & Deg., of Kauai, with its diminutive leaves, is a strong species easily recognized even when sterile. Hence we felt no qualms in publishing an *****illustrated description of it in 1959.

Another "red" is ****** H. kahilii Forbes, known only from the mountains of southern Kauai. It was last collected by St. John in 1947. This species is distinct as **Roe has indicated on page 21.

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*An employee of the State, and an expert in Hawaiiana, especially regarding the native plants of his island.

**Deg. & Greenw. Fl. Haw. 2/15/57; Roe, M.J., in Pac. Sci. 15(1): 4. 1963.

***Fedde Repert. 10:156-157. 1911.

****Rock, J.F., in College Haw. Publ. 2:48. 1913.

*****Deg., O., I. Fl. Haw. 3/20/59.

******Forbes, C.N., in Occas. Pap. B.P. Bish. Mus. 5(1):4. 1912.

Besides the differences noted by Roe between H. newhousei Roe of northeast Kauai and H. saintjohnianus Roe of northwest Kauai, we wish to emphasize the difference in leaf shape and venation. The former bears leaves with a distinctly acuminate apex and, on the under side, more delicate ribs and venation; while the latter has them acuminate and, on the under side , a prominent midrib flanked on each side by a single prominent rib. Contrary to some locally expressed opinion of wishing to unite the taxa, we follow Sister Margaret James Roe's findings. We know both species from living specimens as well as herbarium ones: 1.) Degeners & D. Plucknett No. 28,210. Hibiscus newhousei Roe (2 trees 12 feet high, slender-twiggy; calyx swollen, pale green; stamens red; anther & pollen pale yellow; style branches pink; stigma brownish.) Moloaa, Anahola, Kauai. Open weedy ledges near water intake. March 12, 1961. 2.) H. saintjohnianus Roe is represented by Degeners & H.F. Clay No. 34,106. Cultivated in Lyon Arboretum, Honolulu, Oahu. A species endemic to Kauai. July 12, 1963. Degeners' No. 34,105 collected by H. F. Clay. Cultivated in Foster Botanical Garden, Honolulu, Oahu. Originally collected by B.C. Stone along Napali Coast, Kauai, Dec. 28, 1964.

Dismissing as good species with moderately well known ranges H. schizopetalus (syn. H. fauriei), H. clayi, H. kahilii, H. newhousei and H. saintjohnianus, our opinion regarding the two binomials H. kokio Hillebr., ex Wawra nom. nud., (in Flora oder allgemeine botanische Zeitung, p. 174. 1873.) versus H. saintjohnianus Roe (in Pac. Sci. 15(1):18. 1961.) deserves explaining:

What is precisely the true H. kokio, designated the official flower of the Islands in 1923? How many varieties and forms occur? We have worked out some of the answers. The remainder may be gained by the possible finding of herbarium specimens lurking neglected in some foreign museum, living specimens in botanic gardens, further field work, and growing seeds or cuttings from wild plants native to various island regions under controlled conditions.

Hooker & Arnott in Bot. Beech. p. 79. 1832, mentioned the occurrence of Hibiscus Boryanus, native to the Island of Réunion and described by deCandolle, as occurring at Byron Bay, an obsolete name for Hilo Bay, Island of Hawaii. The present city of Hilo is about ten miles south of the village of *Hakalau.

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*Though we have no proof, we suspect that Hooker & Arnott's "Byron Bay" taxon is the "Hakalau Red" of E.V. Wilcox and V.S. Holt described in their "Ornamental Hibiscus in Hawaii. Haw. Agr. Exper. Stat. Bull. 29:58. 12/1/13 as a "Large tree, dark brown bark, green on twigs. Leaves ovate or lanceolate, serrate, smooth, dark green, 3/4-2¼ in. wide, 1½-4¼ in long, petiole 1/8-1½ in. Flower 2½ in., wide, uniform scarlet throughout, filaments short, column 2 in., peduncle 1½ in., bracts 6, very narrow, green. Not self seeding; used as male parent." Knowing the area, practically a single sugarcane field stretching along the lowlands for about forty miles, we doubt this has persisted in the wild state unless, very improbably, along one of the few narrow, weed strangled gulches traversing it. The "Hakalau Red" is the only red hibiscus the authors mention for the island.

As deCandolle's species bears a red flower, the red-flowered Hilo plant was evidently in error identified as the Réunion species. In 1854 Gray (Bot. U.S. Expl. Exped. 1:176.) described the novelty H. Arnottianus, basing his description on two distinct species: the red-flowered Hawaii plant and a white-flowered Oahu one. According to the 1961 Int. Code Bot. Nomencl. Art 64, "When the same new name is simultaneously published for more than one taxon, the first author who adopts it in one sense, rejecting the other, or provides another name for one of these taxa must be followed." Ignoring for a moment Wawra's reference to "Hibiscus Kokio Hillebrand mss.", we find that Hillebrand (Flora Haw. Islands, p. 48. 1888.) selected the name "H. Arnottianus, Gray" for the species with white petals and "H. Kokio, Hillebr.", for a species with red. Now that we have established that some red-flowered hibiscus is H. kokio, precisely which plant is it? Wawra in Flora, oder allgemeine botanische Zeitung, page 174 [not 173, please note!], 1875, published "Hibiscus Kokio Hillebrand mss.", as a nom. nud., with the remark, "Aus Hillebrands Herbar; #403. Kokio der Eingebornen [sic!]; der etwas breitere Kelch und Kronröhre unterscheidet sie von H. Arnottianno, mit dem er sonst über einstimmt (?). Baumartige schöne Sträucher, sollen nach Hillebrand aus den Pali-bildenden Felsmauern von Waiawa (Kauai) vorkommen; auch kultivirt in seinem Garten." On page 48 of his Flora, Hillebrand under the heading "H. Kokio, Hillebr. in Flora 1873, p. 173.", in error for p. 174 gives an adequate but garbled description to establish the name and, on page 49 adds the range: "Oahu, Nuuanu (Remy); Molokai! Halawa (Hbd.); Kauai Haena and Waimea? (Mrs. Sinclair). Very rare, and probably is the Hibiscus with red flowers from 'Byron's bay' referred to by Hook. & Arn. under H. Boryanus, l.s. - Nat. names: 'Pualoalo' and 'Kokio'. Wawra's specimens came from the writer's garden, where it has been in cultivation for many years." The description includes numerous taxa, not just one. According to Hillebrand's Flora, page VIII, "The conventional sign ! placed after a name denoting habitat signified that a specimen or specimens of the species described are to be found in the author's herbarium, which, according to a verbal wish expressed a few hours before his death, has been presented to the Royal Botanical Museum of Berlin*." This fact is worded a bit differently on page XCI. Though Wawra's article mentions the species as occurring in Waiawa, Kauai, Hillebrand does not repeat this region in his Flora but mentions "Haena and Waimea? (Mrs. Sinclair)" instead. An enigma is Mrs. Sinclair's plate 9 (Indig. Fl. Haw. Isl. 1885.) which Hillebrand cites under his H. kokio. This is a painting of a red-flowered hibiscus, identified by J.D. Hooker as "Hibiscus Arnottianus A. Gray forma" and coming from Kauai or perhaps Niihau. This painting is certainly not of our Molokai type plant though identified as H. kokio by St. John (Pac. Sci. 8:143. 1954.). Judging from our own reactions when dealing with novelties, we believe a botanist would describe a novelty he had not only discovered himself but was cultivating in his garden. Following this reasoning, we place the type locality for the true H. kokio s.s., as Halawa, Molokai. Remember, this is the only red native in Hillebrand's herbarium (as noted by his exclamation mark "!") and evidently the only kind cultivated in his Vineyard

PLATE I. Hibiscus saintjohnianus Roe; Kew specimen

Street, Honolulu, garden. Caum (Occasional Pap. B.P. Bish. Mus. 9. (5):7. 1930.) apparently never saw Wawra's article but simply copied Hillebrand's reference precisely, even to the wrong page number. Miss Roe on page 14, incidentally, gave another wrong Hillebrand-Wawra reference. Caum describes as new Hibiscus kokio var. pukoonis from "Molokai, bottom of Pukoo Valley, just inside the native forest - - -" and considers, with some misgiving, the Oahu plant the species itself. He is wrong. His var. pukoonis fits precisely a fragment of Hillebrand's plant as being in his herbarium by an exclamation mark and now deposited under an "Ex Museo botanico Berlinensi" label in the Bishop Museum as a gift from Berlin to J.F. Rock. It is annotated in Rock's handwriting to be "Hibiscus Kokio Hbd. Cultivated in Hbd's garden." We have seen the sheet. That is why we consider var. pukoonis a synonym of the species itself; and we have drawn heavily upon Caum's careful description. The Oahu plant, surprisingly, has never been properly named botanically.

Furthermore, we omit Mrs. Sinclair's Kauai plant as the possible type for Hillebrand's H. kokio as Hillebrand himself in his Flora indicates his doubt about his species identification by printing a question mark.

To make doubly sure regarding our suspicions about the two binomials H. kokio and H. saintjohnianus, we wrote Kew for help. Through the kindness of Director Sir George Taylor, C.E. Hubbard wrote us under date of the 27th June, 1963: "Dear Dr. Degener, Following your letter of the 18th June, we have looked up the specimen of Hibiscus kokio Hillebrand that was originally sent by Mrs. Sinclair in 1885. A photograph of the specimen is being prepared and a copy will be sent to you when it is ready. On the sheet is a label bearing Hooker's original determination 'Hibiscus aff. arnottianus'. There is also the collectors brown paper label bearing the vernacular name Kokio-ula. The later determination of Hibiscus kokio Hillebr. is on a separate slip. This sheet has been compared with Mrs. Sinclair's illustration and there can be no doubt that the two are the same plant. The illustration is, in fact, a very good representation of the species. We shall be very pleased to have duplicates of this species in due course when you are able to send them to us. Yours sincerely, C.E. Hubbard for Sir George Taylor, Director." July 16 Mr. Hubbard wrote: "I enclose the photograph of the type sheet of Hibiscus kokio Hillebr. which was promised to you in my recent letter. The descriptions on the labels do not show clearly, but they have been transcribed on the back of the print." Our accompanying plate I is a reproduction of the copyrighted Kew photograph. On the reverse is the following note, mentioned above, written in pencil:

"Hibiscus kokio Hillebr.
Hibiscus aff. Arnottiana
Hawaii; Mrs. Sinclair
Comm 1/1885
Kokia-ula"

PLATE II. Hibiscus kokio var. pekeloi Deg. & Deg.
Deg. No. 18,222, Wailau, Molokai, 8/3/28.

Though Mr. Hubbard considers Mrs. Sinclair's sheet at Kew the type of H. kokio Hillebr., the photograph shows it to be H. saintjohnianus Roe. Even though collected almost a Century earlier, we follow Roe in considering St. John No. 25,989 the lectotype. Put in other words, it is as follows:

HIBISCUS SAINTJOHNIANUS Roe

Hibiscus arnottianus A. Gray forma sensu Sinclair, Indig. Fl. Haw. Isl. Pl. 9. 1885. (Represented by Sinclair plant and Kew photograph.)
Hibiscus kokio Hillebr. Fl. Haw. Isl. 48. 1888. (In part.)
Hibiscus saintjohnianus Roe in Pac. Sci. 15(1):18. 1961.

Type Locality: "Headland west of Hanakapiai, Napali Coast, Kauai. Altitude- 700 feet; on partly precipitous slope. December 22, 1956. H. St. John 25,989." Degeners, H.W. Hansen & G. Cliff No. 24,008 was collected Sept. 23, 1955 along "Nualolo Trail, Kokee region, Kauai. Sonny shrubby talus above cliffs. (4 ft. bush; fl. slightly yellower than true Chinese red.)" This specimen has leaves somewhat acuminate and the margins more serrate than the type plant.

The above witches' brew, though retaining H. saintjohnianus, boils down to our considering Caum's trinomial H. kokio var. pukoonis superfluous as it is predated by H. kokio Hillebr., s.s. (see also Articles 69 & 70 of the Code), The Molokai plant, needing a trinomial shall be:

HIBISCUS KOKIO Hillebr. var. KOKIO

Hibiscus kokio Hillebr. Fl. Haw. Isl. 48. 1888. (As to Molokai plant only.)
Not Hibiscus kokio of most authors.
Hibiscus kokio var. pukoonis Caum in Occas. Pap. B.P. Bish. Mus. 9(5):7. 1930. (His plate 5, however, has flower legends reversed in error.)

Type Locality: "Molokai! Halawa (Hbd.)"; deposited in the Marie C. Neal Herbarium, Bishop Museum, Honolulu.)

A recently discovered novelty is:

HIBISCUS KOKIO var. PEKELOI Deg. & Deg., var. nov. A specie foliis minimis differt. Plate II.

The blades are 50-80 mm. long (not 100-120 mm. as in Caum's taxon), 22-45 mm. wide (not 55-65 mm.), acute to rarely acuminate (not more uniformly acuminate), sinuately crenate to very rarely serrulate (never serrulate); petioles 3-20 mm. long (not 30-40 mm.).

PLATE III. Hibiscus ula Deg. & Deg. Degeners' No. 34,145 collected by Rene Sylva, West Maui, 11/-/76.

Type Locality: Otto Degener No. 18,222. Wailau Valley, Molokai. Rainy, shrubby, coastal ledges. Aug. 3, 1928. Deposited in NY. Lest readers err, we wish to emphasize that this is a trivial taxon of the true H. kokio of Molokai and not of any "red" thus named in error on Kauai or elsewhere. The name commemorates Mr. Noah Pekelo, Jr., who collected the same variety about May 18, 1963. The original Pekelo (or "Peter" in English), according to our friend, bore a longer Hawaiian name before the advent of the Missionaries. (Distributed to NY, Bishop, Berlin, Kew, Leiden, Vienna, Smithsonian). His material came from a "Little gully at an elevation of 2,250 ft. at Kainalu, Molokai, back of 'puu Mano'." "About a dozen or so plants remaining - very long branches crawling about over ulehe and other plants similar to Ieie but not entwining."

Having equated the above names with plants to our satisfaction, we know of numerous native "red" taxa having existed or still existing in the Hawaiian Archipelago. We know this from publications, from herbarium specimens collected by ourselves and others, and from plants formerly and presently in cultivation. The two acre "Hibiscus Garden," established by the Government in 1955 at the corner of Monsarrat and Paki Avenues, Waikiki, Honolulu, was a potential source of tremendous help. Due to the contributions of horticulturists and botanists like ourselves, a large collection of native, exotic, and hybrid taxa between the two, were growing under controlled conditions. In fact, by 1957 the collection consisted of hundreds of hybrids donated by "The Hawaiian Hibiscus Society," and "about 20 endemic Hawaiian species (Haw. Holiday, 12/1/57)." These plantings of scientific value were, while botanists were concentrating on other genera, suddenly bulldozed without much prior warning and changed into a "Rose Garden," a garden pretty to be sure but quite useless scientifically and out of place in the subtropics. The loss of this garden is largely responsible for the following sketchy surmises regarding some scientifically nameless "reds" not mentioned above. Many of these appeared closely related to one another perhaps because of lack of plasticity; because of ready transport from one island to another by floating seed or capsule to mix emerging gene pools; or, more likely, because of having been transported dry-shod between areas that later became distinct islands due to fluctuations in sea level or due to land movements. Be that as it may, keen gardeners or horticulturists, and less often botanists, have early recognized among the "reds" many different taxa. In fact, Wilcox & Holt mention, beside the Hakalau red, the Haena red, Kawaihapai red, Kipu red, Molokai red, and Oahu red. Caum (ibid., p. 8) in addition mentions an Ahuimanu red and a Mokuleia red.

HIBISCUS ULA Deg. & Deg., sp. nov. Frutex. Lamina 4-11 cm. longa, 2-7 cm. lata, obovata vel ovata, margine sinuato-dentate; petiolo 2-50 mm.; stipulis 0-5 mm. Pedunculo 1-3 cm.; bracteis 6-7, subulatis; 4-8 mm. Calyce 15 mm. longo, furcato 4-5; lobis acutis. Corolla (rubris?), 75 mm. longis. Columna staminarum 55 mm.; filamentium 8 mm. Ramuli stylorum 8 mm. T. III.

Scandent shrub. Leaves with thin glabrous, broadly obovate to ovate blades 4-11 cm. long, 2-7 cm. wide, sinuately dentate, acumin-

ate to acute or rarely obtuse at apex, rounded at base, on ferruginous scurfy 2-50 mm. long petioles; stipules obscure to (on vigorous shoots) 5 mm. long, setaceous, pubescent. Peduncles near end of branches, 1-3 cm. long, articulate 1/4 from top, glabrate. Involucral bracts 6-7, subulate, 4-8 mm. long, glabrate. Calyx tubular, 15 mm. long, silky puberulent, cleft for 1/3 to 1/4 into acute triplinerved lobes of which lateral nerves in same flower may be fused at cleft or some mm. below it. Corolla red: tube about as long as calyx; lobes 4- to 6-nerved, narrow-obovate, 6 cm. long, toward top 3 cm. wide, glabrous except for faintly ciliolate margin. Staminal column 55 mm. long, glabrous, red, ending in five 1.5 mm. long teeth; filaments crowded toward distal fifth of column, about 8 mm. long, glabrous, antrorsely spreading; pollen yellow. Ovary 7 mm. long, 4 mm. wide, glabrous; style as long as staminal column, its red spreading glutinous hair (mostly with adhering pollen). Stigma and seed unknown.

Type Locality: "'The plant is vine like and grows on a narrow ridge about an hour's walk from the Iao Valley State Park', West Maui." Collected by Rene Sylva (Degeners' No. 34,145). Type: NY; isotypes: Amherst, Berlin, Edinburgh, Geneva, Ithaca, Kew, Leiden, Leningrad, St. L., Wien.

Degeners & Fleming No. 25,125, "(15 ft. high, red flowered, twiggy shrub.) Honokowai ditch trail, W. Maui. Dark gulch-bottom near stream. March 27, 1959.", collected without flowers was a confusing plant until examination of Mr. Sylva's recent find. His No. 34,145 bears a few apparently depauperate leaves which are smaller, oval and with an obtuse apex, thus resembling those of No. 25,125. This latter plant is not thriving as its densely crowded nodes indicate. Conversely, a few of its watersprouts and a flowering specimen (Degeners No. 27,807) "Cultivated [by Colin Potter] in Foster Botanical Garden, Honolulu from cutting No. 25,125 (which see) from West Maui. Nov. 3, 1961.", matches the normal growth of No. 34,145. We conclude Nos. 25,125, 27,807 and 34,145 to be H. ula.

HIBISCUS OAHUENSIS Deg. & Deg., sp. nov. Frutex foliis saepe glabratis. Petiolus 6-18 mm. longis; lamina chartacea, 5-13 cm. longa, 2-6 cm. lata, ovata; basi obtusa vel truncata; apice acuta rare acuminata; margine crenata vel raro subintegra. Pedunculus 25-30 mm. longus, bracteolae circa 7, puberulentae, 5-10 mm. longae. Calyx 25 mm. longus, 12 mm. latus, lobis acuminatis. Corolla 6-7 mm. longa, rubra. Columna staminarum 55 mm. longa.

Hibiscus kokio Roe in Pac. Sci. 15(1):14, 17 as to Oahu plant only; Figs. 9, 10. 1961.

Not Hibiscus kokio Hillebr. Fl. Haw. Isl. 48. 1888. (Unless it is the plant collected by Remy in "Nuuanu," Island of Oahu, sometime between 1851-55 and unknown to us.)

Straggling shrub with virgate branches up to 6 meters long, yellow-pubescent when young. Leaves: Petioles 6-18 mm. long, yellowish pubescent; blades ovate, 5-13 cm. long, 2-6 cm. wide, chartaceous, above glabrous to especially glabrate when young on ribs below, broadly obtuse to subtruncate at base, acute to rarely acuminate above, crenate except for lower fourth which is entire or nearly so or blade rarely subentire throughout; stipules linear, 2-6 mm. long, often caducous. Peduncle 25-30 mm. long, yellowish-pubescent; involucral bracts about 7, subulate, 5-10 mm. long, puberulent. Calyx glabrous, 12 mm. wide, 25 mm. long and split 2/5 its length into acuminate lobes. Corolla 6-7 cm. long, red, with spreading-reflexed 3 cm. wide petals. Staminal column pinkish, 55 mm. long, with flattened linear acuminate 4-5 mm. long reflexed teeth at top, with its 11 mm. long glabrous branches spreading from upper fifth of column. Style slightly longer than staminal column, with red spreading branches coarsely pubescent; stigma subcapitate, dark red.

Type Locality: "Kawaiiki Ditch Trail, Kawailoa, Koolau Range, altitude 1080 feet, November 23, 1956, Roe 204."

Local Range: Reliably known only from the type locality at about 400 meters elevation where a small colony existed. A venerable shrub with straggling branches up to 6 meters long has attracted the attention of several generations of hikers, hibiscus hybridizers and botanists. The kane writer, with Bush & Topping, collected material over thirty years ago from this individual shrub. A visit to this same plant in 1963 to gather Deg. & Deg. No. 28,245 for distribution to a few larger museums showed practically no change in appearance. The label reads: "On perpendicular, rocky bank at Kawaiiki Ditch intake, Kawailoa, Oahu, June 30, 1963." How this taxon relates to other plants on this and remaining islands, we do not presently know. Though it resembles H. kokio Hillebr., of Molokai, it differs in too many features like leaf shape and size of floral parts to be conspecific with it.

HIBISCUS ROEATA St. John in Pac. Sci. 26(3):286. 1972.

This taxon was discovered on "Kauai Island, Waimea Dist., bottom of short Nualolo Trail, 2,250 ft alt, 30 September 1969, Robert W. Hobdy 158 (Bish)." According to Dr. St. John's description the flower is "(apparently red.)" Furthermore, according to a letter from Forester Hobdy dated Dec. 15, 1971 "The Hibiscus (#158) you asked about are quite variable. - - - The flowers show much variety ranging from pale yellow-orange to red. The leaves also show variation in shape and pubescence. I suspect that there is hybridization occurring between the H. St.-johnianus and a maroon Hibiscus described to me by Hans Hansen. I could not find the maroon plants in three trips into the area, but there does seem to be hybridization. What do you make of it?"

The present prodromus should alert our young colleagues to continuous field work, hunting botanical and cottage gardens for native species that may have escaped the vandalized "Hibiscus Garden," and delving through libraries and herbaria throughout the World for neglected references and sheets of historical importance. Much remains to be done to gain a better knowledge of the red-flowered hibiscus endemic to the Hawaiian Islands.

This study is an example of the fuzzy state of knowledge pertaining to our native genera. In fact, most of them, every bit as interesting but not with conspicuous flowers universally admired, are still less known. So modern man is exterminating such fascinating creations faster than a botanist can list them in a Red Book as being rare and endangered. How can botanists stay the bulldozer from crushing an endemic jungle with unique plants and the animals that depend on them for food and shelter when no biologist has had the time to collect and study its unique biota (Phytologia 34(1):28-32. 1976.). Unfortunately by the Red Book method, the rarest plants have no protection at all as, being unknown, they miss the list! For most isolated and little known island systems, like the Hawaiian, all native species should be considered rare and endangered except a few. These last, like some treeferns, acacia and ohia-lehua, should be listed in a Blue Book of species available for harvesting, for replacement with a sterile golf course, or for judiceous population control.

"Man is endowed with intellect and creative powers so that he may multiply what is given him, but up to now he has not created, he has destroyed. Forests are fewer and fewer, rivers dry up, game becomes extinct, the climate is ruined, and every day of the earth get poorer and uglier." Chekhov, "Uncle Vanya", 1899.

WESTONIELLA, A NEW GENUS OF THE ASTEREAE FROM THE COSTA RICAN PARAMOS.

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During several years exploration of the high mountains of Costa Rica for ecological research, many less accessible areas never visited before by botanists, have been botanically scrutinized by the intrepid, Dr. Arthur S. Weston. He gathered several thousand collections from the Talamanca Cordillera, mostly representatives of the páramos. A part of the Compositae of his collections was turned over to me for identification. I found in it many novelties, which are not only significant for the flora of the Costa Rican paramos, but also because of the various undescribed taxa which represent additions to the already known series of Costa Rican endemics. The most important novelty is a new genus in the Astereae described here as Westoniella, represented by five distinct species which were all collected by Weston in the paramos or subparamos of the Chirripó massif and Buenavista massif. Of these five species, one had been collected before (by Pittier) and published first by Klatt as a Senecio, and transferred later by Greenman, to Erigeron. The other four species are all first records.

Westoniella is mostly characterized by its tubular ray corollas with a narrow proximal part and a more expanded, inflated, distal section representing the limb. The apex is contracted, the margin being almost entire or with five regular or oblique short teeth. A curving of the corolla or the obliqueness of the opening often make it slightly zygomorphic. The color may be roseate, red, lilac or white, contrasting more or less from the disc corollas which are red, maroon or purplish and usually darker than the rays. The rays may be straight, the heads appearing discoid, or more or less bent downwards radiating, like in W. chirripoensis with spreading, showing, white rays. The corollas of both kinds have at the middle part copious obovate-oblong or claviform biseriate glandular trichomes. The styles have fine, long branches with marginal stigmatic bands in the female flowers; they are lanceolate-oblong, rigid, non stigmatic and papillose-hispid abaxially in the functionally male, disc flowers.

The ovaries of ray flowers and achenes are obovoid, somewhat compressed with rounded apex, with 2 marginal costae and frequently with an additional prominent vein at one side. They have sparse or abundant geminate-celled trichomes throughout and few obovoid or pyriform glands near the apex. The sterile linear or oblong

4-5 ripped ovaries of the disc flowers have similar pubescence. The pappus is of one row of strigose bristles.

The genera that most resemble Westoniella in the habit and apparent structure, are Andean genera Diplostephium, Hinterhubera and Blakiella. The new genus differs readily from the three by the particular shape of the tubular ray corollas. These corollas are very different from the tubular ray corollas found in Conyzinae, Baccharidinae, and some Asterinae, which are the result of extreme reduction of the ligular corollas down to a tiny tube. The ray corollas of Westoniella probably represents a more primitive structure than in the Aster type, the latter being a more evolved disposition into the trend of capitulum→functional flower. Hinterhubera differs clearly from Westoniella by the deeply lobate ray flowers and by the several rows of pappus bristles. Blakiella differs by the particular bottle shape of the ray flowers and the beaked, fusiform achenes.(Cuatrecasas 1969, fig. 8-A) Diplostephium, in addition to the ligular character of the rays differs by a double row of pappus bristles. Other genera of Astereae (Laestadia, Solenogyne, Haastia) with tubular ray-flowers have a different structure and are more distantly related to Westoniella. In the present stage of knowledge of the Astereae tribe, Westoniella should be included in the subtribe Asterinae.

This new genus is extremely significant in relation to the capacity of biological differentiation through time and isolation of the paramo-biomas. Its evolutionary process may be seen in parallel connection with those of the Hinterhubera, Diplostephium and Blakiella. The variety of species of Hinterhubera developed in Venezuela and of Westoniella in Costa Rica, within a relatively limited area, show parallel or convergent trends in the vegetative structures.

Dr. Weston is preparing a detailed account of the phytogeographical and ecological aspects of his findings in Costa Rica.

WESTONIELLA Cuatr. gen. nov. Asteracearum

Capitula heterogama, parva (4-10 mm diam), (20-) 50-180 flores ferentia. Involucrum pluriseriatum phyllariis subaequilongis anguste ellipticis membranaceis, vel subpapyraceis. Receptaculum nudum planum vel paulo convexum, alveolatum.

Flores radii feminei, 2-4-seriati magis numerosi illis disci. Corolla sursum rosea, lilacina, rubra vel alba, anguste tubularis, saepe leviter curvata tenuiter zygormorpha parte media glandulifera, limbo quam tubulo latiori plus minusve inflato saltem dilatato, apice plus minusve constricto, regulare breviterque 5-denticulato dentibus aequalibus, vel oblique dentatis adaxiale saepe leviter depresso. Stylus plerumque inclusus interdum corollam paulo excedens, ramis longis anguste linearibus subobtusis marginibus

minute stigmato-papillosis, ceterum glaber. Ovarium obovatum apice obtuso basi subacuta lateraliter compressum crassiuscule costato-marginatum, plerumque nervo vel costa laterali tenui conspicua. Embryo basale affixus. Pappus setis uniseriatis (20-30) subaequilongis subrigidulis strigosis subapice levissime ampliatis, acutis.

Flores disci actinomorphi hermaphrodite contexti masculi fungentes. Corolla staltem apice rubra, atrorubra, brunneo-purpurea, limbo inferne stricto, sursum tubuloso-infundibuliformi 5-lobato lobis triangularibus acutis brevibus. Collum antherae longum columnare incrassatum cellulis crebris pluriseriatis inferne subquadratis superne rectangularibus. Antherae basi acute auriculatae, appendice apicali anguste elliptico-triangulata subacuta, cellulis exothecialibus elongatis lateraliter noduliferis. Pollen grana tricolporata copiose spinulosula circa 25 μ diam. Stylus crassiusculus, maturitate corollam excedens basi paulo incrassatus apice breviter bifidus ramulis anguste elliptico-lanceolatis vel anguste elliptico-acuminatis acutis, abaxialiter longe denseque piloso-papillosis, adaxialiter glabris numquam stigmaticis. Ovarium anguste oblongum plerumque exovulatum sterile 5-nervatum plerumque 4-5 costis notatis. Pappus setis uniseriatis strigosis subapice leviter ampliatis, acutis. Nectarium crasse discoideum margine laevi vel marginato-dentatum, margine basim styli cingenti.

Carpopodium plus minusve elongatum subcylindraceum vel subobconicum callosum, cellulis crebris pluriseriatis subquadratis parietibus incrassatis.

Pili gemini rigidi uni vel bi-acuminati in ovariis copiose vel sparsi. Glandulae oblongo-obovoideae cellulis biseriatis in parte media corollae saepe copiosae, glandulae obovoideae ad apicem ovariorum achaeniorumque praesentes.

Frutices parvi saepe prostrati vel caespitosi, vel suffrutices usque ad 1.5 m alti, caulibus ramisque glabris vel lanuginosis vel hirtis glandulosisque, denique glabratis. Folia alterna sessilia basi amplectenti, copiosa, saepe imbricata et valde congesta in ramulis terminalibus. Lamina foliorum subcoriacea marginibus plus minusve revolutis saepe complicata, interdum subplana, plus minusve pilosa abaxialiter saepe lanuginosa et glandulosa. Fig. 1, 2, 3.

Typus generis: Westoniella chirripoensis Cuatr.

KEY TO THE SPECIES OF WESTONIELLA

1. Shrubs 40-150 cm high with erect undivided or branched leafy stems. Heads many, arranged in terminal whitish-woolly corymboid glomerate panicles. Phyllaries with long, thick, white-hyaline trichomes. Ovaries sparingly hairy. Leaves longer

than 15 mm.

2. Leaves linear, apparently entire, margins strongly revolute, 20-35 x 1-1.5 mm, abaxially lanuginose, adaxially glabrous or with long and very slender flexuose white arachnoid hairs. W. kohkemperi

2'. Leaves narrow-elliptic, inciso-dentate with long-mucronate teeth, flat with more or less revolute margins, 15-35 x 2.5-6 mm, hirsute and glandular. W. eriocephala

1'. Dwarf, densely or loosely matted shrubs, less than 20 cm tall. Heads solitary at tip of leafy branchlets. Ovaries copiously to densely hairy. Leaves less than 10 mm long with fully revolute margins, apiculate.

3. Leaves 3-lobate, seldom 5-lobate, lobes fingerlike triangular ending in claw-like acute, incruved apiculum. Heads sessile; involucre white woolly, hairs very long and slender (0.005-0.010 mm diam). Branchlets woolly. W. triunguifolia

3'. Leaves absolutely entire. Branchlets glabrous.

4. Heads shortly pedicellate; involucre greenish below with purplish phyllaria tips, white-woolly, hairs hyaline, flexuose, thick (0.035 - 0.06 mm diam). Ray corollas rather reddish or purplish. Leaves 4-10 mm long loosely imbricate, the blade narrow-elliptic. Loosely matted plant with longer erect branches than the following species. W. barqueroana

4'. Heads sessile; involucre more or less purplish, appearing glabrous, with sparing or rare long, slender (0.005 - 0.010 mm diam), arachnoid, inconspicuous hairs. Ray corollas white, spreading. Leaves 4-6 mm long, densely imbricate, blade narrowly elliptic acuminate, appearing rather aciculate. Compact matted, prostrate shrub. W. chirripoensis

WESTONIELLA CHIRRIPOENSIS, Cuatr. sp. nov.

Fruticulus prostratus ramis brevibus robustiusculis congestis caespitoso-pulvinatis ad 10 cm altus. Ramuli 1-3 cm longi densissime imbricato-foliati glabri vetusti exfoliati crebrissime arguteque semicirculari-cicatricosi.

Folia visu acicularia rigida, in totum 4-6 mm longa, sessilia, basi longe vaginantia. Lamina chartacea crassiuscula visu 2-4 mm longa 0.7-1 mm lata ellipsoideo-lanceolata acute apiculata, marginibus revolutissime plicatis abaxialiter superficiem tegentibus, adaxialiter glabra nitida laevia vel interdum glandulis immersis leviter vissibilibus, abaxialiter (infra plicaturam) sparse pilosula et copiose glandulosa. Vagina 2-3 mm longa 1-1.5 mm lata membranacea plana ad ramum adpressa marginibus longe gossypino-pilosula, pilis tenuissimis (0.005 - 0.015 mm diam) longissimis flexuosissimis. Capitula solitaria ad extremos ramulorum dense foliossorum subsessilia, visu glabra.

Capitula cylindracea 6-8 mm alta, 4-6 mm diametro, heterogama radiata 50-90 flores ferentia. Involucrum campanulatum 5-6.5 mm altum. Phyllaria 28-42, subaequilonga, 4(-5)-seriata, membranaceo-subpapyracea, firmula, anguste lanceolata, acuminata, acuta, 4-6.5 mm longa 0.8-1.2 mm lata, dorso basi excepto brunneo-violacea nitida marginibus scariosis lilacinis, dorso sparsis glandulis subclavatis 0.05-0.1 mm longis ad margos parcis vel parcissimis pilis longissimis strictis 0.005 - 0.015 mm diam flexuosis, exteriora leviter lacerato ciliata, interiora circa 20 integra. Receptaculum plano-convexum 2-3 mm diam, alveolatum marginibus alveolorum membranaceis dentatis.

Flores radii feminei 37-60 in capitulo, triseriati. Corolla 4-4.7 mm longa, alba, tubulosa inferne tubulo angusto glabro, limbo inferne anguste tubuloso copiose piloso pilis glandulosis crassiusculis (glandulis biseriatis subclavatis) ad circa 0.1 mm longis, superne subite in limbo anguste ellipsoideo inflato 1.6-2.1 mm longo glabro apice constricto instructo, apice 5-dentato dentibus minutis obtuse triangularibus subaequalibus 0.1-0.15 mm interdum adaxiale brevioribus. Stylus 3.8-4 mm, inclusus maturi-

tate ramis exsertis, glaber basi leviter incrassatus apice in 2 ramos membranaceos 0.8-1 mm, lineares subacutos glabros marginibus anguste stigmato-papillosis divisus. Ovarium fertile 1.3-1.5 x 0.4-0.6 mm ellipticum subcompressum apice obtusissimo basi acuta saepe 3 nervatum, costato-marginatum copiose antrorso-pilosum, pilis geminis, rectis, rigidulis, strictis, conspicue bidentatis 0.1-0.3 mm et circa apicem parcis vel raris glandulis obovoideis; carpopodio calloso circa 0.2 mm alto cellulis circa 8-seriatis rectangularibus instructo. Pappus circa 4 mm longus circa 20 setis strigosis sursum levissime dilatatis subaequilongis, basi breviter coalitis.

Flores disci pseudohermaphroditi 13-28 in capitulo. Corolla purpurea 4-5 mm longa, tubulo 1.2 - 1.5 mm longo glabro, limbo inferne anguste tubuloso copiose pilosulo pilis glandulosis crassiusculis (cellulis biseriatis) oblongis subclavatis, paulo flexuosis 0.05-0.1 mm longis, superne 1.5 mm longitudine tubuloso-campanulato, glabro vel parcissimis glandulis, lobis triangularibus acutis crasse marginatis marginibus minuti-papillosulis, abaxialiter parcis vel raris glandulis. Antherae 1.2 mm longae basi breviter sagitatae appendice apicali anguste elliptica attenuata seu subulata, acuta circa 0.3 mm. Stylus crassiusculus extremo paulo dilatatus apice subconicus et in duos lobos anguste ellipticos attenuatos acutos 0.5-0.7 mm longos abaxialiter longe densissime antrorse pilosulo-papillosos divisus. Ovaria sterilia linearia 1.5 mm longa 4-5 nervata basi acutata, copiose pilosa pilis geminis antrorsis rigidis 0.2-0.3 mm copiosis vel densis vestita, circa apicem parcis vel raris glandulis obovoideis obsita; carpopodio annulato calloso cellulis rectangularibus pluriseriatis conspicuis. Fig. 1-C, 2A-G, 3I-J.

Typus: Costa Rica, South to southwest of Cerro Chirripó, Pico Sureste, rain paramo, 3600-3800 m, tussocks, leaves dark green, ray flowers white, other disc flowers dark red, 9 Dec 1966, Arthur S. Weston 3614 (US, holotype). Other collections: South to southwest of Cerro Chirripó, Cerro Terbi, 3600-3800 m, leaves medium green, most flowers pink-lavender and dark maroon, in some heads white, 5 Sept 1969, Weston 6027 (US). Chirripó massif, along cliffs of Rio Talari, above lower Refugio, 3400 m, common on near vertical cliffs, 14 Feb 1976, Weston 10092 (US, paratype). Buenavista massif, Cerro Sakira, 3400 m, low shrub, "ray" flowers more than 30, white, tubular, slightly irregularly and very shortly 5-lobed, disc flowers dark red ca 12, anthers yellow, 26 Jan 1976, Weston 10055 (UC).

WESTONIELLA BARQUEROANA, Cuatr. sp. nov.

Fruticulus prostratus ad circa 15 cm altus caulibus inferne repentibus radiciferis intricatis cum vaginis foliorum marcescentibus tectis superne ramosis ramis arcuatis et ± erectis glabris

copiose vel dense foliosis.

Folia alterna anguste linearia 4-10 mm longa inferne plana tenuia longe vaginantia semiamplectentia, sursum subchartacea rigidula marginibus argute revolutis. Lamina 3.8-8 mm longa complicata visu 0.8-1.2 mm lata viridis apice argute calloso-apiculato, uninervis costa abaxialiter crasse prominenti adaxialiter filiformi impressa, utrinque pilis longis tenuibus albis arachnoideo intricatis in juvenilibus magis copiosis et glandulis capitato pediculatis moderate copiosis. Vagina 1-3 mm longa plana basi dorsale gibboso-incrassata protruda, margine integra amplectenti. Folia juvenilia magis villosa, et sicut infra capitulum foliis tenuioribus copiosiore barbatis numerosis, imbricatis involucrum partiale tegentibus. Capitula breviter pedicellata ad apicem ramulos dense foliatos 3-8 cm longos, solitaria, vel interdum 2-4 capitula ferentes, visu lanugineo-villosa.

Capitula cylindroidea circa 8 mm alto 6 mm lata, heterogama pseudodiscoidea, 80-110 flores ferentia. Involucrum campanulatum circa 7 mm altum. Phyllaria membranacea ad basim subpapyracea numerosa (46-60) 4-5-seriata, subaequilonga, 5-5.5 x 1 mm, subulato-lancolata, acuminata acutaque, sursum lilacina vel brunneo-violacea, marginibus scariosis hyalinis plus minusve lacerato cilatis, trinervata, abaxialiter apice excepto copiose longeque barbata pilis crassis albis multicellularibus cellulis rectangularibus vel botuliformibus, hyalinis 0.035-0.05 mm diam 2-3 mm longis, flexuosis patulis intricatis, in interioribus sparsis. Receptaculum circa 3-3.5 mm diametro, plano-convexum, alveolatum, marginibus alveolorum obtuse denticulatis.

Flores radii feminei 47-73 in capitulo 3-seriati; corolla 4-4.2 mm longa anguste tubulosa deorsum albida sursum (1/4 parte distali) leviter inflata purpurina vel rubescenti apice leviter constricto 5 denticulato dentibus minusculis subaequalibus, parte mediali copiose glandulosa, pilis seu glandulis cellulis biseriatis subclavatis glanduloso-capitatis circa 0.1 mm longis instructa. Stylus inclusus circa 4 mm longis, filiformibus apice bifurcatus ramis 0.7-1 mm, marginibus minute stigmato-papillosis. Achaenia 1.7-2 x 0.7-1 mm, obovata lateraliter compressa apice rotundata basim versus attenuata basi acuta bicostato-marginata, faciebus plano-convexa saepe nervo uno laterali conspicuo, pilis antrorsis acute bidentatis (geminis) 0.07-0.15 mm longis copiosis et parcis glandulis claviformibus 0.05-0.1 mm circa apicem munita; carpopodium callosum cylindraceum circa 0.15 mm altum 0.1 mm latum cellulis rectangularibus usque ad 10 series instructum, Fig. 3-S. Pappus albidus circa 4 mm longus setis uniseriatus strictis strigosis subaequalibus, subapice vix leviter ampliatis, acutis, rare 1-2 setis brevissimis.

Flores disci pseudohermaphroditi 30-35 in capitulo. Corolla, 4.5-5 mm longa, tubulo circa 1.8 mm longo viridulo palido glabro; limbo infundibuliformi-campanulato, rubro, dimidia parte inferiore

angustiori copiose pilosula, pilis glandulosis crassis cellulis biseriatis circa 0.07-0.12 mm, sursum glabro, vel parcissimis glandulis, nervis commisuralibus notatis, lobis triangularibus 0.7 mm altis acutis, margine crasse marginatis papillosis extus subapice parcis glandulis patulis 0.05-0.1 mm longis. Antherae 1.3 mm longae breviter sagittatae appendice apicali anguste elliptica triangulata 0.3 mm longa. Stylus 4-5 mm, ramis oblongo-lanceolatis 0.7 mm, extus dense papilloso-pilosus. Ovaria sterilia 1.5 mm, anguste oblonga, 5-nervata, sparsis pilis geminis rigidis antrorsis 0.07-0.15 mm et praecipue subapice parcis vel raris glandulis pyriformibus vel clavatis 0.05 mm, basim angustata podocarpio calloso. Pappus corolla aequilongus setis uniseriatis subaequalibus subapice levissime ampliatis basi coalitis. Fig. 2I-Q, 3P-S.

Typus: Costa Rica: South to southwest of Cerro Chirripó, close to Refugio, Valle de los Conejos, 3600 m alt, low clums in rain paramo, flowers dark red at tips, 9 Dec 1966, Arthur S. Weston 3645 (US, holotype). Other collection: Chirripó massif, 3500 m, Valle de los Conejos, 3500 m, grows at stream edges and on alluvial flats. 29 Jan 1976, Weston 10082 (US).

The name of this new species honors Mr. Humberto Barquero Mora, Costa Rican botanist, who has been the botanist of many of the Kohkemper's exploratory expeditions.

WESTONIELLA TRIUNGUIFOLIA, Cuatr. sp. nov.

Fruticulus parvus prostratus ramis robustiusculis saepe intricatis, congestis, plus minusve caespitoso-pulvinatus ad 10 (-15) cm altus. Ramuli ultimi 2-5 cm longi erecti densissime imbricato-foliati, internodis copiosissime crasseque albo-lanatis pilis longissimis tenuissimis (0.005-0.015 mm diam) floccosis, nodis in vetustis exfoliatis cicatricosis.

Folia coriacea 4-6 (-7) mm longa. Lamina crassiuscula profunde 3 (-5) lobata, 2.2-3 mm longa 1.5-3 mm lata, lobis 1-1.5 mm longis triangulare digitiformibus apice acute unguiformis, apiculo calloso duro acutissimo saepe incurvo; adaxialiter viridis bene bullata sursum glabra deorsum floccose albo-lanata, abaxialiter dense lanata marginibus valde revolutis, costa elevata basi paulo angustata et in vaginam amplectentem producta. Vagina submembranacea 2-2.5 mm longa apice 1.2-1.6 mm lata basim versus usque 2-2.5 mm lata ampliata, adaxialiter tantum ad apicem lanata, abaxialiter undique copiose albo lanata.

Capitula cylindracea 7-8 mm alta 4-4.5 mm diametientia 37-50 flores ferentia, heterogama brevi-radiata. Involucrum tubulosum basi rotundatum 7-8 mm altum. Phyllaria 30-34 circa 5-seriata exteriora 1/2-2/3 altitudinem interiorum attingentia, reliqua gradatim intermedia; interiora fertilia 6-7 x 0.8-1.2 mm, linearia acuta subscariosa rigidula, costa crassiuscula immersa signata, ceteris venis obsoletis, dorso costa apiceque lilacina vel

brunnescentia marginibus late scariosa hyalinaque sursum lacerato-ciliolata dorso parcis pilis et copiosis glandulis; exteriora 4.5-3.5 x 1-1.4 mm, anguste elliptica inferne paleacea sursum scariosa basi incrassata costa et ad apicem violaceo-brunnea crassiuscula rigida argute acuteque apiculata, abaxialiter copiose arachnoideo-lanuginea pilis tenuissimis (0.005-0.015 mm crassis) longissimis intricatisque, dorso copiosis glandulis globoso-pediculatis sparsis; intermedia gradatium instructis. Receptaculum plano-convexum alveolatum margine rotundato, marginibus alveolorum membranaceis dentatis, 2-2.2 mm diam.

Flores radii feminei 26-37 in capitulo, 2-seriati; corolla pallide lilacina, 3.8-5.2 mm longa, tubularis, tubulo 1.8-3 mm longo 0.2-0.3 mm crasso, basi excepta copiose pilosulo pilis antrorsis glandulosis cellulis biseriatis circa 0.07-0.12 mm longis, limbo glabro tubuloso plus minusve dilatato-inflato circa 0.45-0.8 mm crasso subapice plus minusve constricto, apice oblique truncato, inaequaliter denticulato, zygomorpho, dentibus abaxialiter 3 (-4) minutis obtusis, adaxialiter 2 antrorsis inferis dispositis. Stylus inclusus vel maturitate paulo exsertus, 3.5-3.8 mm longus, tenuis, ramis flexibilibus linearibus obtusis 0.7-0.8 mm marginibus apiceque late stigmatici-papillosis. Ovarium fertile, maturitate 1.4-1.8 x 0.4-0.6 mm, ellipticum apice obtuso basi paulo attenuata subcompressum costato-marginatum interdum nervo tenui uno latere, densiuscule villosum et ad apicem glanduliferum, pilis rigidulis antrorsis acutis biseriatis (geminis) bicuspidatis 0.1-0.25 mm, glandulis globoso-obovatis crassis, 0.05-0.09 mm, sub apicem intersparsis. Carpopodium crassiusculum circa 0.15 mm altum basi subrotundatum, cellulis quadratis seriatis saepe 5-seriatis. Pappus albus setis uniseriatis strictis scabrosis acutis apicem non ampliatis 3.5-4.5 mm longis, cellulis 3-5 seriatis.

Flores disci hermaphroditi 9-15 in capitulo; corolla tubulosa 4.2-5.3 mm longa, tubulo 1.5-2.5 mm angusto glabro, vel ad apicem parcis pilis strictissimis ad 1 mm longis et sparsis glandulis limbo campanulato-tubuloso sursum magis ampliato, atrorubro nervis 5 tenuibus suturalibus, sparse piloso pilis tenuissimis 0.5-0.8 mm sparsis et glandulis subclavatis 0.07-0.12 mm, lobis anguste triangularibus acutis, marginatis, 0.5-0.7 mm longis, apice intus papillosis, abaxialiter sparsis pilis obtusis 0.15-0.2 mm et parcis glandulis subclavatis. Antherae 1.5 mm basi sagittatae appendice apicali anguste elliptica attenuata 0.4 mm longa, collo crassiusculo cylindraceo circa 0.25 mm longo cellulis quadrato-rectangularibus multiseriatis conspicuissimis. Grana pollinis tricolporata spinulosa circa 26-u diametro. Stylus 4 mm longus basi in discum crassum 5 lobatum 0.15-2 mm altum leviter immersa, ramis oblongo-lanceolatis acutis 0.8-1 mm longis, adaxialiter laevis, abaxialiter margineque densiuscule papilloso-pilosis pilis obtusissimis 0.05-0.07 mm longis, haud stigmatiferis. Ovarium anguste ellipticum vel oblongum exovulatum vel ovulatum sed apparenter sterile, 1-1.5

mm longum densiuscule antrorso-pilosum pilis geminis strictis bicuspidatis 0.1-0.2 mm, et ad apicem glandulis globoso-obovatis, crassis, 0.05-0.08 mm longis. Pappus albus setis uniseriatis 3.5-5.5 mm longis vel interdum parcis brevioribus intersparsis, cellulis 5-6 seriatis acutis apicem haud dilatatis. Fig. 1F; 2H; 3D, N-O.

Typus: Costa Rica, Chirripó massif, Rio Talari, below big pool above lower Refugio, 3450 m, on rock face, 26 Jan 1976, Arthur S. Weston 10076 (US, holotype). Other collections: Cerro Chirripó, south to southwest, 3600-3800 m, rain paramo, dense tuft, 9 Dec 1966, Weston 3632 (US); id. Cerro Terbi, 3600-3800 m, 5 Sept 1969, Weston 6028 (US); South fork of Rio Talari below Sabana Chirripó, small sabana on banks of river, 24 Feb 1976, Weston 10123 (US). Cerro Buenavista group south of Pan-American Highway, Cerro Frío, 3350-3500 m, rain paramo much of it probably occasionally grazed by horses and cattle, low shrub ca 8 cm high, phyllaries maroon lavender outer flowers tubular, pink-lavender, regular stamen yellow, 28 Aug 1969, Weston 5978 (US); id. Cerro Buvis, 3350-m, low shrub ca 8 cm high, phyllaries maroon-lavender, outer flowers tubular pink-lavender, inner dark maroon-lavender, stamen yellow, 28 Aug 1969, Weston 5969 (UC, US); id, between Cerro Buvis summit and lower slopes of Cerro Frío, 3350-3500 m, low, compact shrub with short, erect branches, leaves ascending dark green and glabrous above, tomentose beneath, 14 Aug 1969, Weston 5847 (US).

WESTONIELLA KOHKEMPERI, Cuatr. sp. nov.

Frutex usque ad 1.5 m altus, caulibus simplicibus vel sursum pauce ramosis inferne glabratis paulo striatis cicatricoso-tuberculatis cum reliquis vaginorum foliorum ornatus, sursum dense foliosis internodiis 2-5 mm longis prupurascentibus plus minusve arachnoideo-lanugineis, pilis tenuissimis flexuoso-intricatis.

Folia alterna chartacea stricte linearia 20-35 mm longa 1-1.5 mm lata, ascendentia, leviter curvata, sessilia, lamina replicata marginibus plicato-revolutis abaxialiter superficiem tegentibus, raris dentibus mucronifornibus saepe occultis, apice argute callosoapiculata, basi late aperta auriculato-amplectentia, utrinque tantum costa notata, et araneoso-lanuginea pilis tenuissimis albis flexuosis intricatis et glandulis capitato-pediculatis basi conica, adaxialiter sparsis abaxialiter valde copiosis; costa adaxialiter impressa subnitida sparse glandulosa, abaxialiter infra plicaturam costa crasse elevata superficie copiose lanuginea et glandulosa. Folia suprema juvenilia in ramis sterilibus sicut infra inflorescentias magis copiose seu dense albo-barbata pilis 5 mm strictissimis flexuosis lanatis.

Capitula 15-20 at terminationem caulis in panicula corymbiformi congesta 4-7 cm lata, spisse albo-villoso-barbata, pilis

longis cellulis ad 0.06 mm crassis 0.1 mm longis, hyalinis, visu gossypina. Pedicelli 1-5 mm longi teneri longe villosi et foliato-bracteati, bracteis numerosis subimbricatis barbatis involucrum inferne tegentem.

Capitula late cylindrica 7-9 mm alto 8-10 mm lata heterogama subradiata, 112-176 flores ferentia. Involucrum campanulatum circa 6.5-7 mm altum. Phyllaria 46-60, 4-5-seriata membranacea, subaequilonga, lineari-lanceolata vel subulato-lanceolata acuminata acuta, interiora fertilia 26-30, margine scariosa interdum leviter lacerato-denticulata, 6-7 x 0.6 - 1.2 mm, 4-6 nervis plus minusve conspicuis, inferne pallida subpapyracea, rigidulaque sursum et costa violacea, adaxiale glabra, abaxiale copiose seu dense longeque albovilloso-barbata, pilis multicellularibus (ad 5 mm) cellulis botuliformibus vel rectangularibus hyalinis 0.035-0.05 mm diametro ascendentibus vel transverse-patulis intricatis et glandulis sparsis etiam instructa; exteriora 6-5 x 1 mm brunneo-violascentia magis firmula. Receptaculum 4-5 mm diametro plano-convexum profunde alveolatum marginibus alveolorum membranaceis obtuse dentatis.

Flores radii feminei 100-130 in capitulo 3-4-seriati; corolla 4.5-5 mm longa anguste tubulosa, tubulo stricto subcapillari 3-3.5 mm longo inferne glabro 1/2-1/3 superiore pilosulo, pilis glandulosis crassiusculis (cellulis biseriatis) oblongo-subobovatis circa 0.1 mm longis, limbo tubuloso-ampliato leviter inflato, subbotuliformi, rubescenti apice leviter constricto minute 5-denticulato dentibus aequalibus vel adaxialibus paulo brevioribus 0.02-0.05 mm basi limbi parcis glandulis cetero glabro. Stylus circa 4 mm, inclusus vel corollam aequans raro longior, ramis strictis linearibus subobtusis marginibus argute papilloso-stigmaticis ad 1 mm longis. Achaenia 2.2-2.5 x 1.2-1.5 mm, obovoidea subcompressa apice obtusissima, basi attenuata acutata margine crassiuscula marginata, undique 1 (-2) nervo prominulo, puberula tantum sparsis pilis geminis rigidis antrorsis acutis 0.05-0.15 mm et parcis glandulis obovoideis subapicalibus obsita; carpopodio calloso 0.2 mm longo latoque cellulis 7-10 seriatis rectangularibus instructo. Pappus albido-stramineus 4.8-5.3 mm longus setis uniseriatis 26-30, subaequilongis, basi coalitis, strigulosis subapice levissime dilatatis, acutis.

Flores disci pseudohermaphroditi 34-46 in capitulo. Corolla 4.5-5.3 mm longa, tubulo circa 1.5-1.8 mm longo angusto albido glabro; limbo circa dimidia parte inferiori anguste tubulosa copiose pilosula pilis glandularibus (cellulis biseriatis) oblongis crassiusculis 0.4-0.1 mm longis, parte superiore ampliata tubulosa circa 2 mm longa atrorubra basi parcis glandulis cetera glabra vel subglabra lobis maturitate leviter recurvis triangularibus acutis circa 0.6-0.7 mm longis, abaxialiter parcis pilis glandulosis munitis et parcis vel parcissimis pilis pluricelullaribus crassiusculis hyalinis obtusis antrorsis 0.2-1 mm. Antherae 1.5-1.8 mm

longae basi minute obtusiuscule auriculatae appendice apicali anguste elliptica acutata 0.35 mm longa. Stylus extremo purpureus ramis circa 1 mm longis oblongo-lanceolatis abaxialiter copiosissime piloso-papillosis. Ovarium anguste oblongum 1.7-2 mm longum, sterile, 4-5 nervis vel costis conspicuis, pilis geminis sparsis et glandulis sparsissimis munitis, basi podocarpo annulari calloso. Pappus 5-5.4 mm longus setis uniseriatis subaequalibus strigosis subapice leviter dilatatis, basi breviter coalitis. Fig. 1A, E; 3E-H.

Typus: Costa Rica, South to Southwest of Cerro Chirripó, Pico Sureste, 3600-3800 m, rain paramo, 1.5 m height, erect, 1 or 2 unbranched stems, heads terminal, flowers dark red tipped, occasional, usually associated with other shrubs, 9 Dec 1966, Arthur S. Weston 3612 (US, holotype); id Valle de los Conejos, 3600 m, plant 1/2 to over 1 m, leaves very variable in size, 26 Jan 1976, Weston 10078 (US); id. Cerro Terbi, rain paramo 3600-3800 m, stemmed shrub 1 m high, 5 Sept 1969, Weston 6026 (US, paratype); id. Cerro Truncado, 3700 m, 17 Feb 1976, (specimen mixed with nº 10093), Weston 10093A (US). Buenavista massif, Cerro Sakira, 3400 m, 80 cm tall, stem single or sparsely branched to a few cm below summit, terminated by a tight cluster of heads, disk flowers green below with maroon-red lobes, anthers yellow, ray flowers tubular pink, 26 Jan 1976, Weston 10056 (CR, UC).

The name W. kohkemperi honors Mr. Mainrad Kohkemper Meza, Costa Rica's foremost and best known mountaineer, who has climbed most of the major peaks in Costa Rica and has published more, and most usefull to biologist-explorers, on the remote highest parts of the Cordillera Talamanca than anyone else.

WESTONIELLA ERIOCEPHALA (Klatt) Cuatr. comb. nov.

Senecio eriocephalus Klatt, Bull. Soc. Bot. Belg. 31:212.1892. Erigeron adenophorus Greenman, Proc. Amer. Acad. 39 (5): 94. 1903.

Suffrutex ad 80 cm altus, caulibus sparse ramosis inferne exfoliatis, striolatis, glabris, basis vaginorum foliorum remanentibus adnatis, sursum erectis foliatis internodiis 2-6 mm longis copiosis glandulis capitato-stipitatis circa 0.5 mm longis patulisque vestitis.

Folia alterna crassiuscule herbacea sessilia, lamina subplana 15-35 x 2.5-6 mm, anguste-elliptica apice attenuata subacutata, margine plus minusve revoluta argute inciso-dentata dentibus remotis mucronatis antrorsis mucronibus callosis 0.3-0.5 mm longis, basi auriculata amplectenti, costa utrinque notata nervis remotis ascendentibus venulis reticulatis; adaxialiter copiose hirsutula pilis patulis hyalinis 1 mm longis et dense glandulifera, abaxialiter tantum costa marginibusque pilifera, sed undique glandulifera.

Capitula ad extremos ramorum glomerata in paniculis congestis terminalibus, 3-6 cm latis, copiose albo-lanato-barbatis. Ramuli pedicellique copiose hirsuti et glandulosi. Bracteae subtendentes 5-10 mm longae, viridulae, dense longeque albo-villoso-barbatae pilis longis crassis 0.035 - 0.05 mm diam hyalinis, flexuosis.

Capitula cylindracea 8-9 mm alta 5-7 mm diametientia circa 123-140 flores ferentia, heterogama subradiata. Involucrum campanulatum 7-8 mm altum circa 42-46 phyllariis subaequilongis circa 4-seriatis membranaceis, 5-5 x 1-1.2 mm anguste elliptico-lanceolatis subacutis, margine scariosis praecipue sursum leviter lacerato-dentatis vel lacerato-ciliatis, 3-5 nervatis, interioribus sursum lilacinis, parce villosis et sparse glandulosis exterioribus pallide viridulis copiose longe pilosis pilis ad 4 mm, hyalinis cellulis numerosis cylindricis vel botuliformibus ad 0.06 mm diam terminali obtussissima, flexuosis vel patulis intricatisque (fig. 1-D) et sparsis glandulis intermixtis. Receptaculum plano-convexum alveolatum, 3-4 mm diametro.

Flores radii feminei 50-90 in capitulo, 3-seriatis, corolla 4.3-5.5 mm longa rosea (?) anguste tubulosa parte media sparse vel copiose glandulosa glandulis 0.1-0.15 mm longis crassiusculis oblongis, subclavatis, cellulis biseriatis, terminalibus ellipsoideis, inferne et superne glabra, 1/3 vel 2/5 superiori parte inflato-dilatata, apice oblique truncato plus minusve constricto, plerumque abaxialiter 2-3 sinuato-denticulato adaxialiter levissime sinuato 2-dentato. Stylus inclusus ramis linearibus acutiusculis 0.7-1 mm marginibus dense minuteque papillato-stigmaticis. Ovarium ellipticum 2 x 0.7 mm, costato-marginatum lateraliter compressum, utrinque nervo saepe conspicuo et pilis geminis antrorsis circa 0.05 mm parcis vel raris munitum. Carpopodium cylindraceum callosum, cellulis subquadratis parietibus incrassatis 5-7-seriatis. Pappus 4.5-6 mm longus circa 20 setis subaequilongis uniseriatis strigosis sursum paulo ampliatis apice acutis, basi coalitis.

Flores disci pseudohermaphroditi 24-55 in capitulo. Corolla 4.5-5 mm longa, tubulosa, parte media sparsis glandulis, tubulo 1.8 mm longo deorsum glabro, limbo rubescenti vel purpureo tubuloso sursum gradatim dilatato, inferne sparsis glandulis sursum glabro, lobis triangularibus 0.6 mm altis crasse marginatis marginibus minute papillosis, extus 0-3 glandulis subapice munitis. Antherae 1.5 mm, basi minute sagittatae appendice apicali anguste elliptico-triangulari subacuta 0.35 mm, collo cylindrico-incrassato cellulis seriatis quadratis et elongato-quadratis parietibus incrassatis. Stylus crassus ramis crassiusculis anguste oblongis acutatis circa 0.8 mm longis extus dense longeque papilloso-hirtis. Ovarium sterile anguste ellipsoidei-oblongum, vacuum, 5-costatis parcis pilis geminis rigidulis antrorsis circa 0.05 mm. Pappus 5-6 mm longus setis strigosis, uniseriatis basi coalitis apice acutis. Fig. 1B, D, Fig. 3D-H.

Typus: Costa Rica, Entre le Rancho del Jaboncillal et le sommet du Cerro de Buena Vista, roches 3100 m, 19 Jan 1891, Henri Pittier 3425 (US, isotype). Other collections: Chirripó massif, Cerro Truncado, 3700 m, common, 17 Feb 1976, Weston 10093 (US). Southwest of Cerro Chirripó, rain paramo, 3600 m, 9 Dec 1966, Weston 3638A (US).

Illustration. The excellent photograph by Hans Weber, made at the summit of Chirripó Grande, published in his "Die Paramos of Costa Rica", Abb. 71, 1958, undoubtedly represents Westoniella eriocephala.

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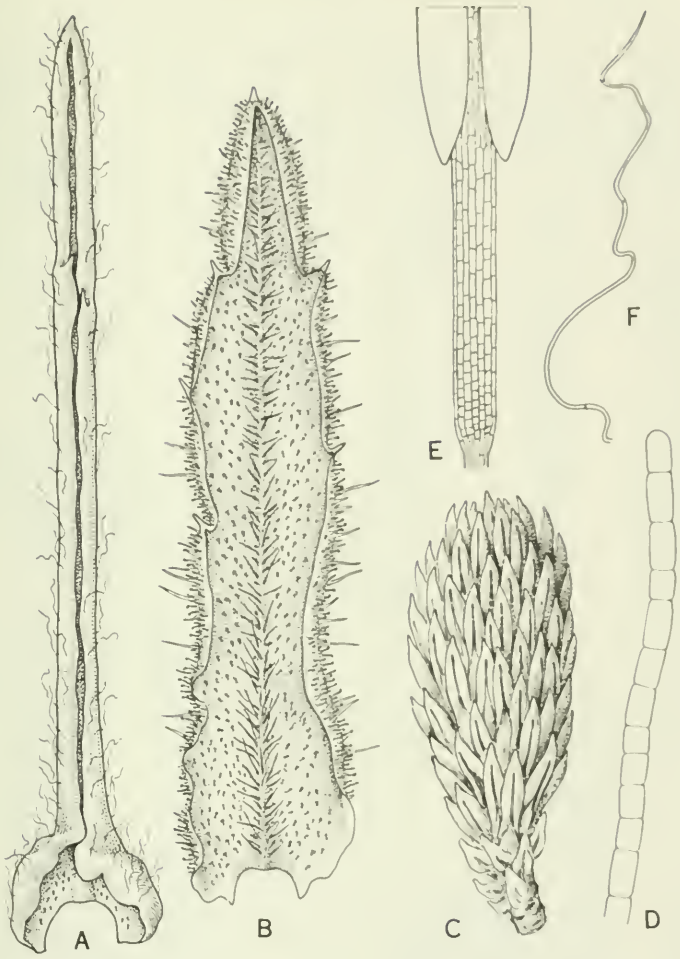

Fig. 1: A, Westoniella kohkemperi, leaf, abaxial side, x 4 (Weston 3612); B, W. eriocephala, leaf, abaxial side, x 4 (Weston 3638A); C, W. chirripoensis, terminal leafy branchlet, x 4 (Weston 3614); D, W. eriocephala, fragment of trichoma from the phyllaries, x 60 (Weston 3638A); E, W. kohkemperi, anther's collar, x 150 (Weston 3612); F, W. triunguifolia, fragment of trichoma from a leaf base, x 100 (Weston 10123).

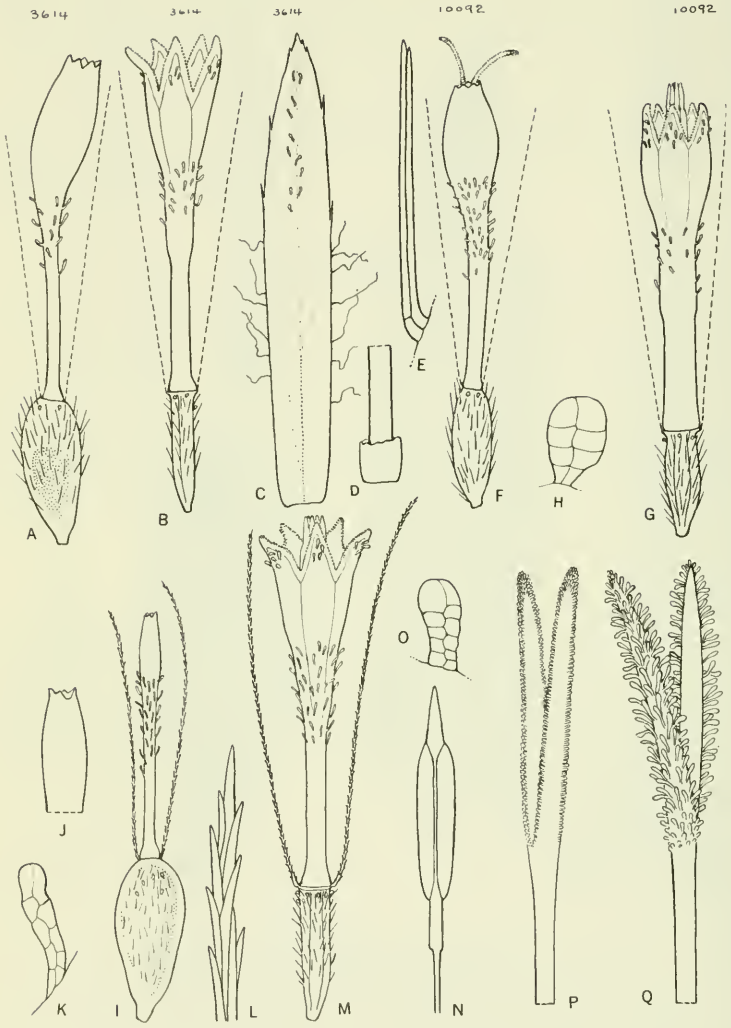

Fig.2: A-G, Westoniella chirripoensis (from Weston 3614 and 10092): A and F, ray flowers, x 10; B and G disc flowers (G a younger one); C, phyllary x 10; D, nectarial disc of disc flower x 20; E. geminate-celled trichoma of ovary, x 200; H, W. triunguifolia, gland from the phyllaries x 250 (Weston 5978); I-Q, W. barqueroana (from Weston 3645) I, ray flower x 10, distal section of a corolla x 20 (J), glandular trichoma of the same x 150 (K) and fragment of pappus bristle (L) x 175; M, disc flower x 10; N, anther x 20; O gland from the ovary x 250; P, stylar branches of ray flower x 50; Q, stylar branches of disc flower x 50.

Fig.3: A-D, Westoniella triunguifolia; A, ray flower x 10 (Weston 5978); B, ray flower and C, variants x 10 (Weston 10076); D, disc flower x 10 (W. 10076); E-H, W. kohkemperi, ray and disc flower and achene x 10 (Weston 3612); I and J, W. chirripoensis, end of style branch x 50 and leaf x 4; K-M, W. eriocephala ray and disk flowers x 10; N and O, W. triunguifolia, leaf, and adaxial and abaxial sides with the woolly vestiture removed, x 4 (Weston 5847); P-S, W. barqueroana, P, phyllary x 4; Q and R, leaf x 4; S, carpopodium x 200.

STUDIES IN THE LIABEAE (ASTERACEAE). XI.

NEW SPECIES IN THE KEW HERBARIUM

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Materials of Liabeae borrowed from the Royal Botanic Gardens at Kew include many specimens of interest pulled out by R.M.King during a visit. The material contains specimens of one Munnozia and two Liabums described here as new. In addition to the new species, a specimen from Peru: Junin: Huacapistana, Sandeman 4439, represents an unusual form of Ferreyranthus excelsus (Poepp.& Endl.) R.& B. having acuminate leaves and strongly papillose anther filaments. The latter is noted for the benefit of others who might be interested in the Peruvian Liabeae.

Liabum sandemanii H.Robinson, sp. nov.

Plantae herbaceae vel suffrutescentes ca. 0.5 m altae inferne ramosae. Caules leniter hexagonales dense albo-tomentosi non pilosi in nodis non disciferi. Folia opposita, petiolis 3-15 mm longis; laminae ellipticae 4.0-10.5 cm longae et 1.3-3.8 cm latae base anguste cuneatae margine aliquantum dense serrulatae apice breviter argute acuminatae supra glabrae nervis et nervulis prominulis subtus omnino dense canescentiter tomentosae distincte supra basem valde trinervatae, nervis secundariis 3/4 laminarum attingentibus valde ascendentibus ad margine parallelis. Inflorescentiae terminales longe scaposae superne subquadratim et ternate ramosae, ramis ultimis 10-25 mm longis dense tomentosis. Capitula ca. 8 mm alta et 11-12 mm lata. Squamae involucri 80-95 plerumque purpureae ca. 4-5-seriatae lanceolatae vel lineares 2-5 mm longae plerumque 0.7 mm latae apice attenuatae perangustae in sicco contortae extus puberulae et persistentiter arachnoideo-tomentosae; fimbriae receptaculorum ca. 2 mm longae. Flores radii 42-45; corollae flavae; tubis ca. 3 mm longis superne puberulis, pilis plerumque glandulosis, limbis linearibus ca. 7 mm longis et 1 mm latis plerumque glabris base pauce pilosis, pilis plerumque glandulosis. Flores disci ca. 35?; corollae flavae. tubis ca. 2.7 mm longis superne breviter glanduliferis et piliferis, faucis ca. 1 mm longis distincte campanulatis base hirsutis superne glabris,

lobis 1.0-1.2 mm longis et 0.4 mm latis plerumque glabris apice 0-2-spiculiferis; filamenta antherarum in parte superiore 0.35 mm longa; thecae ca. 1.5 mm longae; appendices antherarum oblongo-ovatae ca. 0.35 mm longae et 0.18 mm latae. Achaenia immatura ca. 1 mm longa sparse setifera et dense glandulifera; setae pappi interiores 27-30 ca. 5 mm longae apice vix incrassatae, exteriores subnullae. Grana pollinis 33-35μ diam.

TYPE: PERU: Junin: Huacapistana, alt. 5600 ft., herb with composite yellow flowers & opposite acuminate leaves with grey reverse. Grows in colonies in dense shade in marshy ground. About 2-2½ ft. high. Oct. 1943. Christopher Sandeman 4420 (Holotype,K).

The sparing habit and narrow leaves of the plant with secondary veins paralleling the leaf margin suggest the common Liabum acuminatum Rusby or L. amplexicaule Poepp.& Endl. The differences, however, are so numerous as to preclude close relationship. The inflorescence of the new species is decidedly scapose and the heads are less densely clustered, the involucral bracts are narrower with more attenuate contorted tips, with more persistent tomentum and with a purplish color, the corollas have more campanulate throats and slightly but distinctly spiculiferous lobe-tips. A particularly unique character for Liabum is the glanduliferous achene. The glands are weakly differentiated but are nevertheless numerous. This last character is absent from other Liabums but is found in the closely related genus Oligactis. The leaf venation of the new species and the cymose branching of the inflorescence indicate there is no close relation between L. sandemanii and Oligactis and the glands apparently represent a parallel occurence.

Liabum steinbachii H.Robinson, sp. nov.

Plantae herbaceae vel suffrutescentes ca. 4 dm altae base ramosae. Caules distincte hexagonales dense albo-tomentosi non pilosi in nodis disciferi, discis reniformibus ca. 5 mm longis. Folia opposita, petiolis 2.0-2.5 cm longis; laminae ovatae 6-8 cm longae et 3.5-5.5 cm latae base late acutae sensim acuminatae in partibus superioribus petiolorum decurrentes margine minute serrulatae apice breviter abrupte acuminatae supra glabrae ad marginem nervorum distincte anguste canaliculatae subtus omnino albo-tomentosae fere ad basem trinervatae, nervis secundariis 2/3 laminarum attingentibus inferne ab margine remotis. Inflorescentiae terminales, ramis secundariis subquadratim dispositis, ramis ultimis 1-3 cm longis

dense albo-tomentosis. Capitula 10-11 mm alta et 14-17 mm lata. Squamae involucri extus glabrae vel glabrescentes ca. 100 ca. 5-6-seriatae 1-7 mm longae ovatae vel lineares plerumque virides et flavescentes argute acutae apice breviter purpureae; fimbriae receptaculorum ca. 1 mm longae. Flores radii ca. 50?; corollae flavae; tubis 5 mm longis superne puberulis, limbis linearibus ca. 12 mm longis et 1.5 mm latis base puberulis. Flores disci ca. 35?; corollae flavae, tubis ca. 4 mm longis superne sparse puberulis, faucis 1.5 mm longis base puberulis et subabrupte constrictis superne glabris, lobis 2 mm longis et ca. 0.5 mm latis apice pauce minute spiculiferis; filamenta antherarum in parte superiore 0.25 mm longa; thecae ca. 2.5 mm longae; appendices antherarum oblongo-ovatae 0.35 mm longae et 0.15 mm latae. Achaenia ca. 1.8 mm longis dense breviter setifera; setae pappi interiores 35-40 plerumque 5 mm longae apice vix incrassatae, exteriores ca. 30 tenues 0.5-1.0 mm longae. Grana pollinis 32-35 μ diam.

TYPE: BOLIVIA: Santa Cruz: Cerro Tres Cruces, elev. 1400 m, 8 Oct. 1928. Jose Steinbach 8152 (Holotype, K).

The genus Liabum has previously been known in Bolivia by only two species now placed in the genus, L. solidagineum (H.B.K.) Less. and L. acuminatum Rusby, both primarily Peruvian in distribution. The third species described here represents a distinctive apparently endemic entity from the central part of the country. The involucres of L. steinbachii are mostly greenish and glabrous becoming yellowish in maturity, characters reminiscent of the L. floribundum Less. — L. eggersii Hieron group of Colombia, Ecuador and northern Peru. Species of the latter group differ by being larger usually subscandent plants with smaller heads in denser clusters. The leaves of the more northern group are also generally larger with more truncate bases.

Munnozia karstenii H.Robinson sp. nov.

Plantae herbaceae 0.5-1.0 m altae? Caules hexagonales late fistulosi extus dense fulvo-pilosi et dense evanescentiter arachnoideo-tomentosi in nodis non disciferi. Folia opposita, petiolis 3-9 cm longis distincte anguste alatis, alis mucronato-denticulatis; laminae deltoideo-ovatae plerumque 8-19 cm longae et 6.5-14.0 cm latae base truncatae in angulis retrorsis vix latissimae margine multo dentatae et dense mucronato-denticulatae apice breviter argute acuminatae supra minute pilosae et aliquantum persistentiter

arachnoideo-tomentosae subtus dense fulvo-tomentosae fere ad basem trinervatae, nervis lateralibus 2/3-3/4 laminarum attingentibus. Inflorescentiae terminales pauce ramosae, ramis plerumque in ramulis brevioribus divisis, ramis et ramulis ultimis 2-7 cm longis dense aliquantum persistentiter albo-tomentosis et sparse fulvo-pilosis. Capitula 12-13 mm alta et 15-25 mm lata base dense albo-tomentosa. Squamae involucri 35-40 subaequilongae 11-12 mm longae, exteriores late ovatae vel suborbiculares 5-6 mm latae margine minute fimbriatae apice abrupte longe anguste acuminatae extus ca. 15-striatae sparse pilosae evanescentiter arachnoideo-tomentosae, interiores lanceolatae vel lineares longe attenuatae; receptacula fimbrillifera, fimbriis usque ad 1 mm longis. Flores radii ca. 40; corollae flavae, tubis 4.5-5.0 mm longis superne dense hirsutis, limbis ca. 14 mm longis et 1.5 mm latis inferne sparse hirsutis fere ad apicem sparse glanduliferis, glandulis plerumque longe stipitatis. Flores disci 50-75; corollae flavae, tubis ca. 3.5 mm longis supra basem dense hirsutis, faucis ca. 2.5 mm longis glabris base vix abrupte constrictis, lobis ca. 2 mm longis et 0.4 mm latis superne glanduliferis apice longe hirsutis, pilis in fasciculo 0.7-0.8 mm longis; filamenta in parte superiore 0.35 mm longa; thecae 2.8 mm longae, cellulis exothecialibus solum in parietibus transversalibus noduliferis; appendices antherarum ovatae 0.4 mm longae et 0.2 mm latae. Achaenia immatura 0.9 mm longa dense setifera ca. 8-costata; setae pappi ca. 35 plerumque 5.0-7.5 mm longae pallide rufescentes apice attenuatae non incrassatae, setae exteriores breviores 0.5-0.8 mm longae ca. 10 tenues. Grana pollinis ca. 30-33 μ diam.

TYPE: COLOMBIA: Meta: Moscofio, alt. 2028 m, 31 Dec. 1875. André 1105 (Holotype, K). PARATYPE: COLOMBIA: Meta: Villaricencio? or Magdalina? André 1105 (K).

Munnozia karstenii seems closely related to M. gigantea (Rusby) Rusby of Bolivia and but for the wide geographic separation perhaps it would be regarded as only subspecifically distinct. The involucral bracts are the most distinctive feature with their long-attenuate and abruptly acuminate tips. These tips are particularly abrupt and obvious in some of the outer bracts which are much more broadly ovate and more scarious-margined than the equivalent bracts in M. gigantea. The outer bracts also seem distinct in the less persistent arachnoid tomentum, such tomentum being restricted to the base of the head. In M. gigantea, all specimens seen show persistent tomentum

completely covering a number of the outer bracts. The leaf shape seems slightly different from M. gigantea. The blade is longer compared to its width being always obviously longer than wide. Also the lower angles of the leaves rarely seem to extend outward beyond the general outline of the leaf blade. In M. gigantea the basal angles are usually strongly projecting.

The name of the species is derived from the herbarium name Liabum karstenii Schultz that was on the specimens. The Schultz name has evidently never been published.

Liabum sandemanii H.Robinson, Holotype, Kew.
Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Liabum steinbachii H.Robinson, Holotype, Kew.

Munnozia karstenii H.Robinson, Holotype, Kew.

Enlargements of heads: Top left, Liabum sandemanii. Top right, L. steinbachii. Bottom, Munnozia karstenii.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXII.

NEW SPECIES AND COMBINATIONS FROM VENEZEULA.

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Recent loans received from Venezeula through the kindness of Dr. Julian A. Steyermark at the Instituto Botanico in Caracas have called our attention to the following new species and new combinations that must be added to the country's Eupatorian flora.

Ageratina aristeguietii R.M.King & H.Robinson, sp. nov. Plantae herbaceae vel suffruticosae ca. 1 m altae ramosae. Caules teretes fulvescentes hirsuti. Folia opposita, petiolis perbrevis 1-2 mm longis hirsutis; laminae ovatae 2.5-7.0 cm longae et 1.5-5.0 cm latae base rotundatae vel subtruncatae distincte trinervatae margine utrinque 6-10 serratae vel grosse crenato-serratae apice breviter acutae supra pilosae subtus in nervulis et nervulis majoribus hirsutae. Inflorescentiae corymboso-paniculatae, pedicellis plerumque 5-15 mm longis hirsutis. Capitula 8-10 mm alta et lata late campanulate. Squamae involucri 16-25 eximbricatae ca. 2-seriatae plerumque 6-7 mm longae apice acutae vel minute acuminatae extus bicostatae et pilosae; receptacula glabra plana. Flores 20-40; corollae albae 4-5 mm longae, tubis 1.5-2.0 mm longis perangustatis glabris, faucis cylindricis 2.0-2.5 mm longis superne sparse pilosis, lobis 0.3-0.5 mm longis extus dense pilosis intus breviter papillosis; filamenta in parte superiore 0.4-0.5 mm longis; thecae 1 mm longae; appendices oblongo-ovatae ca. 0.3 mm longae et 0.25 mm latae; appendices stylorum dense prominentiter papillatae. Achenia fusiformia ca. 2.5 mm longa, 5-costata in costis plerumque superne dense setifera; carpopodia cylindrica, cellulis quadratis vel oblongis 17-20μ latis et 20-50μ longis; setae pappi 22-25 ca. 4.5 mm longae facile deciduae ad apicem vix latiores. Grana pollinis 23-25μ in diam.

TYPE: VENEZEULA: Merida: Sierra Nevada; Paramo alrededores de La Laguna Verde proximo Picos Humboldt y Bonpland. Alt. ca. 4,025 m. Dec. 4, 1959. Harriet G. Barclay & Pedro Juajibioy 10,057 (Holotype US).

Additional collections: Merida: Sierra Nevada; alrededores de La Laguna Coromoto, Barclay & Juajibioy 9969 (US), Laguna Coromoto-Laguna Verde, Aristeguieta 2599 (US). Laguna Coromoto. Alt. 3,200 m Dec. 1956 A.L.Bernardi 5974 (VEN). Sierra Neveda de Merida, cerca de La Laguna de Coromoto, alt. ± 3,000-3,400 m. 15-16/2/1966. J.P.Schultz, L. Rodriguez P., Horacio Ramirez 300 (VEN 67038). Parte media do la vertiente N de La Laguna. Expostcion S. Matorral destruido por el fuego. Pendiente fuerte. Muchas piedras y rocas entre las cuales hay acumulacion de suelo que contiene mucha mat. organica.
Sufrutice, ramas apoyadas en los restos del matorral (Berberis). Corolas blancas.
Laguna Coromota. Alt. 3,200 m. Planta de Cabezuelos blancas. Estigmos largos exertos. Dec. 1956. A.L.Bernardi 5998 (VEN 39812). Laguna Coromoto, 3,400 m. 13/1/1957. L. et V. Vareschi 6081 (VEN 40163).

Ageratina aristeguietii is related to the common and variable A. ibaguensis (Sch.-Bip. ex Hieron.) K.& R.but the new species differs by the nearly sessile leaves, the large heads, and the comparatively short lobes of the corolla. All specimens seen of the new species show prominently hirsute stems and branches of the inflorescence, while specimens of A. ibaguensis vary from hirsute to puberulous. An Ecuadorian species with essentially sessile leaves, A. glandulifera (Hieron.) K.& R.differs by the copiously glandular pedicels.

Bartlettina tenorae (Arist.) R.M.King & H.Robinson, comb. nov. Eupatorium tenorae Aristeguieta, Flora de Venezeula 10: 189. 1964. Venezeula.

Chromolaena moritensis(Arist.) R.M.King & H.Robinson, comb. nov. Eupatorium moritense Aristeguieta, Flora de Venezeula 10: 129. 1964. Venezeula.

Chromolaena larensis (Badillo) R.M.King & H.Robinson, comb. nov. Eupatorium larense Badillo, Bol. Soc. Venez. Cienc. Nat. 10:287. 1946. Venezeula.

Chromolaena steyermarkiana (Badillo) R.M.King & H.Robinson, comb. nov. Eupatorium steyermarkianum Badillo, Bol. Soc. Venez. Cienc. Nat. 10: 287. 1946. Venezeula.

Chromolaena xestolepidoides (Wurdack) R.M.King & H.Robinson, comb. nov. Eupatorium xestolepidoides Wurdack, Mem. N. Y. Bot. Gard. 8: 145. 1953. Venezeula.

Critonia naiguatensis (Badillo) R.M.King & H.Robinson, comb. nov. Steyermarkina naiguatensis Badillo, Bol. Soc. Venez. Cienc. Nat. 22: 35. 1976.

Dr. Badillo evidently placed the species in Steyermarkina because of the close similarity in habit and supposed hairs on the corolla. The scandant forms of Critonia are common in Central America but have not previously been known from Venezeula. The corolla illustrated by Badillo has the cylindrical shape and small narrow lobes of Critonia but the corollas of that genus are all glabrous. Steyermarkina corollas are broader with larger sometimes very deeply cut lobes totally different in aspect from Critonia, and also there is a dense mass of hairs on the inside of the throat. Examination of the type specimen has resolved the seeming conflict by showing glabrous corollas infested with a fungus.

The only other 5-flowered scandent Critonia seems to be C. bartlettii (B.L.Robinson) K. & R. of Belize, Guatemala and Mexico. The Venezeulan species differs by the thinner, more prominently toothed, more sharply acuminate leaves.

Fleischmannia ejidensis (Badillo) R.M.King & H. Robinson, comb. nov. Eupatorium ejidense Badillo, Bol. Soc. Venez. Cienc. Nat. 10:289. 1946. Venezeula.

Fleischmannia ignota (Badillo) R.M.King & H.Robinson, comb. nov. Eupatorium ignotum Badillo, Bol. Soc. Venez. Cienc. Nat. 10: 290. 1946. Venezeula.

Fleischmannia steyermarkii R.M.King & H.Robinson, sp. nov. Plantae herbaceae 1 m altae? ramosae. Caules teretes striati glabri vel sparse minute puberuli virides sensim subliter castanei. Folia opposita, petiolis 7-30 mm longis angustatis; laminae lanceolatae 4.5-10.0 cm longae et 1.5-2.5 cm latae base rotundatae distincte trinervatae margine utrinque 5-9-crenato-serratae apice longe et anguste acuminatae supra sparse pilosae subtus glabrae in nervis sparse puberulae. Inflorescentiae terminales et in ramis axillaribus corymboso-paniculatae pauci-capitatae; pedicellis

9-15 m longis minute puberulis. Capitula ca. 7 mm alta et lata. Squamae involucri ca. 15 parce subimbricatae 3-6 mm longae 1.0-1.3 mm latae bicostatae margine late scariosae, bracteae exteriores ovatae argute acutae vel acuminatae extus in medio puberulae, bracteae interiores oblongae obtusae vel mucronatae extus glabrae. Flores ca. 18; corollae albae anguste infundibulares 4 mm longae, tubis ca. 0.8 mm nervis angustis, faucis 2.5 mm longis superne extus in cellulis antrorse papillatae, lobis 0.5-0.6 mm longis et latis intus et extus dense papillatis extus dense puberulis; filamenta in parte superiore 0.3 mm longa; thecae ca. 1 mm longae; appendices antherarum subquadratae ca. 0.22 mm longae et 0.2 mm latae; appendices stylorum ad apicem sensim clavatae. Achaenia prismatica ca. 2 mm longa glabra vel in apicem breviter 1-2-setifera in costis persistentiter flava; carpopodia 0.15 mm longis et 0.35-0.40 mm latis, cellulis plerumque subquadratis 15-20μ in diam; setae pappi 25-30 ca. 3.5 mm longis. Grana pollinis ca. 22 μ in diam.

TYPE: VENEZEULA: Distrito Federal: Cordillera del Avila, above Caracas, on south-facing dryish wooded slopes just W of Los Flores, alt. 1,675 m. January 3, 1944. Julian A. Steyermark 55141 (Holotype US). Paratype collection: VENEZEULA: Silla de Avila. 1934. C. Vogel 753 (US).

Fleischmannia steyermarkii has a number of rather distinctive features that are unusual in the genus and which form a unique combination. The leaves have distinctive long-attenuate tips and essentially glabrous undersurfaces. The involucre is only weakly subimbricate, and the corollas have papillae on the outer surface on the upper part of the throat as well as on the lobes. The type specimen shows the leaf character well but has somewhat immature heads. The paratype specimen which was intermixed with Ageratina ibaguensis has mature heads but only one leaf without a broken tip.

Ageratina aristeguietii R.M.King & H.Robinson, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

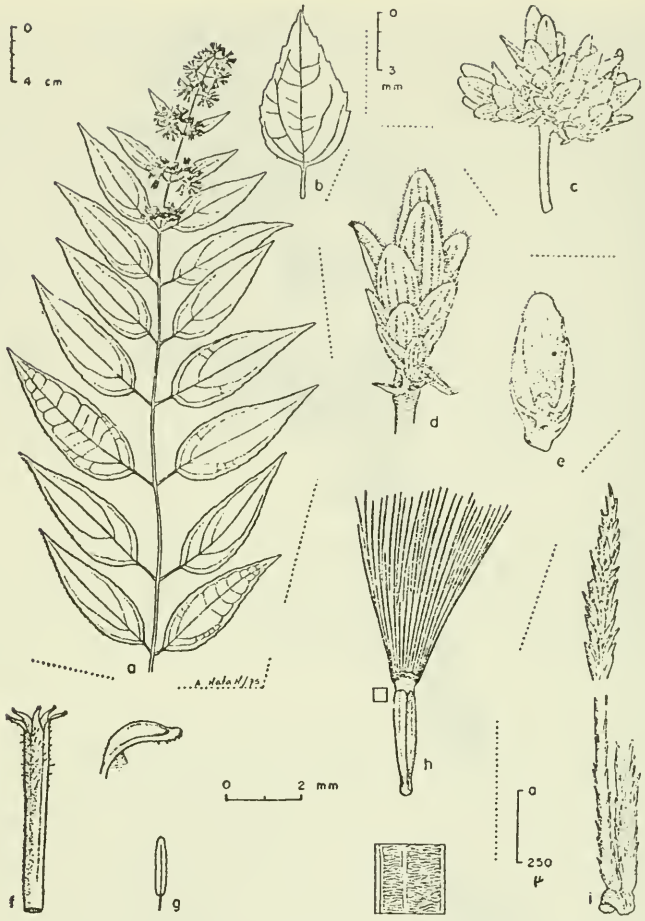

Fig. Nº 1. *Steyermarkina naiguatensis* BADILLO. *a.* Extremo de una rama florífera; *b.* Otra forma de hoja; *c.* Grupo de capítulos sésiles; *d.* Detalle del involucro; *e.* Corte mostrando el receptáculo; *f.* Corola (al lado detalle del lóbulo). *g.* Estambre; *h.* Aquenio (abajo detalle de la pared cuando todavía inmaduro); *i.* Setas del papus mostrando la porción inferior y superior. Todos los dibujos basados sobre STEYERMARK 92039, salvo *b.* basado sobre STEYERMARK 89895.

Critonia naiguatensis (Badillo) R.M.King & H.Robinson. (from Badillo, 1976, Bol. Soc. Venez. Cienc. Natur. 22: 36).

Fleischmannia steyermarkii R.M.King & H.Robinson, Holotype, United States National Herbarium.

Enlargements of heads: Top, Ageratina aristeguietii. Bottom, Fleischmannia steyermarkii.

BOOK REVIEWS

Alma L. Moldenke

"REVISION OF THE SYMPLOCACEAE OF THE OLD WORLD - New Caledonia Excepted", by H. P. Nooteboom, xiii & 335 pp., illus. Leiden University Press, Leiden P.O. Box 33. 1975. Dfl 93.60. Paperbound.

This careful taxonomic and systematic monograph is presented as Volume I in the Leiden Botanical Series and so serves as a fine harbinger for future volumes. The research involved 1) over 8,000 herbarium specimens, 2) field studies in Thailand, Malaya, Sabah, West Java and Sarawak, 3) access to and interpretation of pertinent literature, 4) guidance by Dr. van Steenis, and 5) use of the Parkhurst Key Generating Program at Cambridge, England, for computerizing the dichotomous keying data. "After constructing the overall key, the changing of one card was sufficient for constructing a local key.....I have tested all descriptions....and made some adjustments."

The introductory section surveys the literature, European and Japanese fossil record, palynology, chromosome numbers (basic 11), phytochemistry (tendency to accumulate available aluminum in the leaves), comparative morphology indicating to the author a closer affinity to the Cornaceae and possibly Theaceae rather than the Ebenales.

The taxonomic section recognizes only 111 species by reducing many of Brand's locally variable species to assorted infraspecific ranks. There are 21 new species included with full Latin descriptions and 21 well drawn plates showing all diagnostic structures.

Worldwide, the Symplocaceae with its single genus Symplocos and its retained two subgenera, Symplocos and Hopea, contains ca. 250 species in both the Eastern Old World from Bombay to Fiji and from Manchuria 46°N to New South Wales and Lord Howe Island 32° S and in the New World from the state of Washington to Southern Brazil especially in mixed evergreen rain forests. The subgenus Symplocos is limited to the tropics, while the subgenus Hopea ranges also into the temperate areas.

This is a fine needed study.

Index to authors in Volume Thirty-five

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Index to supraspecific scientific names in Volume Thirty-five

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