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THE STATUS OF AGALINIS CADDOENSIS PENNELL

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Abstract: Agalinis caddoensis Pennell is classified as "threatened" on the Smithsonian list. This species is known only from the type collection in 1913.

After an examination of Pennell's collection I conclude that Agalinis caddoensis is not sufficiently distinguishable from Agalinis strictifolia (Bentham) Pennell to justify its classification as a separate species.

There is no reason to continue the classification of Agalinis caddoensis as "threatened".

Agalinis caddoensis Pennell appears on the Smithsonian list of "endangered and threatened plant species", categorized as "threatened". Using the definitions given by the Smithsonian report, this classification seems wrong. The taxon should either be "endangered" or "possibly extinct". For an endangered species is ". . in danger of extinction. . "; or . . ; one which is found in a very limited area " . . e.g. the type locality only . ." while an extinct species is " . . . no longer known to exist after repeated search of the type locality and other known or likely places."

A. caddoensis was found but once, in one locality, and has not been seen in over 60 years. The type locality has long since been absorbed within a metropolitan area and extensive search in known or likely places has been unproductive.

The Smithsonian report emphasizes (p. 18) that once a plant appears on such a list it is subject to the question: "Is the plant species . . a valid taxon? Perhaps it is a . . non-valid segregate of a more common species." I believe this order is wrong: the status should be established before it appears on such a list. The category "taxonomic status in doubt" is, for some reason, applied only to the "extinct" list.

Since the type (and only) location of A. caddoensis was within ten miles of the LSU-S campus in Shreveport, we were well aware of the possibility of finding the species. Correll & Johnston (1970), with quite unfounded optimism, had reported it as ". . undoubtedly in northeast Texas (no material seen)". Fairly intensive collecting between 1970 and 1977 had produced nothing which could not be assigned, with the assurance one can bring to this difficult genus, to one of the common species of the area where they are abundant members of the fall flora.

The problem, however, was but one among many involved in setting up a new herbarium and making an initial collection from the relatively untouched area of northwestern Louisiana.

The matter was called to our attention more forcefully in the spring of 1977 by inquiries which were related to an environmental impact study for an airport extension in north Louisiana: would the construction further endanger the species? All we could tell them at the time was that the plant had not been collected for over a half century, that the type location was some 70 miles from the proposed construction and that we considered the chances of destroying any plants or their habitat as nugatory. But, during the spring, there was little more we could tell them.

I do not know whether this information was enough to satisfy whatever agency was raising the question but the true status of the species seemed worth investigation.

Agalinis Rafinesque (Gerardia L., in part).

Rafinesque divided the Linnaean genus Gerardia into three: Aureolaria, Tomanthera and Agalinis. Most authors, not all, observe the division but there is no agreement about the name Agalinis, many preferring Gerardia. Pennell (1886-1952), on whose work the present treatments of Agalinis are based, vacillated between the two. The result has been a proliferation of unnecessary synonyms and general confusion. Thus the recent "Checklist of Species for Flora North America" (1978) divides the species randomly between Agalinis and Gerardia and includes some names in synonomy. I will use Agalinis throughout.

Pennell attempted to cover the entire Scrophulariaceae of eastern temperate North America (but including at least part of Mexico) and Agalinis made up but a small part of that work. His final summary of Agalinis (as Gerardia) is exceedingly wearisome to study with its many references back to his previous publications. Aside from his use of trinomials, some of his nomenclature would not be permissible today and his reference to previously named species which do not appear in his synonomy is irritating. I begrudge noone the task of revising this monograph.

Agalinis caddoensis Pennell

Agalinis caddoensis Pennell, sp. nov. in Proc. Acad. Nat. Sci. Phil., 1921, Part III, 519.

Gerardia caddoensis (Pennell) Pennell, comb. nov. in: "Scrophulariaceae of Eastern Temperate North America", Acad. Nat. Sci. Phil., Monograph 1, 449 (1935).

Type: Pennell 5653 (sic) PENN): dry loam oakwoods along Kansas City Southern Railroad 2-3 miles northwest of Shreveport,

Caddo Parish, Louisiana; collected in flower October 5m 1913.
Other collections: Louisiana, Caddo: Shreveport, Pennell 5655, 5658, 5665.

Pennell's citation must be erroneous: there appears to be no collection numbered 5653. Requests to PH (where the PENN collections are now found) and US brought examples of the other three numbers but not 5653. Moreover, Pennell 5658 (PH 61211) is labeled "Type" in the same handwriting as all the labels while duplicates (PH 554846 and US 588124) are labeled "Isotype". Pennelll 5655 was collected at the same location (or one with an identical description) but on the day previous.

Pennell 5665 was collected on Oct. 5, 1913 in "mixed woods, 4-5 miles south of Shreveport, Caddo Parish, Louisiana along Cedar Grove trolley." This is about seven miles south of the type location but the specimen is clearly Agalinis gattingeri (Small) Small, a fairly common species of the area but hardly one to comfuse with the Setacea.

There are other disturbing errors in Pennell's work. The original date of the journal in which A. caddoensis was first published is repeatedly given as 1922 instead of the correct 1921. And quite by chance I noticed that the specimen Runyon 195 was cited, in 1935, as both Gerardia maritima grandiflora Benth. and Gerardia strictifolia Benth. with no "in part" indicated.

Pennell placed A. caddoensis in Section Chytra, Subsection Setacea. The only species in Setacea which might be found in northwestern Louisiana are Agalinis pulchella Pennell (Gerardia pulcherrima Pannell, not Gerardia pulchella Pennell), and Agalinis strictifolia (Bentham) Pennell. A. caddoensis is certainly not A. pulchella which has well developed axillary fascicles. A. caddoensis and A. strictifolia are closely related and Pennell separated them in his key on the basis of calyx lobe length.

Correll & Johnston (1970) follow Pennell closely but are led into error by Pennell's key: they add a differentiation between these two based upon the intra-cellular seed area. Since Pennell did not collect A. caddoensis in fruit this character is shown, in his key, as "unknown". Correll & Johnston saw no material and could not have added the diagnostic.

The close resemblance and difficulty of separation of these two taxa are shown by the following table:

	A. strictifolia	A. caddoensis
Height	5-8 dm.	4-6 dm.
Stem	striate, glabrous	striate, very slightly scabrous
Leaves	2-3½ cm. linear-subulate	2½-3 cm. filiform, acuminate
	1-3 mm wide	.8 mm wide
Racemes	4-10 flowered	1-5 flowered
Pedicels	ascending, spreading	ascending, spreading
Pedicel length	1-2½ cm.	1.3 - 2.2 cm.
Calyx tube	3-4 mm	4-5 mm
Calyx lobes	1-2 mm	.7 -1 mm
Corolla length	2-2½ cm.	2-3 cm.
Corolla tube	12-15 mm	19-23 mm
Corolla lobes	8-10 mm	6-7 mm

Some of these measurements imply an exactitude completely unobtainable in living material and statistically meaningless on such a small sample.

After a preliminary check with the major herbaria of the area (SMU, TEX, UARK, LSU, NLU) which produced no specimens of the taxon, specimens of Pennell's collections, except for the questionable 5653, were obtained from PH and US. SMU kindly furnished specimens of the species expected in this area, supplementing our own collections at LSUS.

Careful measurement of the calyx lobes did not show the differences described by Pennell. While the lobes of A. strictifolia might average slightly longer than those of A. caddoensis the difference was of the order of .1 - .2 mm, entirely insufficient in this variable character to separate species. Similarly, the difference in corolla tube length could not be observed; indeed, the tubes of A. caddoensis appeared. if anything, to be shorter than those of A. strictifolia, exactly opposite to the descriptions.

Only one difference of significance could be found: the leaves of A. caddoensis were definitely narrower than those of A. strictifolia, although so highly involute as to obscure the actual width.

All these comparisons were made on south Texas specimens of A. strictifolia since the species is not known from northern

Texas or Louisiana. Pennell cited one specimen (Palmer 14383) (MO) from near Palestine, Anderson County, Texas, about 120 miles southwest of the Louisiana location of A. caddoensis. This specimen and one of Pennell's collections (Pennell 5431, MO) were borrowed from MO. The Palmer collection was typical A. strictifolia similar to those from extreme south Texas. The Pennell specimen, however, was not A. strictifolia and did not even closely resemble that species. It is probably Agalinis oligophylla Pennell (Gerardia microphylla (Gray) Small, not Agalinis microphylla Raf.)

D. A. Webb (1978) has set out two criteria which guided the group who prepared Flora Europea:

First, that for two taxa to be regarded as distinct species they must differ in morphology clearly enough for it to be possible to key them out honestly and unambiguously, by characters of which at least one shows no overlap in normal, well-developed specimens.

Secondly, that one differential character is not enough, it must be backed up by others, even if these admit some overlap.

A. caddoensis might be said to pass the first test, though barely. The abundant and widespread species A. tenuifolia (Vahl) Raf. shows more variation among its varieties in both leaf width and calyx tube length than those adduced to support the separation of A. caddoensis and A. strictifolia. But A. caddoensis certainly does not pass the second; there is no set of characters, even overlapping, which can serve to distinguish it from A. strictifolia, honestly and unambiguously. To be sure, part of the difficulty is inherent in the limited number of specimens available and our inability to acquire more. Living material might well show variation which is not visible on herbarium sheets. But we do not know that Pennell worked from such material since he did not describe until 1921 a collection made in 1913.

While A. strictifolia isno more a normal member of northwestern Louisiana's flora than is A. caddoensis, the location of Pennell's collections: along the KCS railroad suggests a purely adventive origin.

This examination of available material leads me to these conclusions:

1. The reported Agalinis caddoensis Pennell does not differ from Agalinis strictifolia (Bentham) Pennell to justify its designation as a separate species.

2. Neither species is normally found in northwest Louisiana.

3. The solitary population along a railroad track suggests an adventive distribution of the taxon.

4. There is no reason, at present, to include A. caddoensis in a list of endangered plants. If listed at all it should be as "taxonomically doubtful, probably extinct".

Specimens examined:

Agalinis caddoensis	Pennell 5658 (type, PH) 5658 (isotype, PH) 5658 (isotype, US) 5655 (PH)
Agalinis strictifolia	Palmer 14383 (MO) Runyon 5227, 5224, 5232 (SMU) Williams 62 (SMU) Jones 716 (SMU) Johnson 1008 (SMU) Johnston 541517 (SMU)
Agalinis oligophylla	Pennell 5431 (MO) (as A. strictifolia)
Agalinis gattingeri	Pennell 5665 (PH) (as A. caddoensis) Shinners 9485, 16346 (SMU) Moore 1045 (SMU) MacRoberts 746, 2583 (ISUS)

References

_____ Report on Endangered and Threatened Plant Species of the United States, Simthsonian Institution, 15 December, 1974. 94th Congress, 1st session, - - House Document No. 94-51. U. S. government Printing Office, Washington, 1975.

Correll, D. S. & M. C. Johnston, 1970. Manual of the Vascular Plants of Texas. Texas Research Foundation, Renner.

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_____ 1929: Proc. Acad. Nat. Sci. Phil., Vol. LXXXI, 185.

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Shetler, S. G. & L. E. Skogs, Eds. 1978: A provisional Checklist of Species for Flora North America (revised), Missouri Bot. Gar. St. Louis.

Webb, D. A. 1978: Taxon (27) 1, 5.

BEGONIA NOMENCLATURE NOTES, 2

THE *BEGONIA* IN WALLICH'S NUMERICAL LIST

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The Species of the Begoniaceae, Edition 2, 1974, by Fred A. Barkley and Jack Golding is a compendium of the published names and published synonomy for the species and therefore continues the errors from the literature. I have been reviewing the literature to verify or correct the citations and their synonomy. My determinations will be published in this series, "*Begonia* Nomenclature Notes."

WALLICH'S LIST

Dr. Nathaniel Wallich was in the service of the East India Company as superintendent of the Calcutta Botanic Garden (1815-1846). He prepared *A numerical list of dried plants in the East India Company's museum* (often cited as Wallich's Catalogue). This list was lithographed from the manuscript and published from 1828 to 1849. Because this was only a numerical list without descriptions, the new names given by Wallich in this list were *nomina nuda*.

In this review of the *Begonia* in Wallich's *Numerical list*, after the photocopies of his manuscript names, each specimen number is followed by either the correct name with the citation of the author who validly published the epithet of Wallich, or the *nomen nudum* with the name that replaced it.

Additional citations important in establishing the present status and pertinent synonomy have been included.

3671 Begonia guttata Wall.
a Penang 1822
B Hab. An var. mera vel distincta sp.?

no. 3671 A

Begonia guttata Wallich (Num.List.: 129. no. 3671A. 1831. *nomen nudum)* ex A.DC. Prodr. 15(1): 352. 1864.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 648. 1879.

no. 3671 B

Begonia guttata sensu Wallich. Num.List. : 129. no. 3671B. 1831. *nomen nudem.* non Wallich ex A.DC. 1864.

= *Begonia sinuata* Wallich ex Meisner, in Ber.Verhandl. Naturf.Ges.Basel 2: 42. 1836.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 650. 1879.

3672 Begonia pedunculosa Wall.
a Brand. Gelert, M.B. Smith
B HBL

no. 3672 A

Begonia pedunculosa Wallich, Pl.As.Rar. 1: 86. *t.97.* 1830.; Wallich, Num.List. : 129. no. 3672A. 1831.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 639. 1879.

no. 3672 B

Begonia pedunculosa sensu Wallich, Num.List. : 129. no. 3672B. 1831. non Wallich 1830.

= *Begonia khasiana* C.B.Clarke in Hooker f. Fl.Brit. Ind. 2; 656. 1879.

3673 Begonia Wightiana Wall.
Ill. Wight.

no. 3673

Begonia wightiana Wallich, Num.List. : 129. no. 3673. 1831. *nomen nudum.*

= *Begonia albo-coccinea* Hooker, Bot.Mag. 71: *t.4172.* 1845.; A.DC. Prodr. 15(1): 389. 1964.

syn. *Begonia grahamiana* R.Wight, Icon.Pl.Ind.Or. 5(2): *t.1811.* 1852.

syn. *Mitcherlichia albo-coccinea* Klotzsch, Monatsb. Berl.Akab.: 124. 1854.; Klotzsch, Begoniaceen: 73. 1855.

syn. *Mitcherlichia grahamiana* Hasskarl, Hort.Bog. Desc.: 334. 1858.

3674 Begonia parviflora H. Hamilt.
e manul. Morung

no. 3674

Begonia parviflora Hamilton ex Wallich, Num. List.: 129. no. 3674. 1831. *nomen nudum.* non Poeppig & Endlicher 1835.

= *Begonia minicarpa* Hara, J.Jap.Bot. 47: 112. *t.2.* 1972.

syn. *Begonia wallichiana* Steudel, Nom.ed. 2: 194. 1841. *nomen nudum.*; Doorenbos, Begonian 42: 213. 1975. non Lehmann 1850.

non. *Begonia modestiflora* Kurz, Flora 54: 296. 1871.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 640. 1874.; Hara, J.Jap.Bot. 47: 113. 1972.

Observation: C.B.Clarke in Hooker f. Fl.Brit. Ind. 2: 640. 1874., listed *Begonia parviflora* Wallich Cat. no. 3674., as a synonym of *Begonia modestiflora* Kurz. But Hara noted in the citation for *Begonia minicarpa* Hara, that the specimen of Hamilton cited by Wallich for his no. 3674, was different from *Begonia modestiflora* Kurz.

3675 Begonia tuberosa? Herb. Wight.
Caudatum
B. B. Isoptera ? e Caudatum Lall. et B.
Anomalis. – Wb. Madr
D Nilghiry. Dam Rotan

no. 3675 A

Begonia tuberosa herb.Wight ex Wallich, Num. List. : 129. no. 3675A. 1831. *nomen nudum.*

= *Begonia malabarica* var. *dipetala* C.B.Clarke in Hooker f. Fl.Brit.ind. 2; 655. 1879.

syn. *Begonia dipetala* Graham in Hooker, Bot.Mag. 55: *t.2849*. 1828.

no. 3675 B

Begonia tuberosa herb.Wight ex Wallich, Num. List. : 129. no. 3675B. 1831. *nomen nudum.*

= *Begonia malabarica* var. *hydrophila* C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 655. 1879.

syn. *Begonia hydrophila* Miquel, Flora : 769. 1853.; A.DC. Prodr. 15(1) : 392. 1864.

3676 Begonia malabarica Lam. & Blum.
e Gualpara
B. Begon. malabar. Wb. Wight
C ? Wb. Madr
D ? Rapulia rupes 1828
E ? HBC.

no. 3676 A,B,C,E

Begonia malabarica Lamarck, Encyc. 1: 393. 1785. Wallich, Num.List. : 129. no. 3676 excl.D, 1831.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 655. 1879.

no. 3676 D

Begonia malabarica sensu Wallich, Num.List. : 129. no. 3676D. 1831. non Lamarck 1785.

= *Begonia megaptera* A.DC. Ann.Sci.Nat.ser.4. 11: 134. 1859.; A.DC. Prodr. 15(1) : 348. 1864.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 646. 1879.

3677 Begonia gigantea Wall
Rupes Chirseaghatte Napalicis infer.
1820

no. 3677 *p.p.*

Begonia gigantea Wallich (Num.List. : 129. no. 3677 *p.p.* 1831. *nomen nudum)* ex C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 643. 1879.

= *Begonia nepalensis* (A.DC.) Warburg in Engler & Prantl. Natur.Pflanzenf. 3. 6a: 142. 1894.

syn. *Mezierea nepalensis* A.DC. Ann.Sci.Nat. ser.4. 11: 144. 1859.; A.DC. Prodr. 15(1): 406. 1864.

no. 3677 B

Begonia gigantea sensu Wallich, Num.List. : 129. no. 3677B. 1831. *nomen nudum.*

= *Begonia silletensis* (A.DC.) C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 636. 1879.
(sphalm. *B. silhetensis)*

syn. *Casparya? silletensis* A.DC. Prodr. 15(1): 277. 1864.

3678 Begonia laciniata Roxb. Hort. Beng. et Mss
a Sellet DD. et AB
B Nepalia 1921

no. 3678 A

Begonia laciniata Roxburgh ex Wallich, Num.List.: 129. no. 3678A. 1831. *nomen nudum.*

= *Begonia laciniata* Roxburgh, Fl.Ind. 3; 649. 1832.; Hooker, Bot.Mag. *t.5021.* 1857.; A.DC. Prod. 15(1) : 347. 1864.; C.B.Clarke in Hooker f. Fl.Brit. Ind. 2: 645. 1879.

syn. *Begonia roylei* K.Koch, Belg.Hortic 7: 197. 1857.; Doorenbos, Ch.List. *Begonia* Sp. Add. 1. 1971. not published.

no. 3678 B

Begonia laciniata Roxburgh ex Wallich, Num.List.: 129. no. 3678B. 1831. *nomen nudum.*

= *Begonia laciniata* var. *nepalensis* A.DC. Prodr. 15(1) : 348. 1864.

Observation: *Begonia palmata* D.Don, Prodr. Fl.Nep. : 223. 1825 was listed as a questionable synonym of *Begonia laciniata* var. *nepalensis* A.DC. in Prodr. 15(1): 348. 1864., and of *Begonia laciniata* Roxburgh, by C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 645. 1879.

H.Hara in J.Jap.Bot. 45 (3): 92. 1970 referred to "*B. palmata* D.Don (*B. laciniata* Roxb.)" in his comments when naming the species *Begonia flaviflora* Hara. He gave no explanation. It appears that he overlooked the question mark shown in front of *B. palmata* Don by C.B.Clarke and used this older name.

I have reviewed the literature, trying to determine if this synonomy was confirmed or rejected, but I cannot find any information that would clarify this matter. Rather than list this questionable synonomy, which if confirmed would have given priority to the older name, I think it best to consider *Begonia palmata* D.Don (1825) and *Begonia laciniata* Roxburgh (1832) as separate species.

3679 Begonia barbata Wall.
Hand. Bot. Ind. Hk.

no. 3679 A *et p.p.* B

Begonia barbata Wallich (Num.List. : 129. no. 3679A *p.p.* B. 1831. *nomen nudum)* ex A.DC. Prodr. 15 (1): 348. 1864.; C.B.Clarke in Hooker f. Fl.Brit.ind. 2: 646. 1879.

= *Begonia annulata* K.Koch, Berl.Gartens. 1: 76. 1857.; Irmscher, Bot.Jahrb. 78 (2): 191. 1959.

syn. *Begonia griffithii* Hooker, Bot.Mag. 83.: *t.4984.* 1857.

no. 3679 B *p.p.*

Begonia barbata sensu Wallich, Num.List. ; 129. no. 3679B. *p.p.* 1831. *nomen nudem.* non Wallich ex A.DC. 1864.

= *Begonia hatacoa* Hamilton ex D.Don, Prodr. Fl.Nep.; 223. 1825.; A.DC. Prodr. 15(1): 347. 1864.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 645. 1879.; Hara, J.Jap.Bot. 47: 143. 1872 (sphalm. *B. hetocoa*).

syn. *Begonia rubro-venia* Hooker, Bot.Mag. *t.4689.* 1853.

3680 Begonia sinuata Wall
Penang, Penang G.O.

no. 3680

Begonia sinuata Wallich, (Num.List. : 129. no. 3680. 1831. *nomen nudum)* ex Meisner in Ber.Verhandl. Naturf.Ges.Basel 2: 42. 1836.; A.DC. Prodr. 15(1) : 354. 1864.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 650. 1879.; Burtt, Notes Roy.Bot.Gard.Edinb. 32: 273. 1973.

syn. *Begonia guttata sensu* Wallich. Num.List. 129. no. 3671B. *nomen nudum.* non Wallich ex A.DC. 1864.

syn. *Begonia elongata* Wallich, Num.List.: 213. no. 6291. 1832. *nomen nudum.*

syn. *Begonia subrotunda* Wallich, Num.List.: 213. no. 6293. 1832. *nomen nudum.*

syn. *Diploclinium biloculare* Wight, Ic. *t.1814.* 1852.

syn. *Begonia biloculare* (Wight) Craib, Fl.Siam. Enum. 1: 771. 1931.

3681 Begonia tenella Don
A Nepalia 1821
B Gopram Ram
C Kumaon Rib

no. 3681

Begonia tenella D.Don, Prodr.Fl.Nep. : 223. 1825.; Wallich, Num.List. : 129. no. 3681. 1831.; A.DC. Prodr. 15(1) : 327. 1864.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 642. 1879.

Observation: A.DC. listed *Begonia tenella* D.Don as a questionable synonym of *Begonia amoena* Wallich ex A.DC., but Clarke listed it without the question mark. Since

Begonia tenella D.Don was published for this species first, it is the correct name and *Begonia amoena* is the synonym.

syn. *Begonia amoena* Wallich ex A.DC. Prodr. 15(1): 327. 1864.

syn. *Begonia erosa* Wallich, Num.List. : 129. no. 3688 *p.p.* 1831. *nomen nudum.*

3682 Begonia amoena Wall
α Nepalia 1821
β Kamaon Rb

no. 3682

Begonia amoena Wallich, (Num.List. : 129. no. 3682. 1831. *nomen nudum)* ex A.DC. Prodr. 15(1): 327. 1864.

= *Begonia tenella* D.Don, Prodr.Fl.Nep. : 223. 1825.

3683 Begonia subovata Wall
Insut. Gillat Rb

no. 3683

Begonia subovata Wallich, Num.List. : 129. no. 3683. 1831. *nomem nudum.*

= *Begonia ovatifolia* A.DC. Ann.Sci.Nat. ser. 4. 11 : 1832. 1859.; A.DC. Prodr. 15(1) : 328. 1864.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 642. 1879.

3684+ Begonia Finlaysoniana Wall.
B. crenata Hb. Finl. ex inv. ond
Siam.

no. 3684

Begonia finlaysoniana Wallich, Num.List. : 129. no. 3684. 1831. *nomen nudum.*

Observation: A.DC. Prodr. 15(1): 401. 1864. under "Species with only a name or known from a very poor illustration" listed *Begonia finlaysoniana* (Wallich List. 3684.) *Begonia crenata* herbarium Finlays. From an Island on the coast of Siam.

C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 650. 1879., listed *Begonia finlaysoniana* Wall.Cat. no. 3684. as a questionable synonym of *Begonia prolifera* A.DC. Ann.Sci.Nat. ser. 4. 11: 135. 1859.; A.DC. Prodr. 15(1) : 353. 1864. After his description of *Begonia prolifera* A.DC., he commented, "*Begonia finlaysoniana* possibly belongs here, but the example is very imperfect and the leaves are 2-3, some of them petioled."

Since the connection between these species is so vague and still has not been confirmed by later authors, I think it best to list *Begonia finlaysoniana* Wallich no. 3684 only as *nomen nudum* and not as a synonym of *Begonia prolifera* A.DC.

3685 Begonia picta Sm.
A Nepalia 1821
B Kamaon Rb

no. 3685 B *et p.p.* A

Begonia picta J.E.Smith, Exot.Bot. 2: 81. *t.101* 1807.; Wallich, Num.List. : 129. no. 3685B *et p.p.* A. 1831.

syn. *Begonia hirta* Wallich ex Hooker, Exotic Fl. 2:89. 1825. in syn.

syn. *Begonia echinata* Royle, Illustr.Bot.Himal. 313. *t.80, f.1.* 1839.; A.DC. Prodr. 15(1): 312. 1864.

3686 Begonia scutata Wall.
Gepram Ham

no. 3686 *p.p.*

Begonia scutata Wallich (Num.List. : 129. no. 3686 *p.p.* 1831. *nomen nudum*) ex A.DC. Prodr. 15(1): 328. 1864.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 642. 1879.

syn. *Begonia rubella* Wallich, Num.List. : 129. no. 3687. 1831. *nomen nudum.*

no. 3686 A *et* 3685 A *p.p.*

Begonia scutata sensu Wallich, Num.List. : 129 no. 3686A 1831. *nomen nudum.* non Wallich ex A.DC. 1864.

Begonia picta sensu Wallich, Num.List. : 129. no. 3685A *p.p.* 1831.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 639. 1879. non. J.E.Smith, 1807.

= *Begonia josephii* A.DC. Ann.Sci.Nat. ser. 4. 11: 126. 1859.; A.DC. Prodr. 15(1): 313. 1864.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 639. 1879.

3687 Begonia rubella Ham ?
Kapalia 1521

no. 3687

Begonia rubella Wallich, Num.List. : 129. no. 3687. 1831. *nomen nudum.*

= *Begonia scutata* Wallich ex A.DC. Prodr. 15(1): 328. 1864. C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 642. 1879.

Observation: A.DC. Prodr. 15(1) : 328. 1864. listed *Begonia dioica* D.Don, Prodr. Fl.Nep.: 223. 1825. as a questionable synonym of *Begonia scutata* Wallich ex A.DC. C.B.Clarke

in Hooker f. Fl.Brit.Ind. 2; 642. 1979., did not include *Begonia dioica* D.Don as a synonym of *Begonia scutata* Wallich ex A.DC. From an examination of their descriptions they do not appear to be the same species, and I think that *B. dioica* D.Don is neither a synonym of *Begonia scutata* Wallich ex A.DC. nor (via *Begonia scutata sensu* Wallich no. 3686A. *nomen nudum) Begonia josephii* A.DC.

3688 Begonia erosa Wall.
Kapulia 1821

no. 3688 *p.p.*

Begonia erosa Wallich, Num.List. : 129. no. 3688 *p.p.* 1831. *nomen nudum.*

= *Begonia picta* J.E.Smith, Exot.Bot. 2: 81. *t.101* 1807.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 638. 1879.

no. 3688 *p.p.*

Begonia erosa Wallich, Num.List.: 129. no. 3688 *p.p.* 1831. *nomen nudum.*

= *Begonia tenella* D.Don, Prodr. Fl.Nep.: 223. 1825.; via *Begonia amoena* Wallich ex A.DC. Prodr. 15 (1) : 327. 1864.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 642. 1879.

6291 Begonia elongata Wall. (Cit. spec 3671–3688)
Tung W.J.

no. 6291

Begonia elongata Wallich, Num.List. : 213. no. 6291. 1832. *nomen nudum.*

= *Begonia sinuata* Wallich ex Meisner in Ber.Verhandl. Naturf.Ges.Basel. 2: 42. 1836.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 650. 1879.

6292 Begonia procridifolia Wall.
Tovey W. J.

no. 6292

Begonia procridifolia Wallich (Num.List. : 213. no. 6292. 1832. *nomen nudum)* ex A.DC. Prodr. 15 (1) : 352. 1864.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 648. 1879.

6293 Begonia subrotunda Wall
a Woolwyne 1827
B Tovey W. J.

no. 6293

Begonia subrotunda Wallich, Num.List. : 213. no. 6293. 1832. *nomen nudum*.

= *Begonia sinuata* Wallich ex Meisner in Ber.Verhandl. Naturf.Ges.Basel. 2: 42. 1836.; C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 650. 1879.

6294 Begonia Meisneri Wall
Mrs Elliot W. J.

no. 6294

Begonia meisneri Wallich, Num.List. : 213. no. 6294. 1832. *nomen nudum*.

= *Begonia hatacoa* var. *meisneri* (C.B.Clarke) Golding, *comb. nov.*

syn. *Begonia rubro-venia* var. *meisneri* C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 645. 1879.

Observation: C.B.Clarke in Hooker f. Fl. Brit.Ind. 2: 645. 1879. noted that "Wallich's type example [no. 6294] looks like a distinct species, but the examples of C.B. Clarke connects the two [no. 3679B. *p.p.* and no. 6294]". Clarke made the epithet *meisneri* a variety of *Begonia rubro-venia* Hooker, Bot.Mag. *t.4689*. 1853. H.Hara, J.Jap.

Bot. 47: 43. 1972., reported the type of *Begonia hatacoa* Hamilton ex D.Don, Prodr. Fl.Nep. : 223. 1825., agreed exactly with *Begonia rubro-venia* Hooker. Hence, the correct name of this species is the earlier *Begonia hatacoa* Hamilton ex D.Don. The varietal epithet *meisneri* of Clarke had to be transferred to *Begonia hatacoa* as I have done above.

9107 Begonia
Sillet Mts Sylhet

no. 9107

Begonia Wallich, Num.List. : 304. no. 9107. 1849.

= *Begonia silletensis* (A.DC.) C.B.Clarke in Hooker f. Fl.Brit.Ind. 2: 636. 1879.

syn. *Casparya? silletensis* A.DC. Prodr. 15(1) : 277. 1864.

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CHROMOSOMES OF *GUARDIOLA* (COMPOSITAE, HELIANTHEAE)

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Guardiola is a genus of twelve closely related species which are confined primarily to the mountains of western Mexico and extreme southern Arizona. It occurs in the oak-pine forests between 1500 and 2000 meters elevation. It is traditionally placed in the Melampodinae but is without close relatives in that subtribe. Gray (1888) and B. L. Turner (personal communication) point out that the general aspect of the plant suggests a relationship with the Coreopsidinae. Stuessey (1973) retained the genus in the Melampodinae in his review of the subtribe Melampodinae.

Examination of the chromosomes was part of a systematic study of the genus. Meiotic chromosome counts are published elsewhere (Van Faasen 1973, 1976; Van Faasen and Nadeau 1976) and are not included here.

METHODS. Buds and root tips were collected in Carnoy's 6:3:1 (absolute alcohol:glacial acetic acid:chloroform). Pretreatment of root tips in either p-dichlorobenzene or 8-oxyquinoline shortened the chromosomes so much that it was impossible to interpret chromosome morphology. For this reason untreated cells were used in this study. Acetocarmine squashes were prepared for study.

OBSERVATIONS. The meiotic chromosome number of all *Guardiola* species counted was $n = 12$. Selected meiotic configurations are illustrated in Figure 1.

The meiotic chromosomes are relatively small and nearly uniform in size, although they are slightly larger in the broad-leaved species (*G. rosei*, *G. rotundifolia*, *G. platyphylla*) than in the narrow-leaved species (*G. mexicana*, *G. arguta*, *G. tulocarpus*, *G. thompsonii*, *G. angustifolia*).

All of the cells in which I was able to determine the number of somatic chromosomes present contained 24 chromosomes. Idiograms of the somatic chromosomes of the *Guardiola* species examined are found in Figure 2 and measurements of the same are in Table 1.

The somatic chromosomes of the *Guardiola* species studied are very small and vary in length from approximately 1.7 microns to approximately 4.3 microns. No satellites were observed on any of the chromosomes.

Among the somatic karyotypes in *Guardiola* there are readily detected differences in chromosome size and total chromosome length between the broad-leaved and narrow-leaved species. Chromosome length varies from 2.3 to 4.3 microns in the broad-leaved species

Figure 1. Meiotic chromosomes of *Guardiola*. A. *G. rosei*; B. *G. rotundifolia*; C. *G. platyphylla*; D. *G. mexicana*; E. *G. arguta*; F. *G. tulocarpus*; H. *G. angustifolia*.

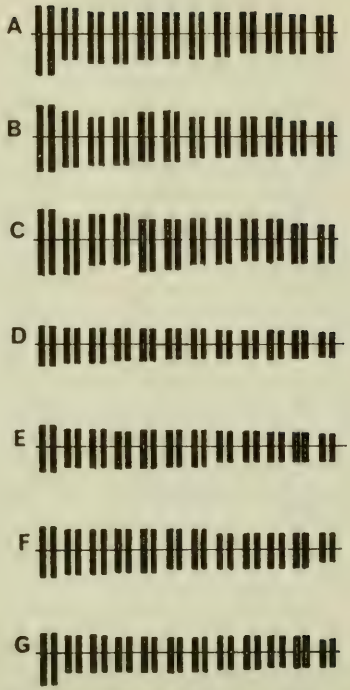

Figure 2. Idiograms of somatic chromosomes of *Guardiola*. A. *G. rosei;* B. *G. rotundifolia;* C. *G. platyphylla;* D. *G. mexicana;* E. *G. tulocarpus;* F. *G. thompsonii;* G. *G. angustifolia*.

Table 1. Mean measurements of somatic chromosomes of seven *Guardiola* species. Most possess median centromeres. Those with submedian centromeres are marked with an *.

Species	Chromosomes	Length in μ	Short arm %
Guardiola rosei	1,2	4.3	38*
	3,4	3.3	50
	5-8	3.3	40
Total chromosome length:	9-16	3.0	44
	17-20	2.7	50
83.2μ	21-24	2.5	47
Guardiola rotundifolia	1,2	4.3	46
	3,4	3.6	45
	5-8	3.3	40
	9-12	3.3	50
Total chromosome length:	13-16	2.8	47
	17-20	2.7	50
73.4μ	21-24	2.3	42
Guardiola platyphylla	1,2	4.3	46
	3,4	3.7	36*
	5-8	3.3	50
	9-12	3.3	40
Total chromosome length:	13-16	3.2	47
	17-20	2.8	47
77.2μ	21-24	2.7	38*
Guardiola mexicana	1,2	2.7	44
	3-6	2.3	43
	7-10	2.2	46
Total chromosome length:	11-14	2.0	50
	15-22	1.8	45
55.4μ	23,24	1.7	40
Guardiola tulocarpus	1,2	3.0	44
	3-6	2.7	44
	7-10	2.5	40
Total chromosome length:	11-14	2.3	43
	15-22	2.0	50
55.6μ	23,24	1.8	45
Guardiola thompsonii	1,2	3.3	45
	3-6	3.0	44
	7-10	2.8	47
Total chromosome length:	11-14	2.7	50
	15,22	2.3	43
62.6μ	23,24	1.8	40
Guardiola angustifolia	1,2	3.3	40
	3-6	2.5	47
	7-14	2.3	43
Total chromosome length:	15-18	2.2	46
	19-22	2.0	50
55.4μ	23,24	1.8	45

(Table 1). The total chromosome length of the broad-leaved species varies from 73.2 to 77.8 microns while that of the narrow-leaved species varies from 49.2 to 62.6 microns. Mean lengths for the two groups are 74.8 and 55.7 microns respectively. In both the broad-leaved and narrow-leaved groups, however, species considered advanced have greater total chromosome length than more primitive ones.

The karyotypes of all *Guardiola* species examined are rather symmetrical (Figure 2); nearly all chromosomes have median centromeres. (Centromere position nomenclature follows Levan *et al*, 1965.)

Primitive karyotype characters (Stebbins, 1966) found in *Guardiola*, i.e. symmetrical karyotypes, median centromeres, and lack of secondary constrictions, suggest a generally primitive karyotype for the genus. However, the small chromosome size, a derived condition (Stebbins, 1966), indicates some karyotype evolution within the genus.

Since the chromosomes were examined in untreated cells, their morphology may have been determined at times prior to maximum shortening and arrest on the metaphase plane, the point at which karyotypes are normally studied. Thus the measurements must be considered approximations. However, consistent chromosome size differences between the broad-leaved and narrow-leaved species appear real and contribute toward that basic subdivision of the genus.

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MISCELLANEOUS NOTES ON NEOTROPICAL FLORA, X.

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The present notes include descriptions of three species of Espeletia, two of Paragynoxys (Compositae), and a key for easy distinction and identification of the six sessile, small-size Venezuelan species of Espeletia. Also a new combination for a species of Malpighia is given. For previous contributions of this series see PHYTOLOGIA 38(1): 7. 1977. The basic work for these notes has been partially supported by the National Science Foundation Grant No. DEB72-01839.

ESPELETIA CUNICULORUM Cuatr. sp. nov.

Caulirosula visu alba circa 50 cm alta, trunco brevi cum foliis marcescentibus spisse obtecto. Gemma terminalis albissima densissime crasseque lanato-sericea.

Folia coriacea crassiuscula albo-lanata sessilis 44-50 cm longa. Lamina linearis 40-45 x 2-3 cm, ratio 13.5-22:1, sursum in apicem acutum angustata, deorsum leviter, sine sensu, basim versus attenuata (1.2-1.7 mm minima latitudine), basi cuneato-ampliata et in vaginam producta, margine integra anguste revoluta; adaxiale superficie leviter rugulosa venulis parum impressis sed costa subplana canaliculata striolulata bene notata, juvenilia densissime lanato-villosa subsericea pilis longis (10 mm) basi crispis ceterum ascendentibus, insuper barbis villoso-subsericeis instructis ad costam densissimis adpressis magis sericeis, in adulta pilis brevioribus indumentum albo-crispo-lanatum densum et crassiusculum formantibus; abaxiale, costa elevata robusta striata basim versus gradatim ampliata et incrassata cum pilis circa 10 mm basi crispis ceterum ascendentibus insuper indumento visu villoso-sericeo tecta, nervis secundariis infra indumentum prominentibus, 4-7 mm inter se distantibus fere patulis angulo 55-65° ascendentibus circa marginem furcatis et cum nervulis venulisque in reticulum anastomosantibus, reticulo elevato alveolis moderate profundis dense albo pilosulis, in juvenile statu superficie tota cum indumento lanato villoso-barbato omnino occulta, in adulta indumento villoso-lanato valde copioso sed nervatione magis induta magis notata. Vagina robusta oblonga vel oblongo-semiovata basi latiora, 3.5-4 x 2.5-4 cm, costa in dimidia distale parte valde evoluta ad 14 mm lata et satis crassa; adaxiale sursum ad costam dense barbata reliqua glabra paralleli-nervata, abaxiale dense sericeo-barbata pilis ad 12 mm longis.

Synflorescentiae thyrsoides axillares rosula foliorum duplo longiores. Axis 80-110 cm longus, robustus, striatus, praecipue inferne fistulosus; pars proximalis vegetativa 1/2 totae longitudinis longior, duobus paribus foliorum sterilium instructa, inter-

nodio proximale circa 28 cm longo sequenti circa 17 cm, foliis angustis linearibus acutiusculis, infimis circa 6 cm supra basim nascentibus, 16-18 cm longis 1-1.2 cm latis cum vaginis 2.5 cm longis in tubum circa 8 mm longum coalitis, alteris foliis 9 x 1.2 cm etiam linearibus; pars fertilis ramosa circa 23 capitulis in 5-6 paribus ramorum oppositorum, vel suboppositis dispositis, internodiis quam ramis brevioribus longitudine sursum decrescentibus (sequentia e.g. 13, 7, 4.5, 3, 1.5 cm) pedicello terminali circa 3 cm longo. Rami proximales inferiores 3-capituliferis 12-14 cm longi, pedicellis circa 2.5 cm, sequentis 2-capituliferi 9, 6, 4.5 cm longis plus pedicellis 3-1.5 cm longis, ramis distalibus monocephalis 5-3 cm longis. Bracteae subtendentes inferiores anguste oblongae subacutae 8-4 cm longae, 1-0.6 cm latae oppositae sed non connatae, basi vaginanti adaxiale glabra, ceterae sursum lineares gradatim descrescentes 4-1.5 x 0.5-0.2 mm adaxiale apice excepto glabrae virides, ceterum in omnibus dense crasseque albido-ochraceo vel pallide fulvescenti lanatae. Axis dense crasseque albo-gossypino-lanatus pilis longissimis, ad 15 mm, valde flexuosis in proximale parte crispis, extremis insuper plus minusve adpresse villoso-barbatis. Rami pedicellique sicut involucra capitulorum, dense ochroleuco vel pallide fulvescente lanati. Basi axorum crassi robusti, densissime sericeo barbati pilis tenuibus rectis antrorsis ad 10 mm longis valde crebris adpressisque vestiti.

Capitula grandiuscula saepe cernua 290-320 flores ferentia, disco convexo brunnescenti vel luteolo 17-20 mm diam., circulo ligularum expanso 30-38 mm diam., ligulis luteis saepe valde contortis. Involucrum cupulatum dense ochroleuco-lanatum circa 25 mm diam., 1.3 cm altum. Phyllaria sterilia crasse herbacea firmula, circa 20 plus minusve 3-seriata 17-12 x (5-)4-2.5 mm introrsum gradatim decrescentia, anguste triangularia seu lineari-triangulata basi maxima latitudine sursum gradatim angustata apice acuta vel acutissima adaxiale acumine excepto glabra nervis paulo conspicuis abaxiale dense crispo-ochroleuco-lanata barbataque barbis intricatis 3-4 mm longis phyllaria omnino occultantis. Phyllaria fertilia exteriora 12-9 x 2.5-2 mm, sterilia similia anguste elliptico-lanceolata acuminataque abaxiale dense antrorso-villoso-barbata pilis ad 2 mm, interiora tenuiora 7-6 x 1.8 mm subamplectentia lineari-lanceolata dorso apiceque dense villosa pilis 0.5-1.5 mm, marginibus glandulis teretibus 0.05 mm longis. Receptaculum plano convexum circa 10 mm diam., copiose hirtum pilis erectis acutis 0.3-0.6 mm. Paleae 6 x 1.8-2 mm scariosae basi incrassatae, amplectentes, ovales apice attenuatae acutae inferne sparsis pilis sed costa protruda densuiscule pubescenti sicut dorso sursum densiuscule barbato, pilis antrorsis acutis 1 mm, marginibus glandulis patulis 0.05-0.07 mm longis.

Flores radii ligulati 110-120 in capitulo 3-4-seriati. Corolla lutea 14-15 mm longa, tubo crassiusculo 2-2.5 mm longo apice adaxiale dente minuto interdum liguli lineari ad 2 mm, dense villoso pilis hyalinis flexuosis crassiusculis obtusis vel acutiusculis, 0.2-0.7 mm, arcuato-antrorsis et sursum parcis vel raris glandulis ad 0.05 mm; lamina tenera linearis 1-1.5 mm lata, saepe plus minusve contorta, 4(-6) nervis subtus prominulis apice minute 2-dentata vel

integra, subobtusa, adaxiale papilloso-velutina abaxiale sparsis vel parcissimis glandulis 0.03-0.06 mm, sessilibus, inferne parce pilosula. Stylus circa 5 mm, ramis 1.5 mm longis. Achaenia brunnescentia, exteriora 2-2.2 x 1.2-1.3 mm, subpyriformia, triangulata apice rotundato basi argute acutata, dorso plano-incurvo, angulis acutissimis; interiora 2.2-2.3 x 1-0.9 mm, obovata basi acuta apice obtusa subquadrangulata dorse valde convexo protrudo, vel obtuse angulato.

Flores disci 180-204 in capitulo. Corolla lutea 6-6.3 mm longa, tubulo brevi, 2 mm longo basi excepto sparse piloso pilis acutiusculis vel obtusis antrorsis, 0.2-0.7 mm longis, limbo late tubuloso basi sparsis pilis, lobis triangularibus 0.7-0.9 mm altis marginibus incrassatis papillosis abaxiale sursum barbulatis pilis 0.2-0.4 mm obtusis vel subobtusis et parcis vel raris glandulis obovatis 0.03-0.05 mm. Antherae 2 mm basis sigittatae appendice apicali ovata attenuata subobtusa 0.4 mm. Stylus 7 mm. Nectarium tubulosum circa 0.8 mm longum brevissime obtuseque dentatum.

Typus: Venezuela, Mérida: Sierra de la Culata: Páramo de Los Conejos en Cañada de los Puentes, 3350 m alt, 19 Oct 1972, Luis Ruiz-Terán 7722; holotypus, US; isotypus MERF.

Espeletia cuniculorum can be easily distinguished from its related Venezuelan species, E. schultzii, besides some other technical characters by its long, linear, acute leaves and the kind of indument.

ESPELETIA BATATA Cuatr. sp. nov.

Rosula sessilis 15-30 cm ampla dense foliosa visu alba vel cinereo-lanata. Caulis subterraneus tuberculatus, tuberculo bulbiformi depresse sphaeroidei vel ellipsoidei 3.5-6 (-10) cm diametro vel in vetusti statu elongato, subcylindraceo truncato, irregulariter transverse striato, radicifero, 4-5 cm diam., usque 8 cm longo; distale inter folia dense patulo-hirto-barbato, pilis rectis acutis circa 5 mm longis. Radix centralis napiformis vel saepe in 2-4 ramis inaequalibus crassis descendentibus 10-20 cm longis divisa et radicibus lateralibus minoribus tenuioribus interdum magis longis munita. Gemma apicalis inter folia juvenilia valde congesta dense adpresseque lanato-villosa alba subsericea.

Folia brevia coriacea dense crasseque villoso-lanata visu alba vel cinerea 8-17 cm tota longitudine. Lamina oblonga vel linearis deorsum gradatim angustata sursum plus minusve dilatata saepe subspatulata apice obtusiusculo vel subite subacutato, 6.5-14.5 x (0.8-) 1-2 cm, ratio 5-12 (-15):1, supra basim 0.5-1 cm minima latitudine; margine leviter revoluta; adaxiale sublaevis costa vix notata indumento denso crispo-lanato insuper villoso-floccoso tecta, pilis basi patula robusta geniculatis spiraliter contortis intricatis extremis parallelis antrorsis; abaxiale costa elevata striato-sulcata, nervis secundariis prominulis 2-4 mm inter se distantibus angulo 40-60° ascendentibus cum nervis minoribus in reticulo minuto anastomosatis, alveolis ovalibus vel subpentagonalibus profundis cum pilis tenuissimis candidis repletis, ceterum dense longueque pilifera pilis longis basi patula reliqua parte 1-2-spiraliter

contorta, extremis ascendentibus subadpressis crasse vestimento villoso-lanuginoso instructis. Vagina coriacea oblonga vel leviter ovalis 1.6-2.5 cm longa 0.6-1.8 cm lata, adaxiale glabra, parallelinervata, longe dense adpresseque sericeo-barbata.

Inflorescentiae axillares scaposae monocephalae, plures, 5-20 in rosula, erectae vel curvato-ascedentes maturitate triplo vel multo rosularum folia excedentes. Axes 23-45 (-56) cm, moderate robusti, argute striati simplices extremo leviter arcuati capitulum inclinatum vel cernuum ferentes, 2-3 paribus foliorum oppositorum instructi. Folia sterilia proximalia 1-3 (-7) cm supra basim orientia, primo internodio (5-) 13-22 (-27) cm, altero 5-18 cm longo ultimo 5-22 cm longo pedunculo simulanti. Folia infima 3-8 cm longa opposita base vaginantia 1-2 cm tubum formantia, lamina 4-7 mm lata anguste oblonga vel oblanceolato-lineari, obtusiuscula; folia medialia breviora 2-3.5 cm longa 3-5 mm lata semper plus minusve longe vaginata tubo 0.5-1 mm alto. Folia distalia parcissima (1-3) opposita vel singula bracteosa 2.5-1.5 x 0.2-0.4 cm lineari attenuata acuta. Scapi dense lanati pilis longissimis crispis congestis fulvis vel brunnescentibus ad superficiem albis ascendentibus laxiuscule villoso-intricatis, ad summitates, infra capitulum, indumento crassiore instructis, foliis bracteisque etiam dense crispo-lanatis et longe albo-villoso-gossypinis. Vaginae foliorum adaxiale glabrae nervatae, abaxiale densissime longeque albo-villoso-barbatae. Basis scaporum infra folia infima et intra tubum vaginae densissime albo-sericeo barbata pilis antrorsis rectis 5-8 mm longis congeste adpressis vestita.

Capitula fere grandia 209-402 flores ferentia, circulo ligularum 30-40 mm, disco 12-15 mm diam., involucro cupulato-campanulato 15-18 mm alto 18-24 mm diam., dense crasseque intricato-lanato barbataque. Phyllaria sterilia 20-26 circa triseriata, 6-8 exteriora (15-) 13-10 x 3-2.2 mm lanceolato-linearia vel subulato-linearia acuta, dense longeque undato-lanato-barbata, adaxiale apicem excepto glabra 3-5 nervata nitidaque. Phyllaria fertilia exteriora 10-8 (-7) x 1.6-1 mm oblongo-lanceolata acuta circa 5-7 nervata dorso sursum lanatissima et barbata, altera 75- x 1.8-1 subhyalina lance-oblonga acutata subamplectentia basim dorso imcrassata 5-3 nervata dorso villosa vel moderate longe pilosa, pilis 1.5 mm, apice piloso-ciliata. Receptaculum 11-15 mm diam., planum vel plano-convexum copiose hirsutulum pilis erectis densiusculis acutis 2.8-1.5 (-2) mm longis. Paleae (5.3-) 6-7 x 1-2 mm oblongae apice acutatae, hyalinae plicato-amplectentes vel subamplectentes 3-7-nervatae sursum dorsale margineque parce glandulosae et barbulatae pilis erectis circa 1 mm.

Flores radii ligulati 3-4 seriati 103-210 in capitulo. Corolla lutea 12-16 (-18) mm longa, tubo 1.8-2.6 mm longo angusto apice interiore annulari-incrassato adaxiale apice dente minimo obsito, dense patulo-pilosula pilis crassiusculis obtusiusculis flexuosis arcuato ascendentibus, 0.2-0.4 mm et praecipue sursum glandulis globosis minute stipitatis; lamina lineari vel lineari-oblanceolata sursum haud vel leviter ampliata apice subobtusa breviter 2 (-3)-dentata, 1-1.2 (-1.7) mm lata, (3-) 4-5-nervata 2 nervis robustioribus, adaxiale minutissime papillosa extus basi sparsis pilis gland-

ulisque reliqua glabra. Stylus 4-6 mm, ramis 1-1.5 mm. Ovaria matura 1.7-2 x 1-1.2 mm obovato-oblonga triangulata dorso leviter convexo basi acutata, interiora 2 x 0.7-0.8,oblonga quadrangulata.

Flores disci 106-220 in capitulo. Corolla lutea 5.8-6.7 mm longa, tubulo 2-2.5 mm tantum subapicem parcis vel parcissimis pilis 0.2-0.4 mm longis, limbo tubuloso infundifuliformi tantum basi sparsis pilis et interdum parcis glandulis, dentibus triangularibus 0.7-0.9 mm marginibus papillosis abaxiale parcis glandulis sessilibus et sparsis vel raris pilis 0.2-0.4 (-0.6) mm. Antherae circa 2.4 (-3) mm longae basi breviter auriculatae appendicibus apicalibus oblongis 0.4-0.6 mm. Stylus 6-7 mm. Nectarium tubulosum 0.7-0.8 mm longum margine minute 5-dentatum saepe eroso-denticulatum. Ovarii rudimentum pediculiforme 0.2 mm longum.

Typus: Venezuela, Mérida: Sierra Nevada de Santo Domingo hacia Los Granates, Alto del Morato, páramo 3600 m alt., acaulirrósula, porte blanco, hojas blanco-grisáceas o cenicientas, ligulas amarillas, escapos monocéfalos, cormus tuberoso subterráneo, 10 Oct 1969, Cuatrecasas, Ruiz-Terán & López-Figueiras 28058; holotypus, US; isotypi US, MERF. Other collections: id Alto del Morato 3670 m, hojas blancas o blanco-verdosas, escapos purpúreos con lana blanca, involucro blanco-rucio, ligulas amarillas, 12 Oct 1969, Cuatrecasas, Ruiz-Terán & López-Figueiras 28081 (US, MERF); Piedra Agrietada, Páramo de Mucuchies en dirección a Piñango, 4300 m, acaulirrosuleto, escapos monocéfalos, predomina en zonas pedregosas y húmedas, 18 Nov 1970, Ruiz-Terán & López-Figueiras 1071 (US, MERF); Cabeceras del rio Motatán, Páramo de Piñango, 4200 m, acaulirrósula, hojas verdeblanquecinas, escapos sepia claros monocéfalos, capítulos sepia, nutantes, cormus tuberculoso, 7 Oct 1969, Cuatrecasas, Ruiz-Terán & López-Figueiras 28036 (US, MERF); Páramo de Piñango, hoya del rio Chirurí, 3970 m, 8 Oct 1969, Cuatrecasas, Ruiz-Terán & López-Figueiras 28051 (US, MERF); Arriba de la Laguna Negra, 3800 m, Sep 1956, Aristeguieta 2645 (VEN).

Espeletia batata is closely related to E. weddellii and E. nana. They may be easily separated by the key that will follow.

ESPELETIA NANA Cuatr. sp. nov.

Rosula sessilis 10-20 cm diametro crebre foliata visu albida siccitate ochroleuca. Caulis lignosis subterraneus tuberculatus, tuberculo depresso-ellipsoideo 2.5-4 cm diam. apice foliifero subplano ad centrum paulo depresso, inter folia dense hirto-barbato pilis sericeis rectis patulis 5-6 mm, inferne 2-3 radicibus robustis descendentibus usque ad 10 cm longis et radicibus tenuioribus longioribusque, in vetustis tuberculo elongato crassiore cylindraceo 3.5-4.5 cm diametro usque 6-7 cm longo distale obtuso, radicifero. Gemma apicalis dense adpresseque albo-villosa.

Folia parva angusta, coriacea crassiuscula in vivo, 6-15 cm tota longitudine. Lamina 4-13 cm longa 4-11 (-13) mm lata (indumento emoto) ratio 8-10 (-14):1, sessilis oblanceolato-linearis sursum in apicem acutum vel subacutum attenuata, basim versus paulo attenuata, circa basim 3-6 mm minima latitudine, et in vaginam leviter ampliatam producta, margine integerrima revolutaque,

adaxiale enervata sed leviter bullato-reticulata; abaxiale costa prominenti mediale sulcata, nervis secundariis prominulis in angulo acuto, 30° ascendentibus vel fere obsoletis, nervis minoribus prominente reticulatis alveolis ovalibus profundis cum pilis tenuissimis candidissimis floccosis repletis, reliqua pilis 3-6 mm, basi contortis ceterum rectiusculis antrorsis vestimento denso albo-villoso in sicco plus minusve ochroleuco omnino tecta; adaxiale indumento denso pilis crassioribus basi patula supra geniculato-angulatis cetera parte rectiscula antrorsis aspectu paralleliter subadpresse villosis; in vetustis extremis pilorum patulis paulo intricatis leviter lanugineis; circa basim costa longe triangulato-dilatata utrinque glaberrima viridique. Vagina oblonga, vel utrinque leviter attenuata 12-15 (-20) mm longa 4-8 (-9) mm lata, nervata, utroque latere glaberrima.

Inflorescentiae axillares scaposae monocephalae, 1-10 in rosula coetaneae foliis saepe triplo vel multo longiores, erectae vel curvato-ascendentes. Scapi 20-45 cm longi teneri vel mediocres teretes leviter striolati fistulosi indivisi rarissime ramusculo uno laterali capitulifero, duobus paribus foliorum oppositorum sterilium supra basim valde approximatis, vel bene separatis et sursum 1-5 foliis bracteiformibus sparsis praediti. Folia infima opposita 0.5-2.5 cm supra basim nascentia, 2.5-5.5 cm longa, vaginis membranaceis 1.5-2.5 cm longis inferne in tubum 0.5-2 cm coalitis, alterum par simile vel breviore valde proximum, 1-3 cm distante vel cum internodio usque ad 20 cm longo separatum. Folia bracteosa parca sparsa 2-1 x 0.4-0.2 cm,sursum decrescentia linearia subacuta antrorsa ad axem saepe subadpressa. Indumentum scaporum bracteariumque dense intricato-lanatum crassiusculum praecipue sursum brunnescens, inferne ad basim et intra vaginam dense albo-villoso-sericeo-barbatum pilis 6-12 mm longis strictis antrorsis inter folia adpressis, sed propria basi conica acuta glabra. Vaginae foliorum proximalium amplae adaxiale glabrae venosaeque abaxiale antrorse villosae.

Capitula mediocria 225-350 (-676) flores ferentia, ligulis amotis 20-26 mm diametro circulo ligularum 24-35 mm, disco 12-16 mm diametro. Involucrum cupulatum 10-14 mm altum crasse denseque ferrugineo-lanatum. Phyllaria sterilia 14-22, exteriora 10-9 (-7) x 2-1.4 mm,linearia vel oblanceolato-linearia, triangulata, subite acutata intus 3-nervata costa conspicuissima, transverse reticulata, abaxiale longe denseque lanata, interiora 9-6 x 1.8-1 mm angustiora lineari-triangulata acutaque extus dense villoso-lanata, saepe usque 6-7 interiora additionalia subulata 6-5 x 1 mm. Phyllaria fertilia exteriora 9-6.5 x 1-0.8 mm, lineari triangulata acutaque adaxiale nervoso-reticulata extus lanata vel saepe longe villosa tantum sursum pilis flexuoso-lanatis; interiora 5-4 x 1 mm lineari vel lineari-subulata, scariosa subamplectentes dorso villosa pilis 2-3 mm, costa brunneo-staminea marginibus hyalinis, parcis glandulis 0.01-0.02 mm altis, intima pilis sparsis sursum longe ciliata pilis 1-0.5 mm et sparsis glandulis marginalibus 0.02-0.03 mm. Receptaculum 9-12 mm diametro planum dense hirtum pilis tenuibus acutis erectis albis 1-1.5 (-2) mm longis. Paleae 4.5-5 x 1-1.2 (-1.5) mm, scariosae amplectentes, oblongo-ellipticae, acutatae dorso brunnei-costato

2-3 nervis utroque latere, sursum antrorso-barbato pilis suberectis subacutis ad apicem 0.5-1 mm et glandulis marginalibus 0.02-0.03 mm.

Flores radii ligulati 3-6-seriati, 100-180 (-346) in capitulo. Corolla lutea 8-11 (-15) mm longa, tubulo angusto 1-1.6 (-2.3) mm, apice interiore annulare incrassato, adaxiale interdum dente apicali minimo obsito, vel interdum adaxiale exciso, dense intricato-pilosulo pilis curvato-ascendentibus ad 0.6 mm subobtusis vel subacutis et sursum parcissimis glandulis breviter capitato-pediculatis 0.03 mm intersparsis, lamina membranacea lineari vel oblanceolato-lineari 1-1.9 mm lata apice obtusa et brevissime obtuseque 2 (-3)-denticulata vel integra, 4-5 nervata nervis duobus magis notatis, adaxiale minutissime mamillato-papillosa velutina, abaxiale supra basim sparse pilosa et parcissimis glandulis reliqua glabra. Stylus 4.5-5 mm crassus ramis subulatis 1 mm. Achaenia exteriora 1.3-1.4 x 0.8-1 mm, elliptico-obovata, 5-nervata, 3-angulata, interiora ellipsoide oblonga 4-angulata, omnia utrinque obtusa.

Flores disci 125-180 (-380) in capitulo. Corolla lutea 4.5-5 (-6) mm longa, tubulo 1.5-2 mm, sursum parcis vel parcissimis pilis paulo flexuosis 0.2-0.6 mm, limbo crasse tubuloso sursum paulo ampliato glabro vel basi parcissimis pilis, lobis triangularibus 0.7-1 mm altis, marginibus incrassatis adaxiale densissime papillosis, extus glabris vel 1-3 pilis 0.3-0.5 mm interdum raris glandulis globosis subsessilibus. Antherae 1.7-2 mm basi breviter sagittatae appendice apicali ovato-oblonga obtusa 0.3-0.4 mm longa. Stylus 4-5 mm apicem versus dilatatus breviter papilloso-pilosus apice subconico minute papilloso. Nectarium tubulosum crassiusculum, 0.5-0.6 mm apice 5-dentatum. Ovarii rudimentum breve pediculiforme 0.2 mm altum.

Typus: Venezuela, Trujillo: La Morita, Paramito, cresta arriba de La Capilla, between Tuñame and Jajó, 3000 m, acaulirrosuleto, roseta foliar 25 cm diam., 15 cm alta, capitulos erectos o nutantes, ligulas amarillas, 13 Jul 1971, Ruiz-Terán & López-Figueiras 2204; holotypus, US; isotypus, MERF. Same locality, 3300 m, acaulirrósula, hojas verdoso blanquecinas haz, lanoso-seríceas envés, ligulas amarillas, 29 Oct 1969, Cuatrecasas, Ruiz-Terán & López Figueiras 28186, paratypi US, MERF. Other collections from the same region are: Ruiz-Terán & López-Figueiras 2202, 2154; Ruiz-Terán 8996; Aristeguieta & Medina 3450, 3451; Hanbury-Tracy 238; from the region of Niguitao and Páramo de Cabimbú: Jahn 151; Ruiz-Terán 2220; Ruiz-Terán & López-Figueiras 2220, 2221; Cuatrecasas, Ruiz-Terán & López-Figueiras 28199; López-Figueiras 11881, 11885, 11886, 11887, 11889, 11890, 11891, 11893.

Espeletia nana is closely related to E. weddelli and its other allies. A key follows to distinguish the six Venezuelan species involved in this group. Hybrid forms which frequently occur between some of these species and E. schultzii Wedd. when they grow together are not considered in the key.

Key to the small, sessile Venezuelan species of Espeletia.

1 Vagina foliorum sicut parte proximali costae utrinque glabra. Scapi monocephali.

2 Scapi aphylli, tantum sursum distale 1-2 bracteis brevibus oppositis vel alternis, dense crasseque albo-floccoso-lanati. Lamina foliorum lineari-spatulata dense floccoso-gossypina, ad apicem obtusum indumento albo crassiore. Involucrum crasse albo-gossypinum visu subglobosum ligulas excedens, 20-30 mm latum. . . . . .E. tenorae Aristeg.

2' Scapi foliati bracteatique, 1-3 paribus foliorum oppositorum circa basim longe tubuloso-vaginantibus, sursum bracteis brevibus parcis vel raris alternis vel absens; indumento lanato ferfugineo vel brunneo. Saepe ligulae involucro longiores.

3 Laminae foliorum adpressissime argenteo-sericeae, pilis rectis antrorsis 1-1.5 mm. Involucrum crasse ochraceo vel ferrugineo-lanatum cupulato-turbinatum, 20 mm latum. . .E. marthae Cuatr.

3' Laminae foliorum albo-villoso-lanatae, pilis plus minusve flexuosis vel contortis 3-6 mm longis. Involucrum rotundato-cupulatum crasse ochraceo vel ferrugineo-lanatum, 20-26 mm latum. . . . . .E. nana Cuatr.

1' Vagina foliorum abaxiale dense barbata.

4 Laminae foliorum utrinque crasse sed molle crispo-lanatae visu teretes praecipue juveniles, lineares deorsum non vel parum angustatae, 12-25 x 0.9-1.5 cm indumento incluso; pili crispi patuli vestitura alba cribrosa laxa molle utrinque uniformiter crassa insuper tenuiter arachnoidea instructi, in sicco roseata vel ferruginea. Scapi saepe monocephali interdum 2-3-cephali, pare uno foliorum supra basim (rare duobus) et 6-12 foliis sparsis linearibus obtusis sursum gradatim minoribus et sicut axis crasse terete lanatis. Capitula 24-32 mm lata ligulis amotis. . . . . E. ulotricha Cuatr.

4' Laminae foliorum longe villosae vel lanatae lineares vel oblongo-oblanceolatae visu planae indumento in sicco albo. Scapi 2-3 paribus foliorum oppositorum longe tubuloso-vaginantibus.

5 Laminae foliorum lineares vel leviter oblanceolato-lineares acutiusculae adaxiale dense antrorso-villosae abaxiale laxe lanuginosae ad costam insuper subsericeo-villosae, 5-12(-18) x 0.3-0.8(-1) cm (indumento amoto). Scapi teneri 2-5-capitulis (rare aliqui monocephali) brevibus, involucro villoso-lanato semigloboso, 14-20(-25) mm diam.
. . . . . .E. weddellii Schultz Bip.

5' Laminae foliorum latiores oblongae vel oblanceolato-oblongae

vel spatulatae, obtusae vel subobtusae dense longiusque lanatae et lanato-barbatae, 6.5-15 x 0.8-2 cm (indumento amoto). Scapi monocephali mediocres vel robusti, dense albo-lanati ad apicem crassiore albo-lanati. Involucra subglobosa crasse lanata 20-30 mm diam. . . . . .E. batata Cuatr.

PARAGYNOXYS URIBEI Cuatr. sp. nov.

Arbuscula 3-4 m alta ramis ochraceis vel fulvescentibus subcylindraceis striatis, breviter sed dense adpresseque pulverulento-tomentosis pilis irregulariter brachiatis acutis valde intricatis 0.2-0.5 mm longis.

Folia alterna ampla rigide crasseque coriacea longe petiolata. Lamina adulta 34 x 16-18 x 8 cm, ovata vel elliptico-ovata basi late rotundata vel obtusa apicem versus gradatim attenuata acuta, margine anguste revoluta integra vel rare parcis dentibus remotissimis brevibus callosis; adaxiale viridis vel lutescenti-viridis, costa plana angusta adpresse tomentulosa excepta glabra; abaxiale costa elevata robusta sulcato-striata dense adpresseque tomentosa, nervis secundariis prominentibus tomentosis, 12-13 utroque latere, proximalibus patulis, distalibus patulo-ascendentibus, supra medium furcatis prope marginem evanescentibus, alteris nervis minoribus laxe prominuleque reticulatis, superficie moderate vel laxe lanugineo-tomentosa indumento ochraceo vel fuscescenti, pilis irregulariter brachiatis, tortuosis vel crispis intricatis, 0.1-0.6 mm, copiosis partiale tecta. Petiolus robustus 6-13 cm longus argute striatus, basi incrassato-dilatata vaginanti, dense adpresseque brevi-tomentosus. Inflorescentiae late paniculatae subthyrsiformes vel rotundatae floribundae, 20-30 cm amplae. Axi ramique ascendentes striati adpresse ochraceo-tomentulosi, ramusculi complanati striatique magis patuli et congesti etiam tomentulosi. Bracteae subtendentes proximales foliosis sed valde breves petiolatae, 8-4 x 2-0.6 cm, mediales sequentes lineares sursum longitudine decrescentes 20-3 mm longae 1 mm latae omnes tomentulosae. Pedicelli angulati rigidi 1-5 mm longi, ad apicem 3-6 bracteolis anguste linearibus acutis tomentellis 1.5-2.5 x 0.5 mm, tomentellis ad modum brevis calyculi irregularis infra capitulum dispositis.

Capitula homogama discoidea maturitate 11-12 mm longa. Involucrum 7.5-8 mm altum quam flores brevius, cylindraceum base paulo attenuatum 8 phyllariis subuniseriatis. Phyllaria subcoriacea rigida interiora 7-7.3 x 3 mm elliptica dorso crasso tomentoso-lanuginosa marginibus membranaceis glabrisque apice subite acutato, exteriora (3) oblonga sursum subacutato-attenuata crassa carnosula dense lanuginoso-tomentosa pilis irregulare brachiatis intricatis 0.2-0.4 mm longis. Receptaculum 1.6-1.8 mm diam. alveolatum minute dentatum.

Flores hermaphroditi 10-11 (-12) in capitulo. Corolla alba glabra 8.2-9 mm longa, tubulo carnosulo (3.5-) 4 mm longo in 5 lacinias lineares usque ad 1 mm supra basim partito. Laciniae 3-3.5 mm longae 0.5 mm latae apice angustato subacuto sed calloso-incrassato et papillosulo, maturitate bene revolutae, venis margi-

nalibus et mediali bene notatis. Antherae 2.5 mm longae basi caudatae caudiculis acutis 0.4-0.5 mm longis, appendice apicali oblonga attenuata obtusiuscula circa 0.4 mm longa. Cellulae endotheciales oblongo-hexagonales nodulis polaribus. Grana pollinis 0.03-0.035 mm. Collum conectivi cylindricum filamento leviter crassius. Stylus circa 10 mm, basim incrassatum supra discum brevem affixus, ramis circa 2.5 mm longis valde revolutis, complanatis adaxiale duobus lineis stigmaticis marginalibus valde crassis confluentibus, abaxiale densiuscule papilloso-pilosulis distale leviter attenuatis apice subacuto papilloso papillis centralis longioribus circa 0.15 mm. Discus denticulatus circa 0.3 mm altus. Ovarium fertile 2.5-2.8 mm oblongum basim versus attenuatum, plus minusve triangulatum, 10-nervatum apice paulo dilatato cum pappo coronato. Pappus 7-8 mm longus stramineus setis rigidis scabridis biseriatis basi coalitis.

Typus: Colombia, Boyacá: Arcabuco, 4 km NE of town, margins of secondary forest, 2700 m, arbusto 2-2.5 m, envés foliar con denso tomento ocre, inflorescencias blancas, 8 Jun 1966, Lorenzo Uribe-Uribe 5633; holotypus US, isotypus COL. Id, Cerro Berlín, entre Arcabuco y La Palma, entre bosque andino degradado, antiguo camino de herradura 2800-2780 m, arbolito 3.5 m, ramillas sepias, hojas verde amarillento haz, verdoso-ocráceas envés, inflorescencias en capullos verdoso-ocracea, 28 Mar 1973, Cuatrecasas, Garcia-Barriga & Jaramillo 28675 (COL, US).

Paragynoxys uribei is the species known with the highest number of flowers per capitulum, 10-11 (-12) with constant number of 8 phyllaries. Paragynoxys neodendroides has not more than 9 flowers and 5-6 phyllaries; this species and its closely related P. santurbanensis with heads of 8 phyllaries and equal number of flowers differ from the new species by their thick coriaceous leaves covered by thick lanate indument and by the larger size of the flowers. The ovate or elliptic-ovate shape with rather sparse tomentum of its blades combined with the nature of the heads distinguish P. uribei from all other species of the genus.

PARAGYNOXYS STEYERMARKII Cuatr. sp. nov.

Arbuscula 3 m alta caule simplici distale paulo breviterque ramuloso. Ramuli costato-angulati breviter adpresseque griseo-lanuginoso-pulverulenti, pilis irregulariter brachiatis crassiusculis intricatis 0.1-0.5 mm longis. Folia alterna rigide crasseque coriacea petiolata. Laminae 9-15 cm longae 4-7 cm latae obovato-ellipticae apice obtusae basi cuneatae, margine planae vel leviter revolutae leviter obtusissimeque sinuatae vel subintegrae sed dentibus mucroniformibus callosis remotis conspicuis, adaxiale virides glabrae costa impressa ceteris nervis in sicco obsoletis, abaxiale pallide virides costa robusta prominenti deorsum adpresse griseo-tomentosa pilis intricatis valde adpressis tecta, nervis secundariis prominentibus 9-11 utroque latere ascendentibus distale furcatis, alteris nervis minoribus in reticulum laxum prominulum anastomosatis, superficie visu nitidula subglabra sed pilis brachi-

atis crassiusculis patulis copiosis sparse munita. Petioli 12-30 mm longi rigidi angulato-striati tomentulosi.

Inflorescentiae floribundae paniculati-corymbiformae circa 20 cm amplae tantum basi foliatae ceterae bracteateae. Rami ramusculique alterni argute striati, dense adpresseque pulverulento-tomentosi, pilis crassiusculis minutis informe irregulariterque brachiatis tecti. Bracteae proximales breve subfoliaceae oblongo-spathulatae basi petioliformi, 25-15 x 4-2 mm, mediales et distales gradatim breviores lineari-triangulares acutae 4-1 mm longae, omnes tomentulosuli. Pedicelli breves angusti rigidi angulati pilosuli 2-5 mm longi ad apicem 3-4 bracteolis minutis anguste triangularibus acutis tomentulosis, 1-1.5 (-2.5) mm longis ad modum calyculi infra capitulum dispositis.

Capitula homogama discoidea maturitate 13-15 mm longa. Involucrum 8.5-10 mm altum quam flores multo brevius, cylindraceum base cuneato-attenuatum, 5 phyllariis subuniseriatis. Phyllaria subcoriacea rigida pallide viridia apicibus purpureis, oblongo-elliptica et elliptica, apice leviter attenuata subobtusa breviterque barbulato-ciliolata reliqua glaberrima, 8.5-9.5 mm longa, exteriora 2 mm lata interiora marginibus tenuioribus 3 mm lata.

Flores hermaphroditi 5-6 in capitulo. Corolla alba apicibus purpureis glabra 11-12.5 mm longa, tubulo carnosulo 6 mm longo rigido angusto sursum gradatim angustato apice paulo constricto, 5-nervato; limbo in 5 lacinias lineares 5.5 mm longas 0.5 mm latas apice acuto brevissime papilloso linea media dorsali notata, in adulta valde revolutas seu circinatas usque circa basin partito. Antherae 3.5 mm longae basi longe sagittatae, appendice apicali oblongo attenuata 0.7 mm longa, maturitate exsertae cellulis endothecialibus hexagonale oblongis nodulis polaribus. Grana pollinis 0.03-0.035 mm. Stylus circa 12 mm, deorsum gradatim dilatatus inferne valde incrassatus, ramis subcomplanatis crassiusculis circa 5 mm longis circinatis, adaxiale crasse papilloso-stigmatiferis mediale leviter sulcatis, abaxiale copiose papilloso-pilosulis, apice paulo attenuato subacutato breviter pilosulo coronato. Discus margine minute denticulatis circa 0.2 mm altus. Ovarium 3 mm longum plus minusve conspicue 10-nervatum plerumque 6-costatum et plus minusve adpresse 3-angulatum, basim versus attenuatum apice marginatum cum pappo coronatum. Pappus stramineus pilis rigidulis biseriatis scabridis basi coalitis 8-9 mm longis.

Typus: Venezuela, Táchira: between Las Copas and Alto de Fila de Tierra Negra at the ridge dividing headwaters of rivers Quinimarí, Riofrio, Uribante and Talco (Oirá), 2870-2880 m; simple-stemmed woody plant 3 m, leaves coriaceous deep green above pale silvery green below with gray-brown midrib, inflorescences branches brown, involucre green, corolla white, the tips purplish, 16 Jan 1968, J.A. Steyermark, G.C.K. & E. Dunsterville 101014; holotypus, US; isotypus, VEN.

Paragynoxys steyermarkii is closely related to P. venezuelae from which it differs by the larger heads and longer flowers, by its glabrous involucre and by the leaves which are smaller, rather obovate, rounded at apex and cuneate at base.

MALPIGHIA ALBIFLORA (Cuatr.) Cuatr. comb. nov.

Stigmaphyllon albiflorum Cuatr., Ciencia (Mex.) 23(4): 139, fig. 1: H, I, J. 1964. Subsequent study and closer examination of more flowers of the type collection proved that the species belongs to Malpighia instead of Stigmaphyllon where it erroneously was placed.

A REVIEW OF THE CENTRAL AMERICAN SPECIES OF PENTACALIA (ASTERACEAE: SENECIONEAE).

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A number of undescribed species of Senecioneae are known from the Neotropical Region which have remained unworked because of the need for more proper generic alignments in the tribe. One group in particular, the section Streptothamni of Greenman, has been rather consistently recognized within Senecio. The inclination to raise the section to generic rank suffered from a lack of knowledge of a proper name to use and the name Streptothamnus itself is preoccupied at the generic level. A previous series of studies (Robinson and Brettell, 1973a, b, c) reviewed Mexican and Central American Cacalioid elements some of which had previously been placed in Senecio, but Senecionoid elements were not treated. More recently the independent status of the Senecionoid Pseudogynoxys has been restated (Robinson and Cuatrecasas, 1977) leaving the section Streptothamni and the species of "Microchaete" as the only significant elements in Central America still treated as Senecio that do not conform to any natural concept of that genus. Two recent studies have appeared that provide great insight into the Senecioneae, Jeffrey et al. (1977) have provided an outline of natural groupings within Senecio and have listed members of the section Streptothamni in their unit A VI, and Nordenstam (1978b) has provided a number of further insights in the process of reviewing the tribe Senecioneae in the Symposium on the Biology and Chemistry of the Compositae. In a preliminary paper Nordenstam (1978a) segregates a number of new genera such as Odontocline of Jamaica and resurrects older genera such as the Andean Aetheolaena of Cassini.

A search among the many Neotropical Senecioneae has shown that the name Pentacalia Cassini based on Cacalia arborea HBK is the earliest available for the group containing section Streptothamni. The genus was established by Cassini in a casual manner but the type species was cited and a primary distinguishing character was given, the 5-angled achene that was the basis for the generic name. The character which is common in many Asteraceae is not common in the Senecioneae,

but examination shows that it is a common and significant feature of almost all the species recognized in this study as members of the genus. Species with 10 ribs still do not show the completely equal development seen in Senecio.

The distinctions from other genera can be broadly summarized. Enlarged cells of the anther collars and the separated stigmatic lines on the style branches both eliminate close relation to Cacalioid genera such as Nelsonianthus (Robinson and Brettell, 1973a). The blunt tips of the styles differ from those of Pseudogynoxys. The fruticose to scandent habit with woody stems, the distinctly petiolate usually non-stipitate leaves, the minutely fistulose or non-fistulose receptacles, the tails on the anthers and the rather stout 5-ribbed achenes all differ from Senecio. The usually non-stipitate petioles, the erect heads, the tails on the anthers and the lack of a central coma on the style tip indicate a different basic element from what is now called Aetheolaena.

Among genera that seem most closely related is Odontocline Nordenst. of Jamaica which has much the same habit and seems initially identical, being named after the crests on the receptacle that are also common in Pentacalia. The Jamiacan genus differs in significant ways, however. The stigmatic surface is bilobed in initial observation but cross-sections show the surface is continuous as indicated by Nordenstam (1978a). The achenes differ by having the more common 8-10-ribbed condition of the tribe. The anther appendages are more ovate to lanceolate while they are mostly oblong in Pentacalia. The tips of the styles of the disk flowers are more produced as shown by Nordenstam and the outer surfaces of the involucral bracts are regularly striated or grooved.

Pentacalia Cassini, Dict. Sc. Nat. 48: 461. 1827.
Senecio sect. streptothamni Greenm., Bot. Jahrb. 32: 19. 1902.

Woody shrubs or vines, often epiphytic. Stems terete or subterete, surface sometimes hardened and whitish or irregularly cracked when dry, becoming corticated when older. Leaves alternate, distinctly petiolate, rarely stipitate; blades ovate to oblong, often carnose, margins entire to minutely denticulate or serrate, nerves pinnate, secondary veins obscure to prominent on lower surface. Inflorescence terminal or lateral, multicapitate, thyrsoid to corymbose paniculate. Heads erect on pedicels, with few usually small subinvolucral bracts; involucre uniseriate with

5-8 rarely 13 oblong shortly acute phyllaries, median outer surface usually fleshy without regular grooves or striations; receptacle often with prominent small crests. Corollas glabrous, usually yellow; with or without rays; disk corollas with long basal tube, throat tubular to slightly funnelform, lobes longer than wide, oblong-ovate to narrowly oblong, sometimes as long as throat, median resin duct weakly developed; anther collars with larger or thinner walled cells below; anther thecae with tails at base, tails often as long as collars; thecial cells oblong, with numerous minute nodular thickenings on vertical walls and a few on short transverse and oblique walls; anther appendage oblong, rounded at tip, with narrow cells; style with 2 separated stigmatic lines; tip truncate to slightly convex, without distinct central coma of hairs. Achenes prismatic with mostly ca. 5 ribs, rather stout, glabrous, smooth; carpopodium short, incurved at lower margin, sharply demarcated above, with many rows of small cells; pappus of 1-3 series of scabrous capillary bristles, usually narrowed distally to ca. 30 μ wide, with or without enlarged tips. Pollen 30-40 μ in diameter.

Type species: Cacalia arborea H.B.K., Nov. Gen.& Sp. 4: 128, pl. 359. 1818, ed folio, Colombia. Paramo de Almaguer juxta pagum Pansitara. Sept. = Pentacalia arborea (H.B.K.) H.Robinson & J.Cuatrecasas, comb. nov.

The present treatment is restricted to the Central American species. South American species will be treated separately. The present broad interpretation of the genus is based on the comparative utility of the unifying characters versus the more subtile characters or combinations of characters upon which natural segregates could be based. The more typical element of the genus presents a distinctive aspect and has more thyrsoid inflorescences, discoid heads, and receptacles without obvious small crests, but none of the characters is restricted to the group. The prominent secondary leaf veins spreading at nearly right angles provide a more significant but still not unique character. The single Central American species belonging to the typical group is P. phanerandra.

Key to the Central American Species

1. Heads without ray flowers; receptacle often with weak crests or no crests.

2. Leaves with primary and secondary veins prominent on lower surface; heads with 10-14 flowers.

3. Leaves with secondary veins sharply spreading at near 80° angles, leaf margins often with few to many small dentations; pappus distinctly in 2 or more series; inflorescence puberulous with coarse hairs P. phanerandra

3. Leaves with secondary veins usually ascending at 50-60° angles, leaf margins entire; pappus mostly in 1 series; inflorescence subtomentose with long-attenuate hairs P. candelariae

2. Leaves carnose with primary and secondary veins usually obscure; heads with ca. 20 flowers.

4. Involucral bracts 7-8 mm long, mostly as long as the head P. parasitica

4. Involucral bracts 5-6 mm long, shorter than the head P. phorodendroides

1. Heads with ray flowers which are sometimes small; receptacle usually with prominent small crests.

5. Inflorescence with distinct large oblong-elliptical primary bracts to 2 cm long and 1 cm wide P. tonduzii

5. Inflorescence without specialized large primary bracts.

6. Heads broadly campanulate, with 15-25 disk flowers.

7. Leaf blades ca.13 cm long and 9 cm wide; disk corollas with lobes ca. 1 mm long P. epidendra

7. Leaf blades not over 10 cm long or 5 cm wide; disk corollas with lobes 1.5-2.0 mm long.

8. Leaf blades elliptical with acute apices; tips of pappus setae not enlarged or distorted P. magistri

8. Leaf blades ovate with acuminate tips; tips of pappus setae enlarged or distorted P. morazensis

6. Heads narrowly campanulate with 5-12 disk flowers.

9. Inflorescence lateral with panicles mostly from axils of normal leaves; limbs of rays 2.0-2.5 mm long.

10. Leaves narrowly elliptical; axillary panicles ca. 5 cm long; heads with 8-10 disk flowers *P. horickii*

10. Leaves elliptical to oblong-elliptical; axillary panicles 10-20 cm long; heads with ca. 4 disk flowers *P. matagalpensis*

9. Inflorescence terminal, broadly corymbose-paniculate; limbs of rays 3-6 mm long.

11. Subinvolucral bracts large, 4-5 mm long, completely covered with dense tomentum *P. calyculata*

11. Subinvolucral bracts less than 4 mm long, not more densely pubescent than involucral bracts.

12. Throats of mature disk corollas extending above tips of the pappus bristles; leaves acute *P. wilburii*

12. Throats of mature disk corollas not extending above tips of pappus bristles; leaves distinctly acuminate *P. streptothamna*

The new species and new combinations of Central American *Pentacalia* are as follows:

Pentacalia calyculata (Greenm.) H.Robinson & J.Cuatrecasas, comb. nov. *Senecio calyculatus* Greenm. in J.Donn.-Smith, Bot. Gaz. 37: 419. 1904. Costa Rica.

Pentacalia candelariae (Benth. ex Oersted.) H.Robinson & J.Cuatrecasas, comb. nov. *Senecio candelariae* Benth. ex Oerted., Kjoeb. Vidensk. Meddel. 1852 (5-7): 108-109. 1852. Costa Rica.

Pentacalia epidendra (L.Wms.) H.Robinson & J.Cuatrecasas, comb. nov. *Senecio epidendrus* L.Wms., Phytologia 31: 440. 1975. Guatemala.

Pentacalia horickii H.Robinson, sp. nov.
A *O. wilburii* similis et *O. matagalpense* valde affinis sed petiolis 7-10 mm longis, laminis anguste

ellipticis ca. 6.5-7.5 cm longis et 1.0-1.4 cm latis base anguste cuneatis apice anguste acuminatis; inflorescentibus axillaribus breviter paniculatis 4-6 cm longis et ca. 3 cm latis, pedicellis 2-9 mm longis minute sparse puberulis, bracteis subinvolucralibus paucis minute linearibus ca. 1 mm longis; capitulis ca. 8 mm altis et 2-3 mm latis; squamis involucri plerumque 5 interdum coalescentibus oblongis ca. 5 mm longis plerumque 1-2 mm latis; receptaculis breviter cristiferis; floribus radiatis 2-3 pallidis, tubis ca. 5 mm longis, limbis minute oblongis ca. 2 mm longis; floribus discis 8-10; corollis pallidis, tubis ca. 3 mm longis, faucis anguste infundibularibus 2.5 mm longis, lobis anguste lanceolatis 1.5-2.0 mm longis et 0.6-0.7 mm latis, cellulis apicalibus scleroideis vix mamillosis; filamentis in parte superiore ca. 0.7 mm longis base ca. 0.17 mm latis; thecis in parte pollinifero ca. 1.3 mm longis base longe caudatis ad 0.5 mm longis, appendicibus antherarum anguste oblongis ca. 0.5 mm longis et 0.18 mm latis; ramis stylorum in apicem breviter cristatis; achaeniis ca. 1.4 mm longis glabris; setis pappi ca. 5 mm longis apice vix incrassatis, cellulis apicalibus saepe obtusis interdum retrorse scabridis; granis pollinis ca. 35-40 μ in diametro.

TYPE: GUATEMALA: Quezaltenango: Pacific watershed in valley of Río Naranjo, between San Martín Chiquíto, Las Nubes south to El Pozo and Chuíkabál (Canton Tuhilacán), not quite reaching Mujuliá; at an altitude between 2100 and 1800 meters. Sent with Bonifazia quezaltica collected on "tall trees in dense dark cloud forest interior. Pendent vine most significant for Bonifazia forests, epiphytic." C.K.Horich s.n. prepared 27 May 1960, UC Bot. Gard acc. no. 57.247-1 (Holotype, US).

The species is most obviously distinct from all related species in the narrowly elliptical leaves with narrowly acuminate tips. The species seems superficially similar to P. phorodendroides but the leaf shape, the presence of ray flowers and the smaller number of disk flowers with longer lobes furnish ample distinctions. Of the new species closest relationship is with P. mataglapensis which has similar lateral inflorescences with few flowered heads, similar long tails on the anthers and a similar nearly complete crown of hairs on the tip of the style branches. The latter species differs in the broader leaves, the longer branches of the inflorescence, the coarser pubescence, the larger subinvolucral bracts, the extremely elongate lobes of the disk corollas and the fewer numbers of disk flowers.

Pentacalia magistri (Standl.& L.Wms.) H.Robinson & J.Cuatrecasas, comb. nov. Senecio magistri Standl.& L.Wms., Ceiba 4: 190. 1954. Honduras.

Pentacalia matagalpensis H.Robinson, sp. nov.

A O. wilburii similis sed caulibus sparse puberulis subglabrescentibus, petiolis 5-10 mm longis, laminis ellipticis 2.5-5.5 cm longis et 1.0-2.5 cm latis distincte breviter acuminatis; inflorescentibus axillaribus longe paniculatis usque ad 17 cm longis et 8 cm latis, pedicellis brevibus vel subnullis 0-2 mm longis dense puberulis, bracteis subinvolucralibus lanceolatis 1-2 mm longis; capitulis 6-7 mm altis et ca. 2 mm latis; squamis involucri ca. 5 oblongis ca. 5 mm longis et 1 mm latis; receptaculis subcristiferis; floribus radiatis plerumque 2 albis?, tubis ca. 3 mm longis, limbis minute oblongis ca. 2.5 mm longis; floribus discis plerumque 4; corollis albis?, tubis 2.5-3.0 mm longis, faucis anguste infundibularibus 1.0-1.5 mm longis, lobis linearibus 2.5-3.0 mm longis et 0.5 mm latis, cellulis apicalibus scleroideis alte mamillosis; filamentis in parte superiore ca. 0.5 mm longis base ca. 0.2 mm latis; thecis in parte pollinifero 1.3-1.5 mm longis base longe caudatis ad 0.5 mm longis; appendicibus antherarum anguste oblongis ca. 0.4 mm longis et 0.17 mm latis; ramis stylorum in apicem prominentiter cristatis; achaeniis ca. 1 mm longis glabris; setis pappi ca. 5 mm longis apice leniter incrassatis, cellulis apicalibus plerumque obtusis; granis pollinis ca. 35-40 μ in diametro.

TYPE: NICARAGUA: Matagalpa: Cloud forest area at "Disparate de Potter" near Sta. Maria de Ostuma. Cordillera Central de Nicaragua between Matagalpa and Jinotega, Alt. 1500 m. Feb. 20, 24, 1963. Williams, Molina & Williams 25036 (Holotype, US).

Pentacalia matagalpensis is most notable for the elongate axillary panicles with small groups of densely clustered heads. The stems and branches of the inflorescence are more puberulous than in related species and the stems remain sparsely roughened apparently from persistent bases of the hairs. The disk flowers have particularly prominent hairs on the style tips and on the back below the tip. This apical crown extends around to the inner surface above the stigmatic lines. The condition of the style tips is approached in the closely related P. horickii but is markedly distinct from the condition in P. streptothamnus which also occurs in Nicaragua. The flowers were noted as being white by the collectors.

Pentacalia morazensis (Greenm.) H.Robinson & J.Cuatrecasas, comb. nov. Senecio morazensis Greenm., Ceiba 1: 122. 1950. Honduras.

Pentacalia parasitica (Hemsl.) H.Robinson & J.Cuatrecasas, comb. nov. Senecio parasiticus Hemsl., Biol. Cent. Amer., Bot. 2: 244. 1881. Cacalia parasitica Sch.Bip. ex Hemsl., Biol. Cent. Amer., Bot. 2: 244. 1881, nom. nud. in syn. Guatemala, Mexico.

Pentacalia phanerandra (Cufodontis) H.Robinson & J.Cuatrecasas, comb. nov. Senecio phanerandrus Cufodontis, Archivio Bot. Forli 9: 103. 1933. Costa Rica.

Pentacalia phorodendroides (L.Wms.) H.Robinson & J.Cuatrecasas, comb. nov. Senecio phorodendroides L.Wms., Phytologia 31: 445. 1975. Guatemala.

Pentacalia streptothamna (Greenm. ex Standl.) H.Robinson & J.Cuatrecasas, comb. nov. Senecio streptothamnus Greenm. ex Standl., Field Mus. Pub. Bot. 18: 1518. 1938; Greenm., Bot. Jahrb. 32: 22. 1902, nom. nud. Costa Rica, Nicaragua, Panama.

Pentacalia tonduzii (Greenm. ex Standl.) H.Robinson & J.Cuatrecasas, comb. nov. Senecio tonduzii Greenm. ex Standl., Field Mus. Pub. Bot. 18: 1519. 1938; Greenm., Bot. Jahrb. 32: 22. 1902, nom. nud. Costa Rica.

Pentacalia wilburii H.Robinson, sp. nov.

Plantae lignescentes scandentes epiphyticae. Caules teretes vel subteretes in sicco subangulati glabri, cellulis superficialibus plerumque in strato eburneiformibus induratis. Folia alternata, petiolis 10-17 mm longis; laminae carnosae ellipticae vel obovatae 4.0-6.5 cm longae et 2.0-3.3 cm latae base cuneatae vel acuminatae margine integrae apice breviter acutae supra et subtus glabrae. Inflorescentiae terminales late corymboso-paniculatae 9-14 cm latae, pedicellis 3-10 mm longis sparse puberulis, bracteis subinvolucralibus paucis membranaceis linearibus 3-4 mm longis. Capitula ca. 9 mm alta et 3-4 mm lata; squamae involucri 5-8 oblongae 5-6 mm longae et 1-2 mm latae extus glabrae apice breviter acutae dense breviter setiferae; receptacula breviter cristifera. Flores radii 2-3; corollae flavae, tubis ca. 3.5 mm longis, limbis oblongis ca. 3.5 mm longis et 1.5 mm

latis. Flores disci 5-11; corollae flavae, tubis 3.5-4.0 mm longis, faucis anguste infundibulares 2.0-2.5 mm longis, lobis lanceolatis 1.3-1.7 mm longis et ca. 0.6 mm latis, cellulis apicalibis scleroideis vix mamillosis; filamenta in parte superiore 0.3-0.4 mm longa base ultra 0.2 mm lata; thecae in parte pollinifero ca. 1.5 mm longae base longae caudatae ad 0.7 mm longae; appendices antherarum anguste oblongae ca. 0.4 mm longae et 0.25 mm latae; ramis stylorum subapice extus breviter cristatis. Achaenia 1.5-2.0 mm longa glabra; setae pappi ca. 50 ca. 4 mm longae apice vix incrassatae, cellulis apicalibus breviter acutis. Grana pollinis ca. 35 μ in diametro.

TYPE: PANAMA: Chiriquí: edge of forested slope above Cerro Punta toward Bajo Grande in Quebrado Bajo Grande, about 6500 ft., succulent epiphyte, florets bright yellow. 14 January 1970. R.L.Wilbur, Weaver, Foster & Correa 10919 (Holotype, DUKE; isotype US). PARATYPES: COSTA RICA: Alajuela: Volcan de Poás, along the road between La Lechería and the Hotel; alt. 2100 to 2600 m. Pendent epiphytic shrub; flowers yellow. Feb. 17, 1924. Standley 34638 (US); San Jose: Cerro Chirripó, elev. 2700-3000 m, oak forest with Chusquea understory. Epiphytic vine; flowers yellow. 6 April 1969. Davidse & Pohl 1643 (US); Carretera Panamericana, 7000', rays amarillos; tallos rastreras, 27 March 1949., Inst. Interamer. Cienc. Agricolas Herb. no. 435 (US).

The new species seems nearest to P. streptothamna occurring in the same general area, but the leaves of the latter are acuminate at the tip. The corolla lobes of the new species are shorter in comparison and the throats longer, a feature particularly noticeable in relation to the length of the pappus. The tails of the anthers are among the longest seen in the tribe, being almost twice as long as the anther collars.

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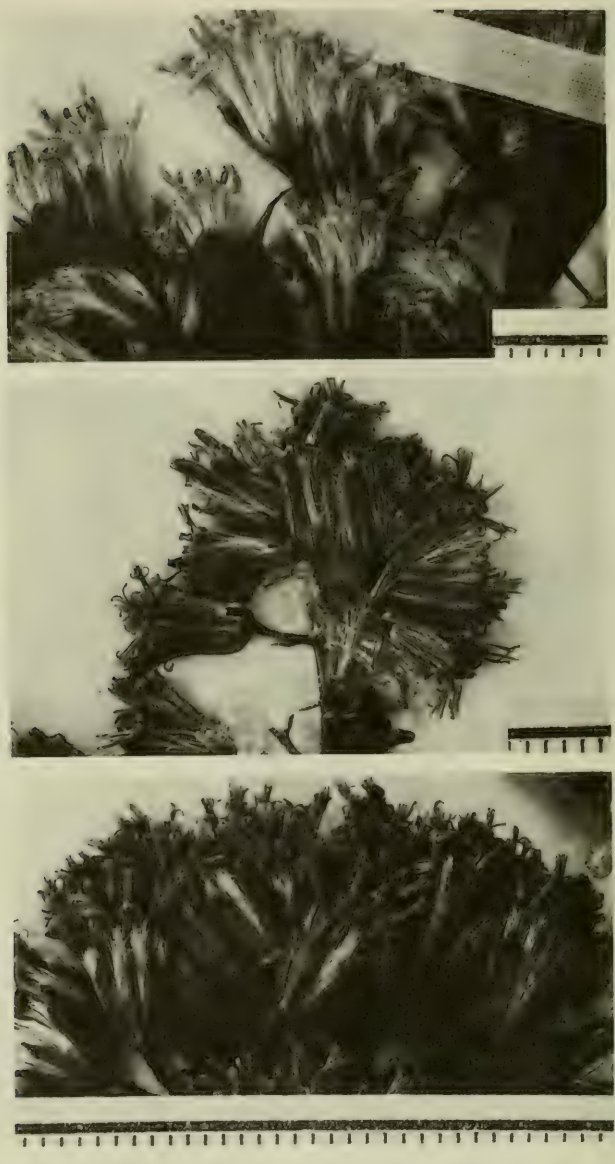
Pentacalia horickii H.Robinson, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Pentacalia matagalpensis H.Robinson, Holotype, United States National Herbarium.

Pentacalia wilburii H.Robinson, Holotype, Duke University Herbarium.



Enlargements of heads of Pentacalia. Top: P. horickii. Middle: P. matagalpensis. Bottom: P. wilburii.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXXIII. A NEW GENUS, BEJARANOA.

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The lack of papillosity on corolla lobes or styles, the lack of enlargements or hairs on the style bases, and the lack of various other specialized traits are found in diverse elements of the Eupatorieae. More subtle characters are often required to determine the proper relationships of such groups. One group described here as a new genus Bejaranoa has had to await improved subtribal concepts in the Eupatorieae and more accurate delimitation of other genera with which it could be confused.

Bejaranoa shows at least superficial resemblance to Koanophyllon of the Critonia series, Austroeupatorium of the Eupatoriinae, and to Conocliniopsis of the Gyptis. Koanophyllon and its immediate relatives do show the most reduced involucre in the Critonia series and approach that of Bejaranoa in aspect but the inner bracts are more deciduous, the corolla lobes are of a distinctive broad-triangular form and alternate leaves are found in only one aberrant species. No close relation seems to be involved. Austroeupatorium has alternate leaves in the upper part and has the more subimbricate involucre common in the Eupatorieae but has the hairs on the base of the style characteristic of that subtribe. Conocliniopsis is seen most similar having alternate leaves, similar form of the inflorescence, individual involucral bracts of the same form and flowers of the same general shape. The genus Bejaranoa seems to be related to Conocliniopsis as closely as to any genus and therefore belongs to the Gyptis series though it differs from Conocliniopsis and most of the series by the unequal involucral bracts and nearly smooth style branches. Further evidence of this relationship is seen in the tendency for a slightly conical receptacle in Bejaranoa though this is not comparable to the highly conical form seen in Conocliniopsis. Further distinctions of Bejaranoa from Conocliniopsis are the lack of glands on the achenes, the larger cells of the carpopodium and the smaller 17-20μ in diameter pollen found in the latter genus.

The genus is named for Professor Gaston Bejarano, head of the Ministry for Forestry, National Parks, Hunting and Fishing. The senior author greatly appreciates the help that Professor Bejarano provided during the

course of field work in Bolivia recently.

Bejaranoa R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae erectae suffrutescentes ca. 0.5 m altae mediocriter vel multo ramosae. Caules erecti teretes striati brunnescentes dense hirtelli et glanduliferi. Folia alternata distincte breviter petiolata; laminae ovatae vel ovato-lanceolatae base obtusae trinervatae margine serratae vel duplo-serratae apice obtusae vel breviter acutae. Inflorescentiae terminales, ramis dense corymbosis, pedicellis brevibus vel nullis. Capitula campanulata; squamae involucri subimbricatae ca. 4-seriatae 8-15 inferne 2-4-costatae superne laxe herbaceae, squamae interiores persistentes; receptacula convexa vel minute conica glabra vel subglabra. Flores 4-10; corollae anguste infundibulares, tubis cylindricis, faucis extus pauce glanduliferis intus glabris, cellulis interioribus in parietibus laxe sinuosis, lobis ovato-triangularibus vix longioribus quam latioribus margine subcarnosis extus dense glanduliferis superne minute papillosis intus laevibus; filamenta in parte inferiore glabra in parte superiore breviter cylindrica, cellulis in parte superiore breviter oblongis in parietibus dense annulate ornatis; cellulae endotheciales subquadratis; appendices antherarum oblongae longiores; quam latiores; basi stylorum glabri non noduliferi; appendices stylorum lineares superne leniter clavatae minute leniter mamillosae. Achaenia prismatica 5-costata setifera et glandulifera inferne angustiora; carpopodia breviter late obturaculiformia superne distincte limitata, cellulis 4-8-seriatis subquadratis vel breviter oblongis ca. 12 μ latis et 12-20 μ longis parietibus subincrassatis; setae pappi capilliformes ca. 30-55 dense scabridae, cellulis apicalibus acutis vel interdum truncatis. Grana pollinis 23-25 μ diam.

Species typica: Eupatorium balansae Hieron.

The genus contains the following two species as shown in the key below.

1. Leaves strongly crenate-serrate to sharply serrate; heads single on short pedicels, each head with 5-10 flowers; achenes densely pubescent throughout B. balansae

1. Leaves shallowly crenate, heads in pairs or small complexes that look like heads; each head with 4-5 flowers; achenes less densely pubescent in lower half B. semistriata

Bejaranoa balansae (Hieron.) R. M. King & H. Robinson, comb. nov. Eupatorium balansae Hieron., Engl. Jahrb. 22:778. 1897. Bolivia, Paraguay. The species shows considerable variation in number of flowers per head (5-10) and number of pappus setae (30-55). The stems and pedicels usually have only sessile glands. One specimen (Cardenas 4607) from Bolivia represents an extreme form with the maximum number of flowers (10) and pappus setae (50-55) and with stipitate glands. Glands of this type are like those seen in B. semistriata.

Bejaranoa semistriata (Baker) R. M. King & H. Robinson, comb. nov. Eupatorium semistriatum Baker in Mart. Fl. Bras. 6(2):319. 1876. Conoclinium semistriatum Sch.-Bip. in Baker in Mart. Fl. Bras. 6(2):319. 1876

The species superficially resembles B. balansae very closely but the leaves are less strongly crenate-serrate, the achenes are less densely pubescent and the undersurface of the leaf has glandular punctation more evident because of the less dense pubescence. Examination of the head-like structures on the material of the type (Pohl, Brazil) kindly loaned by Dr. H. Merxmuller, Director, Botanische Staatssammlung, Munchen, shows that each is divided by a series of bracts into 2 or even 3 units containing 4-5 or occasionally less flowers.

Acknowledgement

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NOTES ON NEW AND NOTEWORTHY PLANTS. CXIV

Harold N. Moldenke

CITHAREXYLUM HEXANGULARE var. BREVIFOLIUM Moldenke, var. nov.

Haec varietas a forma typica speciei laminis foliorum maturis 4—7 cm. longis 2—3.5 cm. latis recedit.

This variety differs from the typical form of the species in having its mature leaf-blades only 4—7 cm. long and 2—3.5 cm. wide.

The type of the variety was collected by Cyrus L. and Amelia A. Lundell (no. 7679) in low secondgrowth at the west end of Lake Coba, Coba, Quintana Roo, Mexico, in June or July, 1938, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collectors describe the plant as a shrub, 3—5 feet tall, with white corollas.

CITHAREXYLUM HEXANGULARE var. LATIFOLIUM Moldenke, var. nov.

Haec varietas a forma typica speciei laminis foliorum usque ad 6 cm. latis recedit.

This variety differs from the typical form of the species in having its leaf-blades decidedly elliptic or ovate-elliptic and to 6 cm. wide.

The type of the variety was collected by Antonio Molina R., Louis O. Williams, William C. Burger, and Bruce Wallenta (no. 17478) in a cutover forest area in a barranca near La Laguna, 6—8 km. south of Villa Quesada, Alajuela, Costa Rica, on February 19, 1966, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collectors describe the plant as a tree, 10 m. tall, with white corollas.

STACHYTARPHETA CANESCENS var. BAHIENSIS Moldenke, var. nov.

Haec varietas a forma typica speciei ramis ramulisque rhachideque petiolisque laminisque foliorum breviter pubescentibus.

This variety differs from the typical form of the species in having the pubescence of its branches, branchlets, inflorescences, petioles, and leaf-blades merely short-pubescent, the individual hairs irregularly antrorsely arcuate and interspersed among much shorter ones, light-brownish in color, mostly in two opposite bands on the branches and branchlets.

The type of this variety was collected by S. G. da Vinga and T. S. Santos (no. 147) in the restinga in the Parque Nacional de Monte Pascoal, Bahia, Brazil, on March 26, 1968, and is deposited in my personal herbarium. The collectors refer to the plant as 40—60 cm. tall and the corollas as blue.

A NEW COMBINATION IN GUZMANIA (BROMELIACEAE)

by

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When Thecophyllum spectabile Mez & Werckle was described in 1904, Mez noted that the relationships of this species seemed to be with several Andean and Antillian taxa rather than with other Costa Rican Thecophyllums. Smith and Pittendrigh dismembered Thecophyllum in 1953 and transferred a single species to Tillandsia, several to Guzmania and the majority, including Thecophyllum spectabile, to Vriesea. At that time Thecophyllum spectabile was known only from the type collection which lacked complete floral material. "Flores ob speciminis statum putridum ignoti" (Mez, 1904). Recent flowering collections of the taxon have shown that the species has fused sepals and petals (Fig. 1). These character states are discordant within Vriesea and necessitate the transfer of the species to the genus Guzmania.

Guzmania spectabilis (Mez & Werckle) Utley, comb. nov. Fig. 1.

Thecophyllum spectabile Mez & Werckle in Mez, Bull. Herb. Boiss. ser. II. 4: 873. 1904.

TYPE: COSTA RICA: without further locality, Werckle s.n. (HOLOTYPE: B!, photograph US!).

Vriesea spectabilis (Mez & Werckle) L.B. Smith & Pitt. Jour. Wash. Acad. 43: 403. 1953.

ADDITIONAL MATERIAL EXAMINED: COSTA RICA: ALAJUELA PROVINCE: roadbanks and forest remnants between Angeles Norte and about 7 km north of La Balsa de San Ramon or 10 to 17 km north of San Ramon, elev. 900 to 1200 m, Utley & Utley 2812 and 5422. BORDER OF ALAJUELA AND HEREDIA PROVINCES: vicinity of Colonia Virgen del Socorro on and around the finca of Sr. Carlos Molina, or about 3 to 6 km east of Cariblanco, elev. 900 m, Utley & Utley 2854, 2856 and 2883. CARTAGO PROVINCE: on road from Tapanti to Taus and Tausito between 1 and 4 km beyond the bridge over the Rio Grande de Orosi at Tapanti, elev. 1400 to 1500 m, Utley & Utley 5590.

Guzmania spectabilis is phenetically most similar to a complex of former Thecophyllums which is centered in the northern and central Andes. In addition to differences in floral characters, the foliar trichome morphology of G. spectabilis is inconsistent with that of the thecophylloid vrieseas but is in close agreement with that of its apparent allies in Guzmania [e.g., Guzmania squarrosa (Mez & Sodiro) L.B. Smith & Pitt.].

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I wish to acknowledge the Curators of the following herbaria who loaned essential specimens or materially aided this study: B, CR, DUKE and US. Miss Debbie Townsend assisted with the preparation of the illustrations.

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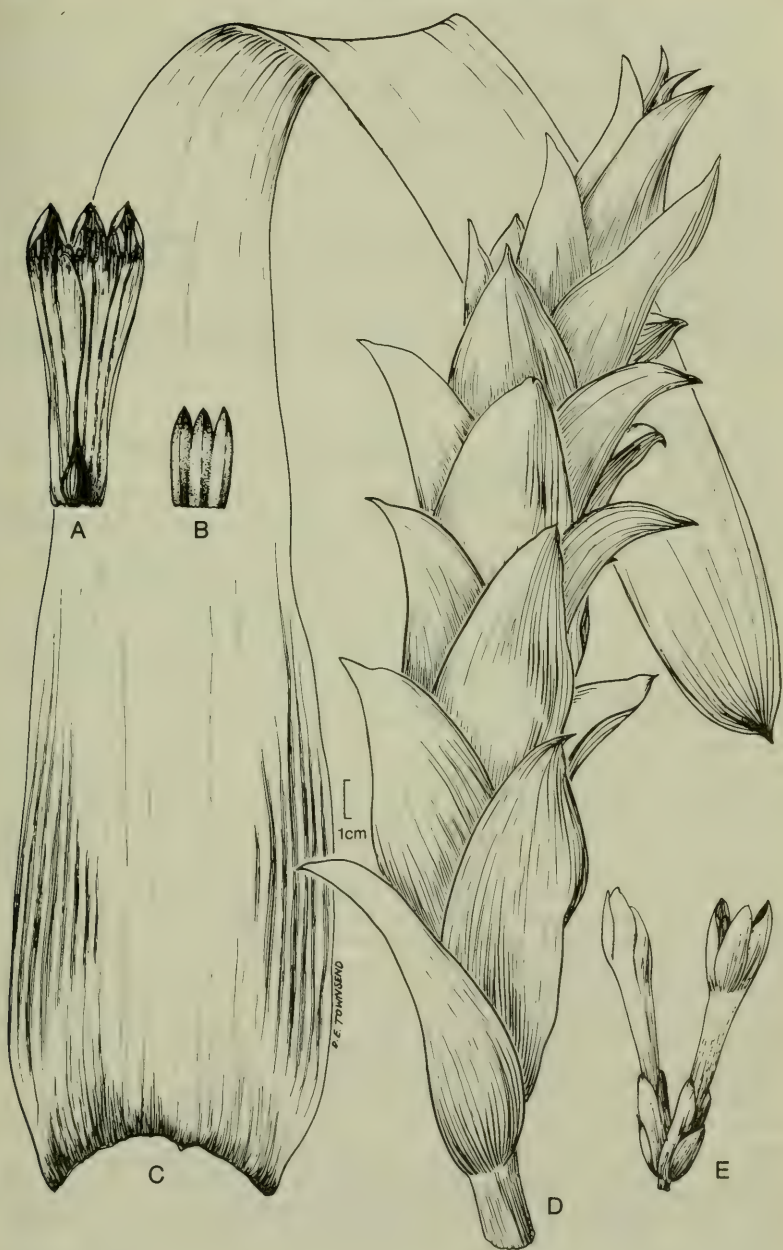
Smith, L.B. and C. Pittendrigh. 1953. Realignments in the Bromeliaceae subfamily Tillandsioideae. Jour. Wash. Acad. 43: 401-404.

FIGURE 1. A. corolla tube opened to show gynoecium and androecium; B. dissected and flattened calyx tube; C. mature leaf; D. 2-flowered lateral fascicle showing corollas, calyces and floral bracts.



See preceding page for explanation.

ADDITIONAL NOTES ON THE GENUS LIPPIA. XII

Harold N. Moldenke

LIPPIA SAVORYI Meikle

Additional bibliography: Moldenke, Phytologia 39: 456. 1978.

Material of L. savoryi has been misidentified and distributed in some herbaria as Lantana sp.

Additional citations: SOUTH AFRICA: Transvaal: Kinges 167 (Mu), 1868 (Mu), 1869 (Mu); Leistner 3199 (Mu); Merxmüller & Giese 666 (Mu); Noel 2403 (Mu).

LIPPIA SCABERRIMA Sond.

Additional synonymy: Lippia scaberrima Souder ex Grieve, Modern Herb. 486, sphalm. 1967.

Additional & emended bibliography: H. H. W. Pearson in Thiselt.-Dyer, Fl. Cap. 5: 193—195. 1901; Power & Tutin, Arch. Pharm. 245: 337—350. 1907; Power & Tutin, Chem. Abstr. 2: 1860—1861. 1908; Grieve & Leyel, Mod. Herb, imp. 1, 2: 831. 1931; G. Klein, Handb. Pflanzenanal. 2 (1): 498, 502, 504, 514, & 762 (1932) and 3 (2): 1232. 1932; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 1, 154 & 235. 1932; Karrer, Konstit. & Vork. Organ. Pflanzenst. 17. 1958; Grieve & Leyel, Mod. Herb., imp. 2, 2: 831. 1959; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. & East. Afr., ed. 2, 1053 & 1410. 1962; Moldenke, Phytologia 13: 367. 1966; C. A. Sm., Common Names S. Afr. Pl. 99, 320, & 601. 1966; Grieve, Modern Herb. 486 & 831. 1967; Uphof, Dict. Econ. Pl., ed. 2, 315. 1968; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 265 & 266. 1969; Moldenke, Fifth Summ. 1: 254, 257, & 421 (1971) and 2: 543, 567, & 894. 1971; Altschul, Drugs & Foods 244. 1973; Moldenke, Phytologia 25: 240 (1973) and 39: 439 & 447. 1978.

Recent collectors describe this plant as a small low-growing shrublet and have found it growing on sandy open tree veld with Combretum, Terminalia, and Acacia, and "localized, especially on disturbed sites", at altitudes of 4750—5000 feet, flowering in February. The corollas are said to have been "white" on Rodin 3518. Vernacular names reported for the species are "benkelbossie", "benkess boas", "beukesbossie", "beukessboss", "laventelbossie", "bewkesbos", and, in Zulu, "umsuzwane".

Karrer (1958) reports the finding of n-heptacosan, $C_{27}H_{56}$, in this plant, as well as in such unrelated plants as Nothopanax simplex, Salvia sclarea, Erythraea centaurium, Trifolium pratense, Tussilago farfara, Papaver rhoeas, Boronia megastigma, Caesalpinia bonducella, Populus balsamifera, Mandragora autumnalis, and Pinus spp. Smith (1966) reports that an infusion of L. scaberrima with brandy is used as a stomachic and that leaf infusions are used as a tonic and to treat hemorrhoids among the Bantu in Africa. Grieve

(1931) states that it contains lippianol, smelling like lavender. Watt & Breyer-Brandwijk (1962) report the Zulu using the tonic orally or as an enema and also giving it to domestic animals. The Dutch in South Africa not only use the leaf-decoction in brandy as a stomachic and tonic but also as a counter-irritant for backache. The lemon-scented leaves are said to have hemostatic and aperient properties and are used in the treatment of hemorrhoids. By the presence of tannin, a glucoside, verbenalin, and a resin, the plant is also an astringent carminative. Farnsworth (1969) lists the following substances as found in the stems and leaves of L. scaberrima: tannin, a volatile oil, formic and butyric acids, heptocosane, hentriacomtane, paraffin, a phytosterol, unsaturated alcohols, esters of formic, butyric, valerianic, arachnic, and linoleic acids, lippianol, two yellow crystalline substances, glucose, and a glucoside, but no alkaloids.

It should be noted that the Lippia scaberrima of Altschul (1973) is actually Phyla scaberrima (A. L. Juss.) Moldenke.

Material of Lippia scaberrima Sond. has been misidentified and distributed in some herbaria as L. rehmanni H. H. W. Pearson.

Additional citations: NAMIBIA: Rodin 3518 (Ba). SOUTH AFRICA: Transvaal: Scheepers 1493 (Mu).

LIPPIA SCAPOSA Briq.

Additional bibliography: Moldenke, Biol. Abstr. 47: 6794. 1966; Moldenke, Phytologia 14: 417. 1967; Hocking, Excerpt. Bot. A.11: 103 & 104. 1967; Moldenke, Fifth Summ. 1: 186 (1971) and 2: 565 & 894. 1971; Troncoso, Darwiniana 18: 340 & 410. 1974.

The corollas are said to have been "yellow" on Jörgensen 4583.

Additional citations: PARAGUAY: Jörgensen 4583 (E--1006229).

LIPPIA SCAPOSA var. MELANOCAULOS Briq.

Additional bibliography: Moldenke, Phytologia 12: 480. 1965; Moldenke, Fifth Summ. 1: 186 (1971) and 2: 894. 1971.

LIPPIA SCHAUERIANA Mart.

Synonymy: Lippia schaueriana Mart. & Schau. ex Troncoso, Darwiniana 18: 339. 1974.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Solered., Syst. Anat. Dicot. 713. 1899; D. H. Scott in Solered., Syst. Anat. Dicot. [transl. Boodle & Fritsch] 1: 631. 1908; Moldenke, Phytologia 12: 480--481. 1965; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 894. 1971; Moldenke, Phytologia 28: 460. 1974; Troncoso, Darwiniana 18: 339 & 410. 1974.

Additional citations: BRAZIL: Pernambuco: Martius 243 (Mu--129--type, Z--isotype).

LIPPIA SCHLECHTENDALII Moldenke

This taxon is now relegated to the synonymy of L. hirsuta var. moritzii (Turcz.) López-Palacios.

LIPPIA SCHLIEBENI Moldenke

Additional synonymy: Lippia schliebenii Moldenke, Phytologia 25: 240, in syn. 1973.

Additional bibliography: Moldenke, Phytologia 14: 417. 1967; Moldenke, Fifth Summ. 1: 231, 237, & 241 (1971) and 2: 543, 774, & 894. 1971; Moldenke, Phytologia 25: 240 (1973) and 39: 105 & 437. 1978.

Recent collectors have found this plant growing on tree steppes at 1100—1500 m. altitude and refer to it as 2 m. tall and very abundant, flowering in January. They record the vernacular name, "zfagafaga". The corollas on Endlich 57 are said to have been "whitish".

Material of this species has been misidentified and distributed in some herbaria as L. asperifolia Rich. and as Lantana viburnoides Vahl.

Additional citations: TANZANIA: Tanganyika: Endlich 57 (Mu), 57a (Mu—4238), 57b (Mu—4239); Holst 8893 (Mu—1758); Schlieben 4548 (Mu).

LIPPIA SCHLIMII Turcz.

Additional synonymy: Lippia schlimii (Moldenke) Moldenke, Phytologia 26: 374, in syn. 1973.

Additional bibliography: Hocking, Excerpt. Bot. A.9: 289—290. 1965; Moldenke, Phytologia 12: 484—486. 1966; Moldenke, Résumé Suppl. 16: 4. 1968; Moldenke, Fifth Summ. 1: 117, 118, 124, & 366 (1971) and 2: 556, 565, 568, & 894. 1971; López-Palacios, Fac. Farm. Univ. Los Andes 15: 58 & 62. 1975; Moldenke, Phytologia 31: 381. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 48. 1976; Moldenke, Phytologia 38: 475 (1978) and 39: 92 & 93. 1978.

Recent collectors refer to this plant as an unarmed tree, 4—12 m. tall, the trunk cylindric, erect, to 12 cm. in diameter, "madera para lena", the leaves deep-green and rugose above, paler green beneath, and have found it growing in "selva siempreverde a lo largo de la quebrada sobre rocas calcáreas", at 1700—2700 m. altitude, flowering in January, February, and July, fruiting in January. The corollas are said to have been "white" on Ruiz-Terán & López-Palacios 2350 & 10414 and "dull-white" on Steyermark 104919. The vernacular name, "saca candela", is reported for it.

López-Palacios (1975) says: "Es ésta una especie media entre la hirsuta y la moritzii, si es que esta última llega a sostenerse. Sus hojos son algo variables (oblongas a ovadas) de envés poco indumentado y sus inflorescencias de cabezuelas por lo general abundantes y pequeñas. Atribuyo a esta taxon las colecciones Steyermark 104919 y Ruiz-Terán & López-Palacios 10414".

Material of L. schlimii has been misidentified and distributed in some herbaria as L. moritzii Turcz.

Additional citations: VENEZUELA: Lara: J. A. Steyermark 104919 (N). Trujillo: Ruiz-Terán & López-Palacios 2350 (N), 10414 (Z).

LIPPIA SCHLIMII var. GLABRESCENS (Moldenke) Moldenke

Additional synonymy: Lippia floribunda H.B.K., Nov. Gen. & Sp., ed. folio, 2: 216. 1817 [not L. floribunda Briq., 1900, nor Hort., 1959, nor R. A. Phil., 1891]. Lippia floribunda Kunth ex Spreng. in L., Syst. Veg., ed. 16, 2: 753. 1825. Lippia floribunda Humb. & Bonpl. ex Steud., Nom. Bot., ed. 2, 2: 54. 1841. Lippia floribunda Humb. & Kunth ex D. Dietr., Syn. Pl. 3: 599. 1843. Lippia schlimii var. glabrescens Moldenke, Phytologia 26: 374, in syn. 1973.

Additional bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 216 (1817) and ed. quarto, 2: 267—268. 1818; Schau. in A. DC., Prodr. 11: 579. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Hocking, Excerpt. Bot. A.9: 289—290 & 367. 1965; Schubert, Assoc. Trop. Biol. Bull. 4: 73. 1965; J. A. Clark, Card-Ind. Gen. Sp. & Var. Pl., issue 245. 1965; Moldenke, Phytologia 13: 367. 1966; Moldenke, Résumé Suppl. 16: 4. 1968; Moldenke, Fifth Summ. 1: 118, 124, & 366 (1971) and 2: 556, 568, & 894. 1971; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 58, 59, & 61. 1975; Moldenke, Phytologia 31: 381. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 48. 1976; Moldenke, Phytologia 38: 475 (1978) and 39: 92, 93, & 256. 1978.

Recent collectors describe this plant as a treelet or tree, 2—16 m. tall, with a crown spread of 2—5 or more meters, the trunk 1—3 dm. in diameter at breast height, the bark gray-brown, the "young stems" medium-green shading to olive or light-tan to olive-tan on the oldest parts, or "dark-olive flushed with dark-purple", the herbage with a pungent odor, the petioles flushed dark-purple, the leaves stiff, brittle-chartaceous, dark-green, lustrous dark-green, or dark yellowish-green above and rugose or rugulose, dull-green or lustrous light-green to medium-green beneath with purple veins, the inflorescence light-green or light olive-green, the bracts light-green or olive to "more bluish", the flowers with a slight sweet fragrance, the calyx green or light-green, and the stamens light-green. They have found it growing in fields and forests, the edge of woods, and along streams by waterfalls, at 1400—3000 m. altitude, flowering in March, May, July, August, and from October to December, fruiting in March, July, August, October, and December.

The corollas are said to have been "white" or "totally white" on Barkley & Bouthillette 38C073, Cuatrecasas & Willard 26230, Duque Jaramillo 2650, Killip & al. 39841, López-Palacios 8246, Steyermark 105082, and Tillett & Höning 738-393 & 738-535, "cream with yellow center" on Tillett 737-300, "white with yellow throat" on Ruiz-Terán & López-Figueiras 2247, and "primeramente blanquicinas con el ápice de los lóbulos lilacinos y a la larga totalmente blancas" on Ruiz-Terán & López-Figueiras 1273.

Tillet found the plant to be "frequent in drier rocky soil with much leaf litter and humus on steep hillsides of quebradas", while Tillett & Höning refer to it as "common to abundant" or as "fre-

quent in remains of wet montane forest with stumps of treeferns to 1 m. in diameter, the soil with humus". Kernan describes it as "dominant". The vernacular name, "saca-ojo", has been recorded for it.

I am indebted to my friend and colleague, Santiago López-Palacios, for pointing out the synonymy of L. floribunda with the present variety after examination of the type in the Paris herbarium annotated by Bonpland. López-Palacios and his associates describe the variety as an "árbol erecto, inerme, de 4—6 m. (los hay en los alrededores de 10—12 m.), perennifolio; tronco redondo de corteza fisurada; ramitas jóvenes tetrágonas atropurpúreas puberulentas con olor a cera de abejas fresca, con pelitos pátulos, blancos; ramitas adultos 4-gonas, pardas; hojas simples, opuestas, decusadas, coriáceas, lanceoladas, algo doblados y falcadas, verde obscuras, lucientes por la haz, verde claras, sublucientes por el envés, crenuladas; pecíolos subatropurpúreos; cimas paniculadas, panículas terminales, las flores en glomérulos inodoras; corolas pequeñas, blancas [or "flores blanco cremosas"]". He comments that "Esta variedad es muy característica y puede ser fácilmente identificable por el nevés glabrescente de sus limbos. En cuanto a forma y tamaño de cabezuelas tiene las mismas variaciones de las especies afines hirsuta y moritzii, pero en la forma de las hojas se acerca más a la hirsuta. En muchos herbarios figura aún con la vieja determinación de Moldenke: L. hirsuta var. glabrescens."

Material of this taxon has been misidentified and distributed in some herbaria as L. hirsuta L. f. and even as Lepochinia sp.

Additional citations: COLOMBIA: Antioquia: Cuatrecasas & Willard 26230 (W—2402397); W. H. Hodge 6528 (Fn, Ms—34161), 6744 (Ms—34162); Killip, Barkley, & Daniel 39841 (W—1954134); López-Palacios 3890 (Ld). Boyacá: Barkley & Bouthillette 38C073 (Ld). Huila: Schultes & Villareal 5175 (Ld, Ws). Magdalena: Cuatrecasas & Castañeda 24688 (W—2325412, Z), 24717 (Fg, W—2325497). Norte de Santander: Garganta 702 (W—2771832); López-Palacios 3598 (Ld, N). Quindiu: López-Palacios & Idrobo 3700 (Ac, N). Tolima: Duque Jaramillo 2650 (N). VENEZUELA: Mérida: Gehriger 337 [296] (E—1005442); López-Palacios 2581 (Ft, N); Ruiz-Terán & López-Palacios 8246 (Ld); Ruiz-Terán, López-Palacios, & Rodriguez 6730 (N); Tillett & Höning 738-393 (N, W—2747327). Táchira: Bunting 2478 (Ld); Ruiz-Terán & López-Figueiras 1273 (N); J. A. Steyermark 105082 (N); Steyermark & Rabe 96983 (Z); Tillett 737-300 (N); Tillett & Höning 738-535 (N). Trujillo: Ruiz-Terán & López-Figueiras 2247 (N).

LIPPIA SCHOMBURGKIANA Schau.

Additional synonymy: Lippia schomburkiana Schau. apud López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 63, sphalm. 1975.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266, 1858; Moldenke, Phytologia 14: 417 (1967) and 15: 466. 1968; Mol-

denke, Fifth Summ. 1: 124, 130, & 157 (1971) and 2: 559, 565, & 894. 1971; Moldenke, Phytologia 25: 229 (1973) and 28: 436. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 61--63. 1975; Moldenke, Phytologia 31: 382 (1975) and 39: 263 & 264. 1978.

Recent collectors describe this plant as a shrub or subshrub, 1--1.5 m. tall, erect, the leaves with a lavender-like odor when crushed, and the fruit gray-green, maturing brown. They have found it growing on savannas at 33--1850 m. altitude, flowering from October to January as well as in April and July, fruiting in January, April, July, and October. The corollas are said to have been "white" on Barroso, Lima, & Lima 568 and on Santos 2529 and "cream-color" on Irwin & al. 30423. Goodland encountered it "in dry lateritic-ridged savanna grassland with scattered trees, Curatella, Byrsonima, Trachypogon, and Fimbristylis being dominant", while Irwin and his associates found it on "upper shrub-covered slopes with iron-rich rocks and gravel, the soil restricted to crevices and pockets". Pinheiro found it "in mata litoranea" and Davis refers to the plant as a "pleasant-smelling forb".

Although previously cited by me as occurring in Bolívar, Venezuela, López-Palacios is convinced that this species does not occur in Venezuela. He says (1975): "No conozco el material típico (Schomburgk 404), y parece que lo único que queda de él son las fotografías que Macbride tomó para el herbario de Chicago. En verdad la encuentro muy similar a ciertas formas xerofiticas de L. origanoides, y sin decidir si son coespecíficas o no, las diferencias que se han establecido (Phytologia 12: 487) sobre forma de las hojas y de las cabezuelas no son definitavas: en L. origanoides se dan también cabezuelas 4-anguladas (Cf. Schau., Prod. 11: 575). Basado en descripciones llamo la atención sobre el carácter del aroma de las hojas, de que ya se habló, pero sin poder asegurar si es ésta una característica firme."

Material of L. schomburgkiana has been misidentified and distributed in some herbaria as L. origanoides H.B.K. On the other hand, the Davidse, Ramia, & Montes 4747, Irwin 402, Ruiz-Terán & López-Figueiras 1817, and Ruiz-Terán & López-Palacios 11415, distributed (and in the case of the Irwin collection previously cited by me) as L. schomburgkiana, actually are L. origanoides H.B.K., while D. H. Davis 896 is Phyla betulaefolia (H.B.K.) Greene, and D. H. Davis 791 is Waltheria sp.

Additional citations: GUYANA: Carrick 1027 (Kl--7027); D. H. Davis 889 (N); Goodland 215 (Ld, W--2546178), 540 (Ac, W--2546154); Goodland & Persaud 215 (N), 697 (N). BRAZIL: Bahia: Pinheiro 2140 (N); Santos 2529 (N). Goiás: Barroso, Lima, & Lima 568 (Ld). Minas Gerais: Irwin, Harley, & Onishi 30423 (Ld, N, W--2709293).

LIPPIA SCLEROPHYLLA Briq.

Additional bibliography: Moldenke, Phytologia 13: 367. 1966; Moldenke, Fifth Summ. 1: 186 & 199 (1971) and 2: 565, 568, & 894. 1971; Troncoso, Darwiniana 18: 337 & 410. 1974.

Recent collectors describe this plant as an annual herb, 60—70 cm. tall, or as a subshrub, 0.5—1 m. tall, with fragrant flowers, and have found it growing on campos and in matorrales, "generally high places", at altitudes of 220—295 m., flowering from December to February and in April, fruiting in February, April, and December. Montes refers to it as "rather abundant", while Bertoni says "not very abundant". The corollas are said to have been "white" on Montes 732, 14656, & 27694, Krapovickas & al. 14977 & 28772, Schulz 7128, and Schwarz 691, 950, 5704, & 5834 and "white, yellow in center" on Krapovickas & al. 18290. The vernacular name, "cabará-mi", is recorded for it and the plant is said to be used in popular medicine. Troncoso (1974) gives its distribution as Paraguay and the provinces of Chaco and Formosa in Argentina.

Material has been misidentified and distributed in some herbaria as Borreria sp.

Additional citations: PARAGUAY: Fiebrig 886 (Mu—4038). ARGENTINA: Misiones: Bertoni 3579 (N); Krapovickas & Cristóbal 28772 (Ld); Krapovickas, Cristóbal, Arbo, Benitez, Maruñak, Maruñak, Pire, & Tressens 18290 (Ws); Krapovickas, Cristóbal, Maruñak, Maruñak, Pire, & Tressens 14977 (Ld, Ws); T. Meyer 6658 (Ut—3305678); Montes 475 (Ld, N), 732 (N), 14656 (Ac, Ld, N, N), 27694 (N, N, N, N); A. G. Schulz 7128 (N); G. J. Schwarz 535 (Ut—3305508), 691 (N), 950 (N), 1006 (N), 1036 (N), 5323 (N), 5704 (N), 5834 (N).

LIPPIA SCLEROPHYLLA var. LORETENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 12: 492. 1966.

LIPPIA SERICEA Cham.

Additional synonymy: Lippia sericea Schau. ex Moldenke, Phytologia 36: 44, in syn. 1977. Lippia stöchas Mart. ex Moldenke, Phytologia 36: 44, in syn. 1977.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 13: 367. 1966; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 836 & xi. 1971; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 544, 550, 557, 566, & 894. 1971.

Recent collectors describe this plant as an herb, subshrub, or shrub, 45 cm. to 2 m. tall, "lax-stemmed" or erect, brittle and easily defoliating, and have found it growing in cerrado, campo cerrado, cerrado woodland "on deep red latosol", gallery forests, and gallery margins, at altitudes of 800—1150 m., flowering from March to July, fruiting in July. Anderson encountered it in cerrado in areas of cerrado sloping down to gallery forest and brejo (sedge meadow) at edge of forest. Irwin and his associates found it "among rocks in area of campo and rocky slopes", "in cerrado in area of steep slopes with campo and cerrado", and "frequent in cerrado and gallery on rocky slopes".

The corollas are said to have been "yellow" on Hatschbach 36707, Hunt & Ramos 6292, and Taxonomy Class 93, "light-yellow"

on Irwin & al. 15822 & 26917, and "cream" on Irwin & al. 15159, 18072, & 24378.

The Angely (1971) work cited above bears the incorrect titlepage date of "1970". Lippia stöchas Martius is based on Martius s.n. [in campis ad V. R. et alibi, Apr. Maio] in the Munich herbarium.

Additional citations: BRAZIL: Distrito Federal: Hunt & Ramos 6292 (N), 6646 (N); Irwin, Grear, Souza, & Reis dos Santos 15822 (N), 18072 (Ac, N); Taxonomy Class Univ. Bras. 93 (W--2757757). Goiás: W. R. Anderson 9502 (Ld, N); Hatschbach 36707 (Ld); Irwin, Reis dos Santos, Souza, & Fonsêca 24378 (Ac, N); Irwin, Souza, Grear, & Reis dos Santos 15159 (Ld, N). Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 26917 (Ld, Ld); Irwin, Reis dos Santos, Souza, & Fonsêca 24989 (N); Martius 1046 (Mu--132), s.n. [in campis ad V. R. et alibi, Apr. Maio] (Mu), s.n. (Mu--131); Smith, Segadas-Vianna, Egler, Ormond, Lopez da Silva, & Machline 6987 (N). State undetermined: Pohl s.n. [In Brasilia] (Mu--1117).

LIPPIA SESSILIFLORA J. G. Baker

Additional bibliography: Moldenke, Phytologia 12: 495. 1966; Moldenke, Fifth Summ. 1: 375 (1971) and 2: 894. 1971.

LIPPIA SIDOIDES Cham.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 14: 417. 1967; Moldenke, Résumé Suppl. 16: 6. 1968; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4: 836 & xi, map 1387. 1971; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 560, 566, & 894. 1971; Moldenke, Phytologia 23: 418 (1972) and 28: 439. 1974; Troncoso, Darwiniana 18: 337 & 410. 1974; Moldenke, Phytologia 39: 39 & 173. 1978.

Recent collectors describe this plant as a shrub, 1--2.5 m. tall, with pendent inflorescences, and have found it growing in cerrado and on streambanks, at altitudes of 600--1750 m., flowering from January to March, as well as in July and August, and fruiting in February. Irwin and his associates report it "common in open disturbed places in wooded valley" and "on hills with iron-rich 'canga' soil".

The corollas are said to have been "white" on Anderson 6940 and on Hatschbach & Ahumada 31325, "whitish" on Hatschbach & Ahumada 31606, "white, yellow in throat" on Irwin & al. 29679, and "white, the throat orange within" on Irwin & al. 29159.

Troncoso (1974) gives the geographic distribution of the species as "Brasil merid." and Misiones, Argentina. The Angely (1971) reference in the bibliography bears the incorrect titlepage date of "1970".

The Irwin, Harley, & Smith 31842, distributed in some herbaria as L. sidoides, actually is L. elegans Cham., while Philcox & Ferreira 4380 is L. mattogrossensis Moldenke.

Additional citations: BRAZIL: Goiás: W. R. Anderson 6940 (Ld, N); Hatschbach 36927 (Ld). Maranhão: Eiten & Eiten 10730 (Z). Minas Gerais: Hatschbach 31606 (N, W—2706093); Hatschbach & Ahumada 31325 (Ld, N), 31606 (Ld); Irwin, Harley, & Onishi 28159 (Ld, N), 29679 (Ac, N, W—2758981); Martius s.n. [in ruderatis ad Lapucahy prope S. Barbara] (Mu--134), s.n. [in campis deserti retro fl. Jaquehinhonda] (Mu—133, Z); J. E. Pohl s.n. (Mu--135).

LIPPIA SIDOIDES f. FLACCIDA Hayek

Additional bibliography: Moldenke, Phytologia 12: 497. 1966; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4: 836 & xi. 1971; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 566 & 894. 1971.

As stated under other taxa in this series of notes, the Angely (1971) work bears an incorrect titlepage date of "1970".

LIPPIA SOMALENSIS Vatke

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 278--280. 1900; Glover, Prov. Check List Brit. & Ital. Somal. 268. 1947; Dale & Greenway, Kenya Trees 588. 1961; Moldenke, Phytologia 12: 498. 1966; Glover, Stewart, Fumerton, Marindany, & Andersen, Gloss. Botan.-Kipsig. Names 256. 1969; Moldenke, Fifth Summ. 1: 213 (1971) and 2: 894. 1971; Moldenke, Phytologia 23: 420 & 421 (1972) and 39: 395. 1978.

LIPPIA STACHYOIDES Cham.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Eiten in Ferré, Simpos. Sôbre Cerrado 190. 1962; Moldenke, Phytologia 14: 417. 1967; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4: 836 & xi, map 1387. 1971; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 894. 1971; Moldenke, Phytologia 38: 386 (1978) and 39: 45. 1978.

Recent collectors describe this species as a tall herb or shrub, 0.4—2.5 m. tall, erect, with whorled leaves, and have found it growing on sandy campos, campo cerrado, and rocky hillsides, at altitudes of 615--1320 m., flowering in February, April, May, November, and December. Ratter and his associates encountered it "in grassy cerrado with scattered trees to 5 m. tall on very rocky soil". Anderson found it at the "edge of forest in area of cerrado sloping down to gallery forest through grassy brejo (sedge meadow), the brejo wet and seeping in some places, dry in others"; Sampaio found it "pouca, margem de corrego". Eiten collected it on "slightly degraded campo cerrado with shrubs and trees to 4 m. tall twisted by former fires, forming an open thicket with the groundcover of grasses and herbs, the soil a poor dark reddish-brown sandy clay, in an area of campo cerrado on the uplands (or occasional forest) and open marsh or dense secondary forest along streams".

The corollas are said to have been "white" on Anderson 8658 and Sampaio 6829, "lilac" on Hatschbach & Koczicki 33231, 33327, & 33377, "dark-purple" on Eiten 3557, "roxas" [rose] on Campos &

Lima 122-9572, and "vermelhas" [vermillion] on Mattos & Mattos 8540. This diversity in corolla color may indicate that two taxa are represented here. Certainly Anderson 8658 has bractlets which do not match well those seen on the other collections.

Eiten (1962) cites Eiten 1575 from cleared cerrado. Angely (1971) — not "1970" as indicated on the titlepage — records the species from Mato Grosso, Goiás, Minas Gerais, and São Paulo.

Material of L. stachyoides has been misidentified and distributed in some herbaria as L. glandulosa Schau., while Sampaio 6829 was distributed as and even cited by me in a previous (1965) publication as L. affinis Schau.

Additional & emended citations: BRAZIL: Goiás: Hatschbach & Koczicki 33327 (Ac). Mato Grosso: Hatschbach & Koczicki 33231 (Ld); Ratter, Bertoldo, Castro, Santos, & Souza R.913 (N). Minas Gerais: W. R. Anderson 8658 (Ld, N); Hatschbach & Koczicki 33377 (Gz). São Paulo: Campos & Lima 122-9572 (Ld); G. Eiten 3557 (Ld, N, W--2523077, W--2687532); Mattos & Mattos 8540 (W—2523076); Sampaio 6829 [Herb. Jard. Bot. Belo Horiz. 12307] (N). State undetermined: J. E. Pohl s.n. [in Brasilia] (Mu—136). MOUNTED ILLUSTRATIONS: Schau. in Mart., Fl. Bras. 9: pl. 37 I. 1851 (N, Z).

LIPPIA SUBRACEMOSA Mansf.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 53 (1): 1074. 1932; Moldenke, Phytologia 12: 500—501. 1966; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 568 & 894. 1971; Moldenke, Phytologia 31: 385. 1975; Hocking, Excerpt. Bot. A.28: 170. 1976.

Additional citations: BRAZIL: Bahia: Lützelburg 710 (Mu—isotype).

LIPPIA SUBRACEMOSA var. HARLEYI Moldenke, Phytologia 31: 232. 1975.

Bibliography: Moldenke, Phytologia 31: 232 & 385. 1975; Hocking, Excerpt. Bot. A.28: 170. 1976.

Citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15834 (Z—type).

LIPPIA SUBSTRIGOSA Turcz.

Additional synonymy: Lippia substrigosus Turcz. ex Moldenke, Phytologia 36: 44, in syn. 1977.

Additional bibliography: Benth., Pl. Hartw. 80. 1841; Cummins, Lloydia 3: 16. 1940; Moldenke, Phytologia 14: 417. 1967; Uphof, Dict. Econ. Pl., ed. 2, 315. 1968; Moldenke, Résumé Suppl. 16: 3. 1968; Gibson, Fieldiana Bot. 24 (9): 207, 210, & 214—216, fig. 40. 1970; Lowden, Taxon 19: 23. 1970; Moldenke, Fifth Summ. 1: 70, 80, 82, 83, 85, & 86 (1971) and 2: 556, 557, 566, & 894. 1971; Moldenke, Phytologia 23: 415. 1972; Rouleau, Taxon Index Vols. 1-20 part 1: 216. 1972; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 67 & 147. 1973; Molina R., Ceiba 19: 96. 1975; Moldenke,

Phytologia 39: 26, 27, & 30. 1978.

Illustrations: Gibson, Fieldiana Bot. 24 (9): 215, fig. 40. 1970.

Recent collectors describe this species as a weak shrub "from a hard woody base", 1—3.5 m. tall, or a weak tree, 2--10 m. tall, the trunk to 4 inches in diameter, and the leaves viscid, and have found it growing on mountains and mountain slopes, shrubby or grassy slopes, and dry rocky hills, in pinelands, pine-oak forests, high forests, the edges of cloudforests, mossy secondary thickets, and deep ravines, and in mixed or wet mixed woods, pine forests, and open woods of Pinus pseudostrobus, at altitudes of 130--2700 meters, flowering from November to March, as well as in May and August, fruiting from January to March, as well as in August and November. Molina and his associates refer to the species as "frequent" or "common" in mixed or cutover mixed forests, "common along rivers", "common in clearings in forests", or "an herb 0.5—1 m." tall. The leaves on Molina & al. 15987 have unusually coarse teeth on the leaf-margins.

Breedlove encountered L. substrigosa in steep-walled ravines with seasonal evergreen forests of Quercus, Mastichodendron, Styrax, Oreopanax, and Bursera and on steep slopes with dense montane rainforest of Magnolia, Podocarpus, Calatola, and Ardisia. Ton found it growing on moist slopes with Quercus, Pinus chiapensis, Nyssa, Liquidambar, Dodonaea, and Calliandra and on shrubby slopes with Heliocarpus, Croton, and Erythrina. Anderson reports it "occasional in pine forests with some oaks and Liquidambar, the latter in the wetter places", while Williams and his associates refer to it as "scarce in pine forests" and "at junction of pine-oak forest and montane rainforest or cloudforest".

The corollas are said to have been "yellow" on Breedlove 23163 & 25269 and on Williams & al. 23036, "pale-yellow" on Molina & al. 20433 & 40675, "lemon-yellow" on Williams & al. 22256, 25133, & 25352, "bright-yellow" on Anderson & Anderson 5546, "greenish-yellow" on Williams & al. 41265, "yellowish" on Molina & al. 21503 & 24822, "cream-yellow" on Molina & al. 16228, "cream" on Grashoff 256 and Molina & al. 13498, 13580, & 15987, and "yellow and white" on Contreras 11008.

Vernacular names reported recently for the species are "chichigaste de venado", "oregano de árbol", "salvia santa", and "supup".

Bentham (1841) avers that the species is related to Lantana involucrata L. of the West Indies, but thus is not true. Uphof (1968) reduces L. substrigosa to synonymy under L. umbellata Cav., but this disposition is entirely erroneous. He also misspells the authority abbreviation "Turcs." Cummins (1940) reports that L. substrigosa is attacked by the fungus, Prospodium lippiae (Speg.) Arth., based on Holway 152, 730, & 787 and J. R. Johnston 358 & 611 from Guatemala. Gibson (1970) notes that "This plant has been

reported from Guatemala as L. umbellata Cav. and some of the material has been determined by Moldenke and cited by him as L. callicarpaefolia HBK. Lippia umbellata, which has been poorly understood and which probably includes L. pringlei Briq., was originally described (Cav. Icon. Pl. 2: 75, t. 194. 1792) as having 'flores umbellati, umbellis pluribus axillaribus in ramorum summitatibus' and the illustration clearly shows primary peduncles with several 'rays' forming definite dichasia. I have seen no material of L. umbellata nor the closely related L. pringlei from either Guatemala or Chiapas. The Mexican L. callicarpaefolia, which in foliage and large flowering heads does resemble L. substrigosa, differs markedly in its dichasial inflorescence and conspicuously colored (rose to purple) bracts." The collections to which she here refers which were erroneously cited by me in 1965 as L. callicarpaefolia are Hartweg 560 and Standley 69695.

Material of L. substrigosa has been misidentified and distributed in some herbaria as L. callicarpaefolia H.B.K., L. cardiostegia Benth., L. chiapasensis Loes., and L. umbellata Cav.

Additional & emended citations: MEXICO: Chiapas: Anderson & Anderson 5546 (Mi); Breedlove 9368 (Ld), 9476 (Ld), 23163 (Mi, N), 23952 (Ld), 25269 (N); R. M. Laughlin 401 (Ws); F. Miranda 5331 (W--2508388), 6110 (W--2508380), 6188 (W--2508372), 9164 (W--2508356); Ton 1543 (Mi, N), 1649 (Ld, Mi), 1705 (Ld, N), 1809 (N), 1905 (Mi, N), 2079 (Mi), 2129 (Ld, Mi, N), 3661 (Ld). GUATEMALA: Alta Verapaz: Molina R. & Molina 12116 (N); Türckheim 8441 (Mu--4032). Baja Verapaz: Contreras 11008 (Ld, Ld, W--2795347); P. C. Standley 69695 (N); Williams, Molina R., Williams, & Molina 40675 (N). Chimaltenango: Molina R., Burger, & Wallenta 16228 (N); Williams, Molina R., & Williams 25133 (N, W--2537530). El Quiché: Heyde & Lux 3024 (Mu--1771); Molina R. & Molina 25015 (N); Proctor 25472 (Ld, Ld). Guatemala: Molina R. 13498 (Ld, N); Molina R., Burger, & Wallenta 15987 (N); Molina R. & Molina 12389 (N); J. D. Smith 1888 (Mu--3868). Huehuetenango: Williams, Molina R., & Williams 22256 (N, W--2537592), 41265 (W--2740072). Jalapa: Kellerman 7910 (W--2442196), 8047 (W--2442713), s.n. [Geronimo, 3 Mar. 1907] (Ca--1228027). Quezaltenango: Grashoff 256 (Ln--221750); Hartweg 560 (Lu, N); Williams, Molina R., & Williams 23036 (N, W--2537588). Sacatepéquez: Molina R. & Molina 24822 (N). Santa Rosa: Heyde & Lux 4389 (Mu--1810). Sololá: Webster, Adams, Miller, & Miller 11821 (Ld); Williams, Molina R., & Williams 25352 (N). BELIZE: Hunt 409 (Ld). HONDURAS: Comayagua: Molina R. 13631 (N); Molina R. & Molina 25478 (N). Copán: Molina R. 11661 (Ld, N). Cortes: Molina R. 11448 (Ld, N). El Paraíso: Molina R. 11327 (N), 11365 (N), 11845 (N), 23386 (N). Intibucá: Molina R. & Molina 13931 (N). La Paz: Molina R. & Molina 24215 (Ld). Morazán: Molina R. 11290, 13580 (Ld, N); C. V. Morton 7551 (W--2023476); Williams & Molina R.

18950 (W—2572454), 18952 (W—2572455), 23231 (Ld, Se—213321). Ocotepeque: Molina R. 22237 (N), 24196 (N). EL SALVADOR: Santa Ana: Molina R. & Montalvo 21503 (N). NICARAGUA: Matagalpa: Molina R. 20433 (N); Williams, Molina R., & Williams 23910 (Ld); Williams, Molina R., Williams, Gibson, & Laskowski 27936 (N, W—2537791).

LIPPIA SUFFRUTICOSA (Griseb.) Kuntze

Additional bibliography: R. C. Foster, Contrib. Gray Herb. 184: 170. 1958; Moldenke, Phytologia 14: 417—418. 1967; Moldenke, Fifth Summ. 1: 183 & 199 (1971) and 2: 555, 566, & 894. 1971; Troncoso, Darwiniana 18: 338 & 410. 1974.

Troncoso (1974) records this species from Bolivia and from the provinces of Salta and Tucumán in Argentina.

The Burkart 19390, distributed as L. suffruticosa, actually is L. recolletae Morong.

Additional citations: BOLIVIA: Cochabamba: M. Cárdenas 3837 (W—1909514); R. F. Steinbach 740 (S). ARGENTINA: Jujuy: O'Donell 2950 (N). Salta: Pierotti 1082 (N). Tucumán: Venturi 1789 (W—2562149).

LIPPIA TAYACAJANA Moldenke

Synonymy: Lippia tayacana Moldenke, Biol. Abstr. 48: 874, sphalm. 1967.

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 645 & 654. 1960; Moldenke, Phytologia 13: 368. 1966; Moldenke, Biol. Abstr. 47: 6792 & 6794 (1966) and 48: 874. 1967; Hocking, Excerpt. Bot. A.11: 104 & 450. 1967; Moldenke, Résumé Suppl. 16: 24. 1968; Moldenke, Fifth Summ. 1: 142 (1971) and 2: 566 & 894. 1971; Soukup, Biota 11: 14. 1976.

Macbride (1960) cites only Weberbauer 6510 & 7125 from Cajamarca and Huancavelica, Peru.

LIPPIA TAYACAJANA var. **SESSILIFLORA** Moldenke

Additional bibliography: Moldenke, Phytologia 13: 368. 1966; Moldenke, Biol. Abstr. 47: 6792. 1966; Hocking, Excerpt. Bot. A.11: 450. 1967; Moldenke, Fifth Summ. 1: 142 (1971) and 2: 894. 1971; Soukup, Biota 11: 14. 1976.

Additional citations: PERU: Cajamarca: Hutchison & Wright 7025 (N—isotype).

LIPPIA TEGULIFERA Briq.

Additional synonymy: Lippia tergulifera Briq. ex Moldenke, Phytologia 36: 44, in syn. 1977.

Additional & emended bibliography: Briq. in Chod. & Hassl., Bull. Herb. Boiss., ser. 2, 4: 1156. 1904; Briq. in Chod. & Hassl., Pl. Hassler. 2: 492. 1904; Moldenke, Phytologia 13: 1—6. 1966; Moldenke, Résumé Suppl. 15: 5. 1967; Moldenke, Fifth Summ. 1: 157, 186, & 199 (1971) and 2: 567, 894, & 895. 1971; Troncoso, Darwiniana 18: 335, 340, & 410. 1974.

The corollas on Krapovickas & Cristóbal 28699 are said to have

been "yellow" and these collectors encountered the plant on high campos. Troncoso (1974) cites Pedersen 9516 in the San Isidro herbarium and records the species from Paraguay and the provinces of Corrientes and Misiones in Argentina.

The Fiebrig 429, distributed as typical L. tegulifera, seems better placed as var. ovata Briq.

Additional citations: ARGENTINA: Misiones: Krapovickas & Cristóbal 28699 (Z).

LIPPIA TEGULIFERA var. GRISEA Briq.

Additional bibliography: Moldenke, Phytologia 13: 3 & 4. 1966; Moldenke, Fifth Summ. 1: 186 (1971) and 2: 894. 1971.

LIPPIA TEGULIFERA var. OVATA Briq.

Additional bibliography: Moldenke, Phytologia 14: 418. 1967; Moldenke, Résumé Suppl. 15: 5. 1967; Moldenke, Fifth Summ. 1: 157, 186, & 199 (1971) and 2: 895. 1971.

Material of this taxon has been distributed in some herbaria as Lippia "tergulifera Briq."

Additional citations: PARAGUAY: Fiebrig 429 (Mu—4039).

LIPPIA TEGULIFERA var. PEDUNCULATA Briq.

Additional bibliography: Moldenke, Phytologia 13: 3—6. 1966; Moldenke, Fifth Summ. 1: 186 (1971) and 2: 895. 1971.

LIPPIA TEPICANA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 368. 1966; Moldenke, Fifth Summ. 1: 72 (1971) and 2: 537, 559, & 895. 1971; Moldenke, Phytologia 38: 386 & 394. 1978.

Gentry & Gilly describe this species as an open-crowned shrub, 1.2—1.8 m. tall, and encountered it in a highly mixed tropical forest dominated by pine and oak on mountain slopes with clay soils volcanically derived, at 4000 feet altitude, flowering and fruiting in May.

Additional citations: MEXICO: Nayarit: Gentry & Gilly 10484 (Mi).

LIPPIA THYMOIDES Mart. & Schau.

Additional synonymy: Lippia micromera var. paludicola Moldenke, Phytologia 1: 468—469. 1940. Lippia thymoides Mart. ex Moldenke, Phytologia 36: 44, in syn. 1977. Lippia thymoides Schau., in herb.

Additional & emended bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 1: 468—469 (1940), 12: 24 & 286—287 (1965), 13: 7—8 & 361 (1966), and 18: 210. 1969; Moldenke, Fifth Summ. 1: 156 & 157 (1971) and 2: 562, 893, & 895. 1971; Moldenke, Phytologia 31: 385 & 403. 1975; Hocking, Excerpt. Bot. A.28: 170. 1976.

Recent collectors describe this plant as an aromatic, straight-stemmed, brittle shrub, 1—2 m. tall, the leaves with a strong lavender odor, and the flowers pleasantly fragrant, and have found

it growing in caatinga, swamps, and among "vegetation cutover through cultivation", at 650—910 m. altitude, flowering in February, March, July, and November. The corollas are said to have been "white" on Castellanos 25101, Harley 16924, Santos 2508, and Travescoa 86, "pink" on Pinheiro 1412, "pale-pink with orange throat" on Harley 16813, and "rose, throat yellow" on Martius 1955.

The type of L. micromera var. paludicola Moldenke, matching perfectly the typical form of L. thymoides, is Blanchet 2872 from Bahia, Brazil.

Additional & emended citations: BRAZIL: Bahia: Blanchet 2872 (Br, Br, Br, Lu, M); A. Castellanos 25101 [Herb. Cent. Pesq. Florest. FEEMA 3870] (Ld, Z); Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16813 (Ac), 16924 (Ld); Martius 1955 (Mu--137--cotype, Mu--138--cotype, Z--cotype); Pinheiro 1412 (N); Santos 2508 (N); Travescoa 86 [Herb. Jard. Bot. Rio Jan. 86135] (N, W--2820637).

LIPPIA THYMOIDES var. MUCRONULATA Moldenke, Phytologia 31: 232. 1975.

Bibliography: Moldenke, Phytologia 31: 232 & 385. 1975; Hocking, Excerpt. Bot. A.28: 170. 1976.

Material of this taxon has been misidentified and distributed in some herbaria as L. micromera var. paludicola Moldenke.

Citations: BRAZIL: Bahia: Irwin, Harley, & Smith 30835 (Ld--isotype, N--type, W--2759081--isotype).

LIPPIA THYMOIDES var. TONSILIS (Moldenke) Moldenke, Phytologia 31: 232. 1975.

Synonymy: Lippia micromera var. tonsilis Moldenke, Phytologia 18: 210—211. 1969.

Bibliography: Moldenke, Biol. Abstr. 50: 7999. 1969; Moldenke, Phytologia 18: 210—211. 1969; Hocking, Excerpt. Bot. A.18: 444. 1971; Moldenke, Phytologia 31: 232, 385, & 403. 1975; Hocking, Excerpt. Bot. A.28: 170. 1976.

Harley and his associates describe this plant as a small, bushy, aromatic herb, with small flowers, the corollas being "mauve, with a yellow throat", and found it growing on a floodplain with riverine, chiefly herbaceous, weedy vegetation, at 980 m. altitude, flowering in January. Sobrinho reports the vernacular name, "alecrim verdadeiro", for it.

Citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15625 (Z); Sobrinho 247 [Herb. Tavares 2050] (W--2541751--type, Z--isotype).

LIPPIA TORRESII Standl.

Additional bibliography: Moldenke, Phytologia 13: 368. 1966; Farnsworth, Pharmaceut. Titles 6 (9): vii & title 15746. 1971; Moldenke, Fifth Summ. 1: 85 & 91 (1971) and 2: 567 & 895. 1971;

Sáez R. & Nassar C., Revist. Biol. Trop. 18: 137. 1971; Farnsworth, Pharmacog. Titles 6, Cum. Gen. Ind. [69]. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 67, 72—73, & 147. 1973; Moldenke, Phytologia 31: 392 (1975) and 39: 36. 1978.

Recent collectors describe this species as a large or small weak tree, 5—20 m. tall, the stems thick, to 18 inches in diameter at breast height, the wood soft and light, the leaves very rugose, aromatic, and the bracts "blown by the wind", and have encountered it in wet woodland pastures, at the edge of roadside woods, on forested hills and potreros, on lava fields and volcano slopes, on wooded slopes, and in woods on steep streambanks, open meadows with relics of montane forest, thickets along trails, cutover forests, montane forests, and remnant montane rainforests, at altitudes of 1200—2770 m., flowering from December to February, fruiting from January to April. Wilbur and his associates refer to it as "occasional" in some regions and "common" in others. The vernacular name, "caragra", is recorded for it.

The corollas are said to have been "yellow" on Allen 1481, Croat 13650, Hatheway 1301, and Wilbur & al. 15187, "pale-yellow" on Wilbur & Teeri 13312, "greenish-yellow" on Allen 1565 and Wilbur & al. 10890 & 13682, "pale greenish-yellow" on Wilbur & al. 13276, "yellow-green" on Williams & al. 28912, and "cream" on Lems 5049. Jiménez M. describes the "flores centrales con boca amarilla, cabeza con bracteas centrales atropurpureas" on his 2944 and "flores amarillas con tubo blanco de 3—4 mm." on his 1424. He also describes the tree branches as "ramas oblicuas hacia arriba" and found the plant "en bosque ralo al borde del rio". Wood samples accompany Stern & al. 1997 and Stork 4590. The leaves and stems are said by Sáez R. & Nassar C. (1971) to be used for "el empalme".

Material of this species has been misidentified and distributed in some herbaria as L. umbellata Cav. On the other hand, the Lent 2633, distributed as L. torresii, actually is L. costaricensis Moldenke.

Additional citations: COSTA RICA: Alajuela: Jiménez M. 2944 (N, W—2537537); Williams, Molina R., Williams, & Gibson 28912 (N). Heredia: Hatheway 1301 (W—2512678); Lems 5339 (N); Wilbur & Teeri 13682 (Mi, N, W—2695691). San José: Jiménez M. 1424 (N); Lems 5049 (N); Madríz AMV.41 (N); Pittier & Tonduz 1700 (Mu—3777); Stork 4590 (N); Wilbur & Stone 8833 (N). PANAMA: Chiriquí: P. H. Allen 1481 (E—1190784), 1565 (E—1190483); Croat 13650 (N); Stern, Eyde, & Ayensu 1997 [wood sample USw.33769] (E—1839666, Mi, W—2490056); Wilbur, Almeda, Luteyn, & Utley 15187 (Mi, N); Wilbur & Teeri 13276 (N, W—2695692), 13312 (Mi, N, W—2695694); Wilbur, Weaver, Foster, & Correa 10890 (Mi, N, W—2695693). CULTIVATED: Costa Rica: Madríz 41 (N).

LIPPIA TRACHYPHYLLA Briq.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 576. 1965; Moldenke, Phytologia 13: 10--12 (1966) and 14: 410. 1967; Moldenke, Fifth Summ. 1: 183, 187, & 199 (1971) and 2: 567 & 895. 1971; Troncoso, Darwiniana 18: 340 & 410. 1974.

The corollas are said to have been "blue" on Luna 523, and the plant was collected in anthesis in December. Troncoso (1974) records it only from Paraguay.

Additional citations: ARGENTINA: Salta: Luna 523 (N).

LIPPIA TRISTIS Briq.

Additional & emended bibliography: Briq. in Chod. & Hassl., Pl. Hassler. 2: 495--496. 1904; Burkart, Excerpt. Bot. A.5: 586. 1962; Moldenke, Phytologia 14: 418. 1967; Moldenke, Fifth Summ. 1: 187 (1971) and 2: 546, 550, 567, & 895. 1971; Troncoso, Darwiniana 18: 340 & 410. 1974.

LIPPIA TRISTIS var. ABERRANS Briq.

Additional bibliography: Burkart, Excerpt. Bot. A.5: 586. 1962; Moldenke, Phytologia 13: 15--16. 1966; G. Taylor, Ind. Kew. Suppl. 14: 79. 1970; Moldenke, Fifth Summ. 1: 187 (1971) and 2: 549 & 895. 1971; Troncoso, Darwiniana 18: 340. 1974.

LIPPIA TROLLII Moldenke

Additional bibliography: G. Taylor, Ind. Kew. Suppl. 13: 81. 1960; Hocking, Excerpt. Bot. A.5: 44. 1962; Moldenke, Phytologia 13: 16--17. 1966; Troncoso, Darwiniana 14: 637--638. 1968; N. F. Good, Biol. Abstr. 50: 9661. 1969; Moldenke, Fifth Summ. 1: 183 & 199 (1971) and 2: 895. 1971; Troncoso, Darwiniana 18: 337 & 410. 1974; Moldenke, Phytologia 31: 387. 1975; Anon., Biol. Abstr. 61: ACl.640. 1976; Hocking, Excerpt. Bot. A.28: 170. 1976.

The stems of the typical form of this species have distinct, Rosa-like, small, stiff, slightly recurved thorns. The plant has been collected at 1900 m. altitude. Troncoso (1968) cites Troll 1207 from Santa Cruz, Bolivia, in the Berlin herbarium, and Fabris 5250 from Jujuy, Argentina, in the San Isidro and La Plata herbaria.

Additional citations: BOLIVIA: Santa Cruz: Troll 1207 (Mu—isotype).

LIPPIA TROLLII var. INERMIS Moldenke, Phytologia 31: 26—27. 1975.

Bibliography: Moldenke, Phytologia 31: 26--27 & 387. 1975; Anon., Biol. Abstr. 61: ACl.640. 1976; Hocking, Excerpt. Bot. A.28: 170. 1976.

Citations: BOLIVIA: Santa Cruz: Troll 1054 (Mu—type, N—photo of type, Z—isotype, Z--photo of type).

LIPPIA TURBINATA Griseb.

Additional bibliography: Rojas Acosta, Cat. Hist. Nat. Corrient. 205. 1897; Reiche & Phil., Fl. Chil. 5: 298 & 301—302. 1910; Baez,

Anal. Asoc. Estud. Mus. Pop. Paraná 1920: 40. 1920; Baez, Mus. Entre Ríos Cart. Herb. Paran. 44. 1938; Fester & al., Anal. Soc. Cienc. Arg. 144: 457—471. 1945; Fester & al., Chem. Abstr. 42: 4309. 1948; Fester & Martinuzzi, Anal. Asoc. Quim. Argent. 40: 36—60. 1952; Fester & Martinuzzi, Chem. Abstr. 46: 11586—11587. 1952; Fester & al., Rev. Fac. Ind. & Agr. Univ. Nac. Litoral. Santa Fe Argent. 21/22: 43—84. 1953; Fester & al., Chem. Abstr. 48: 6655—6656. 1954; Karrer, Konstit. & Vork. Organ. Pflanzenst. 32. 1958; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 645, 649, & 655. 1960; Fester, Martinuzzi, Retamar, Ricciardi, Romero Fonsêca, & Cassano, Revist. Fac. Cienc. Agrar. Mendoza 8 (2): 47. 1961; J. A. Clark, Card-Ind. Gen. Spec. & Var. Pl. issue 245. 1965; Hocking, Excerpt. Bot. A.9: 367. 1965; Schubert, Assoc. Trop. Biol. Bull. 4: 73. 1965; Troncoso in Cabrera, Fl. Prov. Buen. Aires 5: 145 & 147. 1965; Y.-R. Naves, Helv. Chim. Act. 49: 2012—2016. 1966; Anon., Biol. Abstr. 48 (13): S.97. 1967; Moldenke, Phytologia 14: 418. 1967; Y.-R. Naves, Biol. Abstr. 48: 5958. 1967; Moldenke, Résumé Suppl. 17: 7 & 11. 1968; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Ind. 6: 266. 1969; Leondo Montes, An. Soc. Cienc. Argent. 187: 21—48. 1969; Rondina & Coussio, Rev. Invest. Agropec. INTA Buen. Aires, ser. 2, Biol. Prod. Veg. 6 (22): 351, 365, & 366. 1969; Farnsworth, Pharmacog. Titles 5 (5): v & item 4563. 1970; Willaman & Li, Lloydia 33, Suppl. 32: 220. 1970; Farnsworth, Pharmacog. Titles 5, Cumul. Gen. Ind. 1971; Farnsworth, Pharmacog. Titles 6 (1): ix & title 932 (1971) and 6 (8): xi & title 14235. 1971; Heusser, Pollen & Spores Chile 61, pl. 57-666. 1971; Moldenke, Fifth Summ. 1: 142, 192, 199, & 366 (1971) and 2: 550, 553--555, 560, 563, & 895. 1971; Bandoni, Mendiondo, Rondina, & Coussio, Phytochem. 35: 69, 71, & 77. 1972; Farnsworth, Pharmacog. Titles 7 (8): xvi & item 16598. 1972; Farnsworth, Pharmacog. Titles 6, Cumul. Gen. Ind. [69]. 1973; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 661 & 668. 1973; Moldenke, Phytologia 28: 450. 1974; Troncoso, Darwiniana 18: 335, 338, & 410. 1974; Moldenke, Phytologia 31: 387. 1975; Soukup, Biota 11: 14. 1976; Otte & Joern, Proc. Acad. Nat. Sci. Philad. 128: 103. 1977; Moldenke, Phytologia 38: 399 (1978) and 39: 89 & 98. 1978.

Additional illustrations: Troncoso, Darwiniana 10: 82. 1952; Heusser, Pollen & Spores Chile pl. 56-666. 1971.

Recent collectors refer to this plant as a shrub, 1.5 m. tall, and have found it growing at 1500--1700 m. altitude, flowering in January and November, fruiting in November. The corollas are said to have been "white" on Terribile 799. Troncoso (1965) reports the plant as "medicinal" in Buenos Aires. She records it from Atacama in Chile and from Córdoba, San Juan, and San Luis in Argentina, citing Burkart 7492 from Córdoba and Werdermann 474 from Atacama, both deposited in the San Isidro herbarium. She notes (1952) that the leaves may sometimes vary to obovate, the bracts smaller, ovate, and apiculate, and the heads geminate, but the significance of these variations had not been determined by her as of that date. Macbride (1960) records the species from Tacna

(Peru), Chile, and Argentina.

Heusser (1971) describes the pollen grains as "Monad, isopolar, radiosymmetric; tricolporate, tetracolporate (stephanocolporate), or pericolporate, colpi long and generally narrow, at times constricted, their membranes granular, pores transverse, distinct, generally long and narrow but also becoming relatively broad-elliptic; mostly oblate spheroidal, amb subtriangular or more or less tetragonal; exine 2 mu or less thick, faintly tectate, foveolate; 25--28 x 25--31 mu."

Fester and his associates (1945, 1948, 1952--1954) report the presence in this species of d-limonene, phenols, ketones, aldehydes, sesquiterpenes, cineole, and lippione in a volatile oil of the leaves. Karrer (1958) found limonene, $C_{10}H_{16}$, in this species as well as in such diverse and unrelated other species as Chamaecyparis obtusa, Citrus nobilis var. deliciosa, Cymbopogon polyneuros, Dacrydium kirkii, Litsea cubeba, Pittosporum tenuifolium, Seseli indicum, Siler trilobum, and Solidago odora. Naves (1966) reports diosphenolene (lippiaphenol).

Material of L. turbinata has been misidentified and distributed in some herbaria as L. chilensis Schau. [=Aloysia salviaefolia (Hook. & Arn.) Moldenke]. On the other hand, the Balegno 330, Krapovickas 6612, Krapovickas & Cristóbal 14659, and Lossen 221, distributed as typical L. turbinata, seem better placed as L. turbinata f. angustifolia Osten, while P. Garcia 956 is L. turbinata f. magnifolia Moldenke, Cabrera & Fabris 13247 is L. grisebachiana Moldenke, Cabrera, Solbrig, Torres, & Vuillemier 16700 is L. integrifolia (Griseb.) Hieron., and O'Donell & Rodriguez 242 is Aloysia gratissima (Gill. & Hook.) Troncoso.

Additional citations: ARGENTINA: Buenos Aires: Tweedie s.n. [Bahia Blanca] (Pd). Catamarca: Brizuela 89 (N), 744 (Ms--34192), s.n. [12-III-1947] (N); O'Donell & Meyer 5143 (N); Reales 830 (N), 939 (N), 1143 (N); Villafañe 1197 (N). Córdoba: Lorentz 86 [Macbride photos 20336] (Mu--1407--type, Z--isotype); Meebold 7 (Mu); Pastore 340 (W--2595169); Ruiz Huidobro 41 (N); Varela 408 (Ut--330583B); Villafañe 4 (Tu--77306), 553 (N). Mendoza: Krapovickas & Cristóbal 14612 (Ld, Ws); Ruiz Leal 8507 (Tu--155516), 17670 (Tu--162099). Salta: T. Meyer 8337 (N); Ruiz Huidobro 513 (Ut--330552B); Sotelo 868 (N). San Luis: Báez 1 (W--2567990); Semper s.n. [20--27-II-1944] (N); Varela 494 (N). Santiago del Estero: T. Meyer 12733 (N); O'Donell 4235 (N); Terribile 799 (N). CULTIVATED: Egypt: Hadidi & Ghabbour s.n. [1/7/1967] (Gz); Mahdi s.n. [1/10/1963] (Gz, Gz), s.n. [27/7/1963] (Gz, Gz); Sisi s.n. [26/5/1973] (Gz, Gz); V. Täckholm s.n. [2/11/1959] (Gz).

LIPPIA TURBINATA f. ANGUSTIFOLIA Osten

Additional bibliography: Moldenke, Phytologia 14: 418. 1967; Moldenke, Fifth Summ. 1: 192 & 199 (1971) and 2: 895. 1971; Molden-

ke, Phytologia 31: 387. 1975.

Recent collectors describe this plant as a shrub, 1.5 m. tall, and have found it growing at the edges of railroad rights-of-way, flowering and fruiting from December to February. They record the vernacular name, "poleo". The corollas are said to have been "white" on Krapovickas & Cristóbal 14659 and on Ruiz Huidobro 84. The latter collection is a mixture with Aloysia gratissima (Gill. & Hook.) Troncoso.

Material of this form has been distributed in many herbaria as typical L. turbinata Griseb.

Additional citations: CHILE: Atacama: Zöllner 6994 (Ac). ARGENTINA: Córdoba: Balegno 330 (N), 1493 (N); Krapovickas 6612 (S); Krapovickas & Cristóbal 14659 (Ld); Lossen 221 (Mu—4357); Ragonese & Piccinini 6148 [Herb. Inst. Bot. 69275] (Ba); Ruiz Huidobro 84 in part (N); Villafañe 114 (N), 375 (N). San Juan: Fabris & Marchionni 2415 (Mu, Mu). LOCALITY OF COLLECTION UNDETERMINED: Herb. Monac. H.75 (Mu).

LIPPIA TURBINATA f. MAGNIFOLIA Moldenke

Additional bibliography: Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; J. A. Clark, Card-Ind. Gen. Sp. & Var. Pl. issue 245. 1965; Schubert, Assoc. Trop. Biol. Bull. 4: 73. 1965; Moldenke, Phytologia 14: 418. 1967; Moldenke, Résumé Suppl. 17: 7 & 11. 1968; Moldenke, Fifth Summ. 1: 199 & 366 (1971) and 2: 554 & 895. 1971; Troncoso, Darwiniana 18: 338 & 410. 1974.

Recent collectors describe this plant as a spreading subshrub with rigid branches arising at an angle of about 30° above the horizontal. The corollas are said to have been "white" on Brizuela 195 and Garcia 937 & 958, "mauve or whitish" on Sykes 23/67, and "lilac" on Cuezzo 25 and Herrera 72. Cabrera (1953) and Troncoso (1974) record the form from Jujuy, Salta, and Tucumán, Argentina. Luna Risso 663 differs in having small leaves, but the blades are broadly elliptic or obovate and mucronulate, the leaves and inflorescences both mostly ternate.

The Cuezzo 25, Garcia 958, and O'Donell 2514 & 2548, cited below, were previously (1966) mis-cited by me as typical L. turbinata.

Additional & emended citations: ARGENTINA: Buenos Aires: Ruiz Huidobro 1388 (N). Catamarca: Brizuela 195 (N), 606 (N), 684 (N); Pierotti "h" [18/V/44] (N); Reales 1146 (N). Córdoba: T. Meyer 12914 (N); Ruiz Huidobro 451 (Ut—330554B). Mendoza: Ruiz Leal 8507 (Ut—220553B). Salta: Herrera 72 (N); F. E. Luna 172 (N); Luna Risso 663 (N); B. Malvárez 180 (N); O'Donell 2514 (Ca—165621, N), 2548 (Ca—164813, N), 2732 (N, N), 5347 (N), 5370 (N); Ruiz Huidobro 618 (Ut—220565B). Santiago del Estero: P. Garcia 937 (N), 958 (Ca—1166982, N); F. E. Luna 265 (N), 1179 (N), 1201 (N). Tucumán: Cuezzo 25 (N, S). CULTIVATED: New Zealand: W. R. Sykes 23/67 [Herb. Bot. Div. D.S.I.R. 176287] (Z).

LIPPIA TURNERIFOLIA Cham.

Additional & emended bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Briq. in Chod. & Hassl., Bull. Herb. Boiss., ser. 2, 4: 1157—1159. 1904; Briq. in Chod. & Hassl., Pl. Hassler. 2: 493—495. 1904; R. C. Foster, Contrib. Gray Herb. 184: 170. 1958; Angely, Fl. Anal. Paran., ed. 1, 576. 1965; Martínez-Crovetto, Bonplandia 2: 41, 52, 59, & 63. 1965; Dombrowski & Kuniyoshi, Araucariana 1: 14. 1967; Moldenke, Phytologia 14: 418. 1967; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4: 836 & xi, map 1387. 1971; Moldenke, Fifth Summ. 1: 157, 183, 187, 189, & 199 (1971) and 2: 545, 567, & 895. 1971; Moldenke, Phytologia 25: 229. 1973; Troncoso, Darwiniana 18: 335, 340, & 410. 1974; Moldenke, Phytologia 38: 263 & 479 (1978) and 39: 180. 1978.

Recent collectors describe this species as an herb or shrub, 70 cm. tall, the stems 1 or a few, rising from a thick root or xylopodium, and have encountered it on campos, high or dry campos, rocky campos, campo limpo, cerrado and burned-over cerrado, at lakesides, along campo roadsides "where sods have been cut", burned roadsides, and in ruderal grassland on hills, at altitudes of 800--1000 m., flowering from September to December as well as in March and April, fruiting in October. Lindeman & Haas found it growing "on campo near border of planalto". Arbo and his associates encountered it on "taipas". Irwin & Soderstrom refer to it as "locally common".

The corollas are said to have been "yellow" on Arbo & al. 1000, Hatschbach 17314, 30636, 33436, 33574, 37731, & 39173, Hatschbach & Kummrow 34963, Hatschbach & Scherer 30403, Krapovickas & al. 16661, Kummrow 42 & 637, Lima & al. ICN.20990, Quarin & al. 2712, and Schinini 8728, "yellow (5Yb/12)" on Lindeman & Haas 20, "golden-yellow" on Lourteig 1909, "inside yellow (2 1/2Y8/10), outside pale (2 1/2 Y8/12) on Lindeman & Haas 2528, "yellow, red-orange at center" on Irwin & Soderstrom 7290, "amarillas y rojizas" on Krapovickas & al. 26396, "orange" on Schwarz 6022, and "orange (10YR7/10)" on Lindeman & Haas 2461.

Angely (1971) records this species from Paraná, Rio Grande do Sul, Santa Catarina, and São Paulo, Brazil -- his work bears the incorrect titlepage date of "1970". Briquet (1904) appears to list as synonyms of L. turnerifolia Cham. the L. turneraefolia Chod. and L. turnerifolia Chod., but I relegate both of these homonyms to the synonymy of L. tristis Briq.

Troncoso (1974) makes L. turnerifolia the type species of a Section Dioicolippia Troncoso. She cites Dombrowski 1967 from Paraná, Brazil, and Cano & Hernández 616 from Corrientes, Argentina, both in the San Isidro herbarium. Hatschbach & Scherer 30403 is a mixture with L. asperrima Cham.

Material of L. turnerifolia has been misidentified and distributed in some herbaria as L. morongii Kuntze. On the other hand, the Herter 989 [Herb. Herter 82594], distributed as L. turnerifol-

ia, actually is L. morongii Kuntze.

Additional citations: BRAZIL: Goiás: Hatschbach & Kummrow 34963 (Ld); Irwin & Soderstrom 7290 (N, N, N). Mato Grosso: Hatschbach & Scherer 30403 in part (Ld, W—2706682). Paraná: Hatschbach 17413 (Ld), 30636 (Ld), 32731 (Ld), 33436 (Ac), 33574 (Gz), 39173 (Ld); Jönsson 35a (Mu); Kummrow 42 (Kh), 637 (Ld); Lindeman & Haas 20 (Ld), 2461 (Ut—320424), 2528 (Ld), 3251c (Ut—320414); Van der Veen 31 (Ut—320419). Rio Grande do Sul: Lima, Vianna, Irgang, & Ferreira ICN.20990 (Ut—320442); Rambo 53437 (B); Sellow s.n. [Brasilia, 17.9.1828; Macbride photos 34333] (W—photo of type). PARAGUAY: Lourteig 1909 (N); Woolston 130 (N). ARGENTINA: Corrientes: Arbo, Schinini, Ahumada, O. de Coll, & Vanni 1000 (Ac), 1061 (Ld); Krapovickas, Cristóbal, Arbo, Marufiak, Marufiak, & Irigoyen 16661 (Ws); Quarín, Schinini, & González 2712 (Ld); Schinini 8728 (Ld). Misiones: Krapovickas, Cristóbal, Marufiak, Pire, & Tressens 15282 (Ld); Montes 14869 (Au—271296, Ld, N, W—2556005); Schwindt 189 (N); G. J. Schwarz 5864 (N), 6022 (N).

LIPPIA TURNERIFOLIA var. ANGUSTA Kuntze

Additional & emended bibliography: Briq. in Chod. & Hassl., Pl. Hassler. 2: 494. 1904; Moldenke, Phytologia 13: 29—31. 1966; Moldenke, Fifth Summ. 1: 187 (1971) and 2: 567 & 895. 1971.

The corollas on Schinini 4307 are said to have been "yellow-orange" when fresh and this collector found the plant in flower in March.

Additional citations: PARAGUAY: Schinini 4307 (Z).

LIPPIA TURNERIFOLIA var. SESSILIFOLIA Moldenke

Synonymy: Lippia turnerfolia var. sessilifolia Moldenke, Lloydia 13: 224, sphalm. 1950.

Additional bibliography: Moldenke, Phytologia 13: 31. 1966; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 567 & 895. 1971.

LIPPIA UKAMBENSIS Vatke

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 278 & 281. 1900; Dale & Greenway, Kenya Trees 588. 1961; J. A. Hutchins., Journ. Tangan. Soc. 64: 105. 1965; Moldenke, Phytologia 14: 409 & 418—419. 1967; Glover, Stewart, Fumerton, Marindany, & Andersen, Gloss. Botan.-Kipsig. Names 160 & 256. 1969; Moldenke, Fifth Summ. 1: 237 & 241 (1971) and 2: 895. 1971; Moldenke, Phytologia 39: 106 & 395. 1978.

Recent collectors describe this species as an upright branched shrub, 6—8 feet tall, "coppice-growing", the sap colorless, the flower-heads "yellow-greenish", the flowers not fragrant, and have found it growing along forest roadsides and in riverside thickets on black loam soil, at altitudes of 4500—5375 feet, flowering in November. The corollas are said to have been "white" on Tanner 1862. The vernacular name, "mwokyot", is recorded for it [as it

is also for L. javanica (Burm. f.) Spreng.] by Glover and his associates (1969).

Baker (1900) cites only the type collection, Hildebrandt 2739, from what was then British East Africa. Dale & Greenway (1961) reduce both L. kituiensis Vatke and L. schliebeni Moldenke to synonymy here, a disposition with which I do not concur.

Additional citations: TANZANIA: Tanganyika: Tanner R.T.1862 (Ba, N). KENYA: Perdue & Kibuwa 8033 (Mu).

LIPPIA UMBELLATA Cav.

Additional bibliography: Pers., Sp. Pl. 3: 352. 1819; Schau., Linnaea 20: 480. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Goyena, Fl. Nicarag. 1: 561. 1911; Roys, Ethno-bot. Maya [Tulane Univ. Mid. Am. Res. Ser. Publ. 2:] 296 & 322. 1931; M. Martínez, Pl. Medic. Mex., ed. 1, 424 & 621 (1933) and ed. 2, 426 & 608. 1939; Cummins, Lloydia 3: 16. 1940; Gómez Pompa, Estud. Bot. Reg. Misantla 93. 1966; Rzedowski & McVaugh, Contrib. Univ. Mich. Herb. 9: 70 & 107. 1966; Moldenke, Biol. Abstr. 47: 7190 (1966) and 48: 874. 1967; Hocking, Excerpt. Bot. A.11: 104 & 504. 1967; Moldenke, Phytologia 14: 419. 1967; Hocking, Pharmaceut. Abstr. 9 (3): no. 1067. 1968; Moldenke, Biol. Abstr. 49: 4199. 1968; Palacios Ch., Anal. Esc. Nac. Cienc. Biol. 16: 89, fig. 285 & 286. 1968; Uphof, Dict. Econ. Pl., ed. 2, 315. 1968; Harley & Kunimoto, Bull. Entomol. Res. 58: 787—792. 1969; M. Martínez, Pl. Medic. Mex., ed. 5, 460 & 639. 1969; A. L. Moldenke, Phytologia 18: 123. 1969; "E. M. D.", Biol. Abstr. 51: 1076. 1970; Gibson, Fieldiana Bot. 24 (9): 216. 1970; J. Rzedowski, Anal. Esc. Nac. Cienc. Biol. 18: 94 & 97. 1970; Moldenke, Fifth Summ. 1: 72 (1971) and 2: 543, 563, & 895. 1971; Altschul, Drugs & Foods 244. 1973; Troncoso, Darwiniana 18: 339 & 410. 1974; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 75. 1975; Moldenke, Phytologia 38: 475 & 477 (1978) and 39: 253, 256, & 442. 1978.

Additional illustrations: Palacios Ch., Anal. Esc. Nac. Cienc. Biol. 16: fig. 285 & 286. 1968.

Recent collectors describe this plant as a shrub, 2—4 m. tall, or a small tree, 6—8 m. tall, aromatic, the trunk to 7 cm. in diameter, the leaves aromatic, and the flowers small, in heads, with the odor of menthol, and have found it growing in mesophytic, pine, or oak woods, oak-pine forests, disturbed oak woods, pine-fir forests, Cupressus-Quercus or Quercus-Liquidambar woods, woods of Quercus and Arbutus, and on basaltic slopes with mesophytic oak vegetation, at altitudes of 2025—2850 m., flowering from October to February, fruiting in January, February, October, and November. McVaugh refers to it as "scarce in pine forests mostly on rolling summits with pine, fir, and oak on the precipitous slopes". Rzedowski encountered it on "ladera tobosa con vegetación de encinar".

The corollas are said to have been "yellow" on Palacios s.n. and on Rzedowski 26935 & 28020, "yellowish" on Rzedowski 26456 & 28722, "greenish-yellow" on Hinton 15706, "yellow or fawn" on Hinton 13550, "yellow-green or white" on Hinton 11910, and "greenish"

on McVaugh 26122.

Common names reported by recent collectors are "cominos rusticos", "hierba de mula", "hierba de la mula", "juanislama del monte", "nacare", "old-woman's staff", "salvia", "salvia poblana", "tabaquillo", "tobaquillo", "toposana", "topozana", "xolte nuc", "xolte-xnuk", "xolté-x-nuc", and "yerba de Santa Gertrude".

Troncoso (1974) makes L. umbellata the type species of Section Rhodolippia Schau., a section of 9 or 10 species which she characterizes as having "Cabezuelas 'lupulinas', por lo general globosas. Brácteas grandes, anchamente ovales o redondeado-cordadas, membranáceas, coloreadas, venoso-reticuladas, que cubren y ocultan las corolas". The included species are found from Mexico to Brazil, principally in Brazil.

Palacios (1968) describes the pollen as follows: "Granos: tricolporados, tectados, subprolatos o esferoidales, de 31 (37) 39 mu x 31 (34) 38 mu. Vista polar inter-hexagonal, con un diámetro de 31 (36) 39 mu. Exina: 2.5 mu de grosor; elementos de la columela imperceptibles, superficie psilada. Surcos: de 18 (22) 25 mu de longitud x 2.5 mu de fisura, con terminaciones agudas y constreñidos en el ecuador. Surcos Transversales: de 17 mu de largo x 2.5 mu de fisura, con terminaciones agudas y situados en el centro de los colpas."

Uphof (1968) regards L. substrigosa Turcz., L. pringlei Briq., and L. chiapasensis Loes. as synonyms of L. umbellata, but I regard them all as abundantly distinct taxa. Cummins (1940) records the fungus, Prospodium lippiae (Speg.) Arth., as attacking Lippia umbellata in Guatemala, based on Holway 554. The beetle, Plagiohammus spinipennis (Thoms.), is also said to feed on it. Gibson (1970) commenta: "Lippia umbellata, which has been poorly understood and which probably includes L. pringlei Briq., was originally described (Cav. Icon. Pl. 2: 75, t. 194. 1792) as having 'flores umbellati, umbellis pluribus axillaribus in ramorum summitatibus' and the illustration clearly shows primary peduncles with several 'rays' forming definite dichasia. I have seen no material of L. umbellata nor the closely related L. pringlei from either Guatemala or Chiapas." Actually, most of the material now regarded as true L. umbellata does not show branched or dichasial inflorescenses.

Altschul (1973) reports a decoction made from L. umbellata is used to treat rheumatism, while Martínez (1969) says that in Durango it is used to treat colic. Roys (1931) says: "L. umbellata is a shrub or tree, reported from Izamal as 10 feet high. The flowers are yellowish, turning red.....With it they cure night-fevers, especially in the case of babies....The Maya text prescribes an infusion of the crushed leaves as a remedy for dysentery accompanied by mucus or pus in the stools."

The Stern, Eyde, & Ayensu 1722 [wood voucher USw.33585], distributed as L. umbellata, actually is L. americana f. pilosa Moldenke, while Hinton 12945 is L. callicarpaefolia H.B.K.; Heyde &

Lux 4387 is L. controversa Moldenke; N. L. H. Krauss 585, Lathrop 5055, H. E. Moore 2000, and Weber & Charette 11939 are L. myriocephala var. hypoleia (Briq.) Moldenke; Cummins 70-220H, Ernst 2446, 2476, & 2558, Herb. Zuccarini s.n. [h. Monac. 1835], s.n. [Hortus bot. Monacensis], & s.n. [Hortus Monac. anno 1845], Hinton 12949 & 13614, Karwinski s.n. [Hab. in Mexico], Kruse 55, Kummer s.n. [Hort. Monac. 1839.3.I], T. MacDougall H.284, J. G. Ortega 5707 & 6548, K. Reiche 1029, J. Rzedowski 19280, and Smith 193 are L. pringlei Briq.; Heyde & Lux 3024 & 4389, J. D. Smith 1888, Türckheim 8441, and Webster, Adams, Miller, & Miller 11821 are L. substrigosa Turcz.; and Pittier & Tonduz 1700 and Stern, Eyde, & Ayensu 1997 [wood voucher USw.33769] are L. torresii Standl.

Additional citations: MEXICO: Federal District: Bourgeau 968 (Mi, N, S, W--2546645); J. Rzedowski 21961 (Au--249300, Ip). Jalisco: R. McVaugh 10070 (Au--236037, Ld, N), 26122 (Mi). México: J. Rzedowski 26456 (Ld, Mi, Ws), 28020 (Ld, Mi, N), 28722 (Au--303720, Mi). Michoacán: Hinton 11910 (Se--97681, Tu--112038), 12791 (Se--87682), 13550 (Se--97680, Tu--112096), 15706 (Se--97686, Tu--112088); King & Soderstrom 5161 (Au--207071); Pringle 3948 (Ld, Ms--30883, Mu--3880, Tu--98615). Morelos: Lyonnet 3157 (W--2636379); Palacios s.n. [17/X/1964] (Ip, Ip), s.n. [14/XI/1964] (Ip, Ws); J. Rzedowski 26935 (Mi).

LIPPIA VELUTINA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 14: 419. 1967; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 560 & 895. 1971; Moldenke, Phytologia 39: 261, 263, & 455. 1978.

Recent collectors describe this plant as a shrub, 1--2 m. tall, and have found it growing along roadsides and the margins of gallery woods, at 1200--1450 m. altitude, flowering in February, April, and November. Anderson encountered it at the edge of the forest in an area of gallery forest, adjacent sedge meadows and "campo sujo" with rocky campo on the higher drier slopes. The corollas are said to have been "white" on Anderson 8411, "whitish" on Hatschbach & Pelanda 27828, and "cream, the tube yellow" on Irwin & al. 20687.

The Philcox & Freeman 4736, Ratter, Bertoldo, Castro, Santos, & Souza R.904, and Ratter, Santos, Souza, & Fereira R.1357, distributed as L. velutina, actually are L. obscura Briq.

Additional citations: BRAZIL: Goiás: J. E. Pohl s.n. [in Brasilia] (Mu--146--cotype). Mato Grosso: Silva Manso s.n. [Morro do Ernesto; Herb. Martius 1024; Macbride photos 7861 & 24676] (Mu--145--cotype, Z--cotype). Minas Gerais: W. R. Anderson 8411 (Ld, N); Hatschbach & Pelanda 27828 (Ld); Irwin, Maxwell, & Wasshausen 20687 (N, Z).

LIPPIA VERNONIOIDES Cham.

Emended synonymy: Lippia hirsuta var. vernonioides (Cham.) Kuntze apud R. C. Foster, Contrib. Gray Herb. 184: 170. 1958.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; R. C. Foster, Contrib. Gray Herb. 184: 170. 1958; Moldenke, Phytologia 14: 419. 1967; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 836 & xi. 1971; Moldenke, Fifth Summ. 1: 157, 183, & 387 (1971) and 2: 551, 552, 556, & 895. 1971; Moldenke, Phytologia 27: 67. 1973; Moldenke, Biol. Abstr. 57: 3780. 1974; Moldenke, Phytologia 28: 439, 440, & 459. 1974; Troncoso, Darwiniana 18: 338 & 410. 1974.

Close inspection of the material presently passing as L. vernonioides reveals that two taxa are involved. In the typical form of the species the pubescence is persistently divergently stiff-hirsute, while in var. attenuata (Mart.) Moldenke it is more or less appressed and usually shorter. I have re-examined and re-annotated the material in the New York herbarium (including the Columbia University, Princeton University, and College of Pharmacy herbaria), but that in other herbaria remains to be re-examined.

Recent collectors describe this plant as an herb or subshrub, 0.5--2 m. tall, erect, the inflorescences or heads white or greenish-white, and have found it growing on grassy campos and in gallery forests, at altitudes of 400--900 m., flowering from April to July, fruiting from April to June. Hatschbach encountered it on "campo cerrado encosta rochosa de morro", while Irwin and his associates report it from "cerrado with 'cascalho' soil".

Troncoso (1974) makes this species the lectotype of Subsection Paniculatae (Schau.) Briq. in Series Paniculatae Schau., characterizing the subsection as having "Cabezuelas subglobosas pedunculadas, agrupadas en inflorescencias terminales racimoso-paniculadas."

Angely (1971) records the species from Pará, Maranhão, Mato Grosso, Goiás, Minas Gerais, and São Paulo, but all of the material which I have re-examined from Pará and Maranhão proves to be var. attenuata. As stated under other taxa in this series, his book is misdated "1970" on its titlepage.

The corollas of L. vernonioides are said to have been "white" on Irwin & al. 16696 & 17924, "whitish" on Hatschbach 32062 & 34730, "white with a yellow throat" on Ratter & al. 1588, "white with yellow center" on Steinbach 7027, "white, yellow on inside of tube" on Hatschbach 31969, and "whitish, interior of tube yellow" on Hatschbach 32062.

The following collections, distributed as L. vernonioides and in most cases so cited by me in a previous (1966) publication, prove to represent var. attenuata (Mart.) Moldenke: Cárdenas 1935 & 2028, Duarte 778, Hatschbach & Ahumada 31228, Herb. Brad. 28163, Herb. Inst. Agr. Est. S. Paulo 3764, Herb. Inst. Biol. S. Paulo 17475, 20411, & 41982, Herb. Jard. Bot. Rio Jan. 58834, Hoehne

2709, s.n., & Com. Rondon 1304, Hoehne & Gehrt s.n. [Turvo, April 24, 1926], Hunt 5540, Hunt & Ramos 5540, Irwin, Souza, Grear, & Reis dos Santos 17537, Kiehl s.n., Kuntze s.n. [Velasco, VII.92] & s.n. [Yapacani, 6.92], Macedo 2288, Martius 87 & 224, Mendes Magalhães 19025, Mosén 4319, Murça Pires 2361, Murça Pires & Black 2146, 2319, & 2361, Paredo s.n. [6-XII-1946], Riedel & Lund 2073, Rusby 926 & 927, and Steinbach 5581.

Additional citations: BRAZIL: Goiás: Irwin, Souza, Grear, & Reis dos Santos 17924 (Ac, N). Mato Grosso: Hatschbach 31969 (Z), 34730 (Ld); Hatschbach & Guimarães 21895 (Ac); Irwin, Souza, Grear, & Reis dos Santos 16696 (Ld); Ratter, Santos, Souza, & Ferreira R.1588 (N). BOLIVIA: Santa Cruz: J. Steinbach 7027 (E—936448).

LIPPIA VERNONIOIDES var. **ATTENUATA** (Mart.) Moldenke, Phytologia 27: 67. 1973.

Synonymy: Lippia attenuata Mart., Flora 21, Beibl. 2: 59. 1838. Lippia hirsuta f. latifolia Kuntze ex Moldenke, Résumé Suppl. 12: 10, in syn. 1965. Lippia hirsuta var. vernonioides f. latifolia Kuntze, in herb.

Bibliography: Mart., Flora 21, Beibl. 2: 59. 1838; Schau. in A. DC., Prodr. 11: 589. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 265. 1858; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 95 (1894), imp. 2, 2: 95 (1946), and imp. 3, 2: 95. 1960; Moldenke, Phytologia 27: 67. 1973; Moldenke, Biol. Abstr. 57: 3780. 1974; Moldenke, Phytologia 28: 439, 440, & 459. 1974.

This variety, only recently recognized as such, differs from the typical form of the species in having the pubescence on its stems and branches more or less appressed and usually shorter, not long and persistently divergently stiff-hirsute.

The original description by Martius (1838) is: "caule tetragono suffruticoso, strigilloso; foliis lato-lanceolatis vel oblongis in petiolos cuneato-attenuatis, antice serratis, postice integerrimis, supra hirsuto-asperis, subtus villoso-tomentosis, subincanis; spicis cylindricis in pedunculis alaribus, vel terminalibus dichotomo-paniculatis, bracteis obovato-rhombeis acutis dorso hirsuto-incanis. Crescit prope Cujabá. Majo floret."

In my previous publications on this genus I included this taxon in typical L. vernonioides Cham., but more recent study persuades me of its distinctness and worthiness of nomenclatural status. The type of the variety actually is Martius 87 [224] in the Munich herbarium. Kuntze's L. hirsuta f. latifolia as well as his L. hirsuta var. vernonioides f. latifolia are based on his collection made at 400 meters altitude at Yapacani, Santa Cruz, Bolivia, in 1892, and is deposited in the Britton Herbarium at the New York Botanical Garden. According to notes in his own handwriting on the label he planned to characterize f. latifolia as having "foliis caulinis 1: 2—3" and f. longifolia [typical L. vernonioides] as having "foliis caulinis 1: 4 1/2".

Recent collectors describe var. attenuata as an herb, subshrub, or shrub, 0.5—3 m. tall, the tips of the bracts brown, and have found it growing in open grassy soil, on campos, campo cerrado, campo limpo, and among stones on high campos, at altitudes of 80—1000 meters, flowering and fruiting from April to June, as well as in October and December.

The corollas are said to have been "white" on Duarte 778, Gehrt s.n., Hoehne s.n. & Com. Rondon 1304, Hoehne & Gehrt s.n., Kuntze s.n., Murça Pires & Black 2146, 2319, & 2361, and Steinbach 5581, "white, throat yellow, mauve in age" on Hunt & Ramos 5540, "white, rose and yellow in center" on Macedo 2288, "yellowish-white" on Mendes Magalhães 19025, "pale-lilac" on Hatschbach & Ahumada 31228, and "lavender" on Irwin & al. 17537, while on W. Hoehne 2709 it is stated "inflorescencia amarelada".

Material of this taxon has in the past been uniformly distributed as L. vernonioides Cham. or as Lantana sp.

Citations: BRAZIL: Goiás: Irwin, Souza, Grear, & Reis dos Santos 17537 (Ac, N); Murça Pires & Black 2361 (Z). Maranhão: Murça Pires & Black 2146 (N), 2319 (N). Mato Grosso: Hatschbach 32062 (Ld, W—2744568); F. C. Hoehne Com. Rondon 1304 (N); Hunt & Ramos 5540 [Hunt 5540] (N); Martius 87 [224] (Br—isotype, F—photo of isotype, Mu—147—type, N—photo of isotype, Si—photo of isotype, Z—photo of isotype). Minas Gerais: Duarte 778 [Herb. Jard. Bot. Rio Jan. 58834] (N); Hatschbach & Ahumada 31228 (Ld, N, N, W—2706089); Hoehne & Gehrt s.n. [Turvo, April 24, 1926] (N, Sp—17475); Macedo 2288 (N); Mendes Magalhães 19025 [Herb. Brad. 28163] (N); Mosén 4319 (N, S). Pará: Murça Pires 2361 (N); Pinheiro & Carvalho 498 (Ld). São Paulo: Gehrt s.n. [Itarapina, April 30, 1923] (N, Sp—8351); F. C. Hoehne s.n. [Mogy-mirim, May 21, 1927] (N, N, Sp—20411); W. Hoehne 2709 (Bh, It, Ml, N, Qu, Ug, W); Kiehl s.n. [Herb. Inst. Agr. Est. S. Paulo 3764] (N, Sp—41982); Riedel & Lund 2073 (N). BOLIVIA: El Beni: H. H. Rusby 927 in part (C, N, Pa, Pa, Pr). La Paz: H. H. Rusby 926 (C). Santa Cruz: M. Cárdenas 1935 (N), 2028 (N); Kuntze s.n. [Velasco, VII. 92] (N, N, W—701988), s.n. [Yapacani, 6.92] (N); Peredo s.n. [6-XII-1946] (N, S); J. Steinbach 5581 (N, Ug).

LIPPIA VILLAFLORIDANA Kuntze

Additional bibliography: Moldenke, Biol. Abstr. 47: 7190 & 8471. 1966; Moldenke, Phytologia 13: 167—169. 1966; Hocking, Excerpt. Bot. A.11: 104. 1967; Hocking, Pharmaceut. Abstr. 9 (3): no. 1067. 1968; Moldenke, Fifth Summ. 1: 157, 187, & 189 (1971) and 2: 554, 568, & 895. 1971; Troncoso, Darwiniana 18: 335, 340, & 410. 1974; Moldenke, Phytologia 38: 480. 1978.

Troncoso (1974) says that "las especies de esta nueva sección Dioicolippia, fueron segregadas de la sección Zapania, series Axilliflorae y Paniculatae, del sistema de Schauer.

[to be continued]

BOOK REVIEWS

Alma L. Moldenke

"ADVANCES IN BOTANICAL RESEARCH Volume 4" edited by R. D. Preston & H. W. Woolhouse, xi & 440 pp., 69 b/w fig. & 20 tab. Academic Press, Ltd., New York, N. Y. 10003 & London NW1 7D70. 1977. $32.85 or £16.80.

The book is composed of four important papers: (1) Callow's "Lectins in Host-Parasite Interactions" proposing that an avirulent fungal race will differ from its virulent counterpart in that a surface-localised lectin becomes modified so that it is now recognized as a parasite by the products of the host resistance genes or sensors, (2) John and Whatley's "Paracoccus denitrificans as a Mitochondrion", the best candidate among any other known bacteria as the closest existing free-living relative of the prokaryote which, on entering the protoeukaryote, evolved into the present-day mitochondrion, an endosymbiont, (3) Cowan's "Stomata Behaviour and Environment" as gas-exchange elements in a system of interacting loops, and (4) Lovis' "Evolutionary Patterns and Processes in Ferns" from paleontological, cytological, polyploidal and distributional information. The statement that "Probably no special meiotic system exists in ferns" is very interesting.

"CHROMOSOME IDENTIFICATION — Technique and Applications in Biology and Medicine" edited by Torbjörn Caspersson & Lore Zech, 355 pp., 281 b/w fig., 48 b/w tab. Academic Press, London & New York, N. Y. 10003. 1973. $28.50.

Herein are the condensed proceedings of the 23rd Nobel Symposium convened at the Royal Swedish Academy of Sciences, Stockholm, September 1972. These 50 papers by 75 authors are still currently important and deal with the cytochemistry and nature of fluorescence, Giemsa, C-band, R-band and other banding techniques in chromosomes and their applications in human-other animal somatic cell hybridizations, human male sterility, trisomy-8, children with mental retardation, etc. Concise discussions after certain papers and a summarizing conclusion add much that is helpful.

"BIOCHEMISTRY" by Lubert Stryer, xiv & 877 pp., 626 (b/w & color) fig. & 55 tab. W. H. Freeman & Company, Reading, England RG1 3AA & San Francisco, California 94104. 1975. $19.95.

This excellent text was gestated in Stanford and Yale Universities classes of undergraduates, graduates and medical students. There are simpler texts but not clearer ones; there are more ad-

vanced ones that could benefit from this one's clarity. It is organized around five major themes: (1) conformation of 3-dimensional structure of proteins and their biological activity, (2) generation and storage of metabolic energy, (3) biosynthesis of macromolecular precursors, (4) genetic information storage, transmission and expression, and (5) interactions of information, conformation and metabolism in molecular physiological processes. At the end of most of the 35 chapters there is a summary, an annotated list of selected readings and a set of problems. Answers to them, often in shortened form, appear in the back of the book.

"DEVELOPMENTAL SYSTEMS: Insects. Volume 2" edited by S. J. Counce & C. H. Waddington, xiii & 615 pp., 127 b/w fig. & 21 b/w tab. Academic Press, Inc., Publishers, London NW1 7DX & New York, N. Y. 10003. 1973. $27.50.

This excellent study consists of five papers that stress the basic principles, biochemical steps and developmental aberrations and normalcies rather than just an entomological orientation. Each paper is well prepared, well presented and well documented bibliographically. The first one, by the first editor, is on "The Causal Analysis of Insect Embryogenesis". Following this are "The Development of Spatial Patterns in the Integument", "The Imaginal Discs of Drosophila", "The Role of Hormones in Insect Development" involving each step in the molting sequence and concomitant polymorphism, and "The Morphogenesis of Patterns in Drosophila" by the second editor as in reference to the scutellar bristle pattern. This book is planned for advanced level students, researchers, teachers, etc.

"BIOLOGICAL CONTROL OF PLANT PATHOGENS" by Kenneth F. Baker & R. James Cook, xv & 431 pp., 56 b/w fig. & 2 b/w tab. W. H. Freeman & Company, San Francisco, California 94104 & Reading, England RG1 3AA. 1974. $12.50.

This book is one in a series on the Biology of Plant Pathogens edited by Kelman & Sequeira. It is so directly and clearly written that it makes an excellent text for undergraduate agriculture students and for individual study. Its emphasis and orientation are also assets: "The biological world is a vast interesting network of living populations in a state of dynamic equilibrium..... [where] the individual species follow their normal cyclic changes .....without significant effect on the whole network, because compensating changes in other components maintain the balance.... in accord with thermodynamic laws....and long evolutionary adjustment." The role of such "antagonists in biological control of plant pathogens as bacteria, actinomycetes, fungi, viruses, higher plants, and predatory microfauna such as protozoa, nematodes, rotifers, collembola, and mites" is effectively explained.

"AN INTRODUCTION TO GENETIC ANALYSIS" by David T. Suzuki & Anthony J. F. Griffiths, xii & 468 pp, 383 b/w illus. W. H. Freeman & Company, San Francisco, California 94104. 1976. $13.95.

Designed for an introductory semester course in college genetics, written in informal style, oriented to problem solvings, and provided with page-flipping animations sequences, this is an interestingly different text. It is evident that the authors are dedicated successful teachers who must imbue a goodly number of their students with the scientific, educational, social and political significances of their subject matter.

Minor criticism involves problems in which white-flowered plants are called white plants, in which the practical solution would involve the destruction of the only possible voucher specimen, etc.

"IMMUNOLOGY — Readings from Scientific American" edited by F. M. Burnet, x & 275 pp., 135 color & 115 b/w illus. W. H. Freeman & Company, San Francisco, California 94104. 1976. $7.00 soft cover & $14.00 hardcover.

This book, like previous volumes in this excellent series, provides another topical arrangement that is very well developed and illustrated. Most of the papers date from during the past 20 years because they refer to the modern molecular/biophysical/biochemical concepts of immunity. Sir Macfarlane Burnet has provided a preface, an epilogue and other notes indicating the scope of this immunology field today.

The only drawback of this volume is the poorer quality paper upon which it is printed, especially effecting the printed photographs. The many thousands of readers who have and will peruse both the magazine articles and this book will notice the difference immediately.

"THE SCULPTURE OF LIFE" by Ernest Borek, xiv & 181 pp., 27 b/w & 2 color illus. Columbia University Press, London & New York, N. Y. 10025. 1973. $2.95 paperbound, $10.00 clothbound.

Borek, molecular biologist/professor and charmer/exciter with words and ideas, gives this interim report from the laboratory on work that is just emerging and of "what is known and not known about normal regulation and its derangements which result in the monstrous growths known collectively as cancer".

"Man's brain, that unique product of Evolution, may yet achieve its supreme goal: the improvement of the frail, disease-ridden body in which it is housed.....Many techniques are at hand and new ones are constantly being perfected....It would be probably less than one-tenth of the cost of preparations aimed at destroying man, body, brains and all...Until sentient man approved, the splendors of Evolution were lost for want of an appreciative witness."

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Eleven of the twelve *Guardiola* species are closely related epappose species with opposite-leaved annual herbaceous stems produced from a perennial woody caudex. They are distributed in the western mountains of Mexico. Few qualitative characters are present in the heads, so the species are distinguished primarily on the basis of vegetative characters. The twelfth species (*G. pappifera*) is a pappose, lowland, herbaceous annual readily distinguished from the other species.

METHODS. Seven perennial species are represented in this study. Specimens of *G. arguta* did not flower so were not available for controlled laboratory experiments. The other four species (*G. pappifera, G. carinata, G. odontophylla,* and *G. odontophylla*) are known only by a total of six collections in various herbaria. I did not collect any of the four.

The plants used in this study were grown from field-collected seeds. The *Guardiola* achene has a very hard seed coat, and this combined with waterproofing properties of the seed coat and inner membranes retards the germination process. To obtain a rapid and high percentage of germination, achenes were placed on damp blotters in petri dishes and maintained in a warm (75-80°F), dark chamber for 2 or 3 days. After this time the seed coat and inner membranes were dissected from the embryo proper, and the excised embryo was returned to the incubation chamber. The embryos grew rapidly, and after 2-3 days the resulting seedlings were large enough to be planted in individual pots. Seedlings were maintained in the growth chamber until the stems were approximately 10 cm high, and then were transferred to the greenhouse. They were maintained in the greenhouse until buds formed, when they were returned to the laboratory for experimental procedures.

Guardiola ray florets, with only rare exceptions, are pistillate, the disk florets are staminate, and the plants were found to be completely self-incompatible. Therefore, emasculation was not necessary prior to hand pollination of the ray florets. Hand pollination was necessary because each head bears only 1-5 ray florets, so it was important to be sure that pollination had been accomplished, and to be as thrifty as possible in making crosses. At anthesis a disk floret was removed from a head with forceps; then under a dissecting microscope, the pollen was applied directly to stigmatic surfaces of the ray florets. This technique made possible the use of several disk florets of a head in different crosses. The heads were tagged and allowed to mature in the growth chamber or in the laboratory if the plants were too large for the growth chambers. Mature heads were

harvested and the achenes removed and germinated according to the procedures outlined above.

Production of a full-sized, apparently mature, fertile achene following hand pollination was considered a successful crossing attempt. Plants grown from seeds of these crosses were compared to parent plants.

Data for the crossing attempts are summarized in Table 1 and illustrated in Figure 1.

As an additional check on fertility of the parent plants, the offspring which did flower, and of some dried specimens, pollen stainability with cotton blue in lactophenol was investigated. Pollen stainability among the individual P_1 plants with two exceptions, *viz.* 78.6% and 83.7%, varied from 90.5% to 99.3%.

Of the progeny from intraspecific matings only five plants flowered. These had 71.1%, 87.9%, 92.9%, 95.9%, and 98.1% stainable pollen. Four progeny from the interspecific matings flowered and had 95.2%, 97.8%, 97.9%, and 98.0% stainable pollen.

OBSERVATIONS. Usually the ray florets emerged from the bud a day or two prior to the emergence of the disk florets. However, in many instances, apparently normal disk florets occupied the position of one or more ray florets in the outer ring of flowers and emerged with the ray florets.

The ray floret style with its two stigmatic branches is erect and white when receptive to pollen and will remain thus for about a week if not pollinated. If, however, the ray florets are pollinated with viable, compatible pollen, one can see a yellowing of the style begin to occur in about 6-10 hours (or in one case 3 1/2 hours) after pollination. After 24 hours the style and stigma are brown, withered, and withdrawn to the mouth of the tube of the ray corolla. If pollen used for the pollination is either incompatible or no longer viable, the ray stigma remains white and erect. Thus, about 24 hours after pollination I could read the previous day's crosses as to "take" or "no take". During the time I read this reaction to determine if it was more than coincidence, the reading of the reaction was correct in 196 of 232 instances (84.4%), establishing the generalization that the success of a cross can be determined after 24 hours. The majority of the incorrect determinations of crossing success were in cases where seeds were set subsequent to a "no take" reading.

In nature insects (We noticed primarily small Diptera on *Guardiola* heads.) pollinate the ray florets with pollen from the disk florets which bloom several days after the ray florets open. The insects may be attracted to the plants by the copious nectar produced by the very large nectaries of the disk florets.

Table 1. Summary of crosses attempted in *Guardiola*.

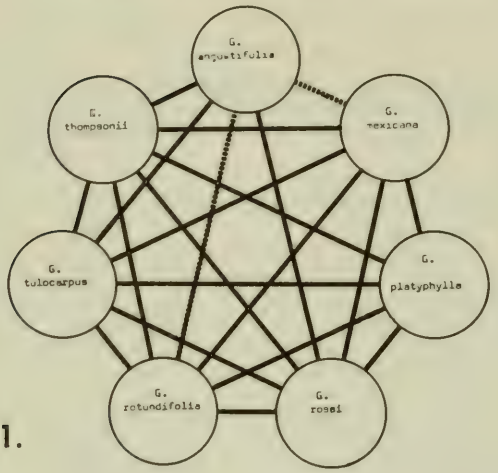
Seed Parent	Pollen Parent: *G. angustifolia*	*G. mexicana*	*G. platyphylla*	*G. rosei*	*G. rotundifolia*	*G. thompsonii*	*G. tulocarpus*	Successes
G. angustifolia	0:2(2)*	0:2	0	0:2	0:1	0:1	0:1	0:9
G. mexicana	0:1	32:56(10)	5:9	10:15	5:7	15:20	20:27	87:135
G. platyphylla	0	5:7	1:6(3)	5:7	2:3	7:8	4:5	24:36
G. rosei	1:1	3:4	5:8	8:20(5)	3:4	4:5	2:5	26:47
G. rotundifolia	0:1	1:2	1:1	2:2	2:6(3)	0	1:4	7:16
G. thompsonii	1:1	8:8	2:2	6:6	1:2	4:10(5)	6:8	28:37
G. tulocarpus	1:1	13:24	5:7	2:5	4:4	6:10	10:30(11)	41:81
Successes	3:7	62:103	19:33	33:57	17:27	36:54	43:80	213:361

*0:2(2) is read as no successes in 2 attempts with 2 of the attempts being selfs.

Total successes, all attempts	213:361	59.0%
Successes excluding 39 selfs	213:322	66.1%
Successes of interspecific attempts	156:231	67.5%
Successes of intraspecific attempts excluding selfs	57:91	62.6%

Table 2. Summary of time required for maturation of seeds in *Guardiola*.

	Broad-leaved Seed Parent			Narrow-leaved Seed Parent		
	Broad-leaved Pollen Parent	Narrow-leaved Pollen Parent	Total	Broad-leaved Pollen Parent	Narrow-leaved Pollen Parent	Total
9			0		1	1
10			0		1	1
11			0		1	1
12			0		0	0
13			0		0	0
14			0		1	1
15			0		2	2
16			0		6	6
17			0	10	5	15
18			0	8	16	24
19			0	2	15	17
20	1		1	6	6	12
21	6		6	6	7	13
22	4	1	5	5	8	13
23	2	3	5	0	1	1
24	4	0	4	5	0	5
25	6	3	9	3	3	6
26	1	2	3	2	0	2
27	0	0	0	0	2	2
28	1	0	1	0	0	0
Mean Days to Mature	23.20	24.22	23.5	20.32	18.97	19.5



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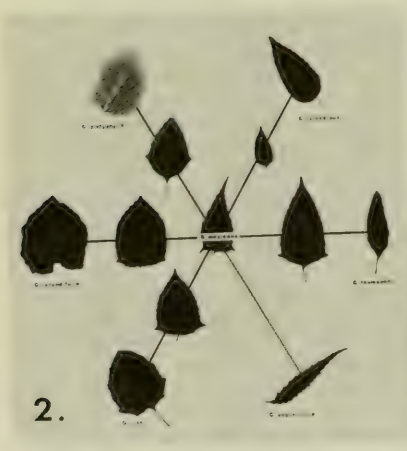

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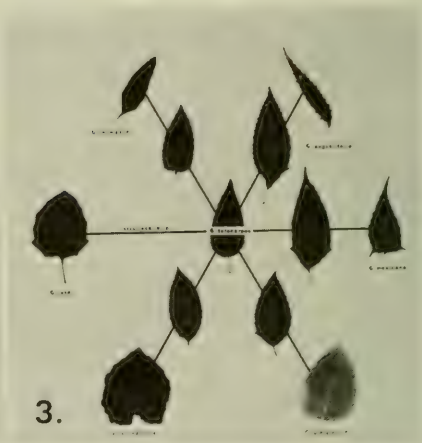

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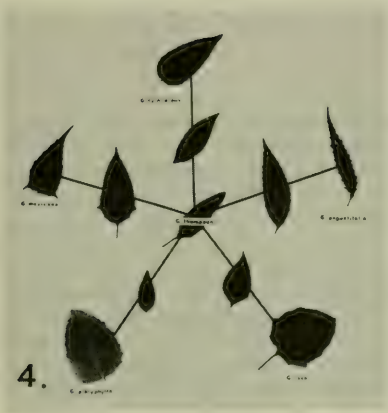
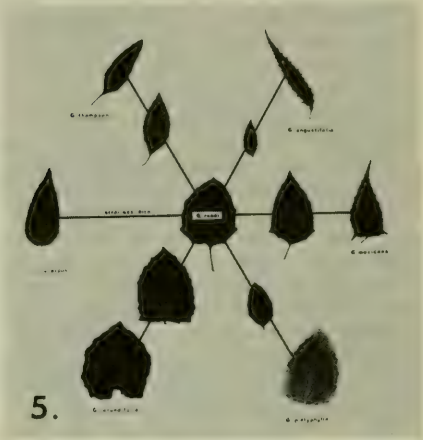
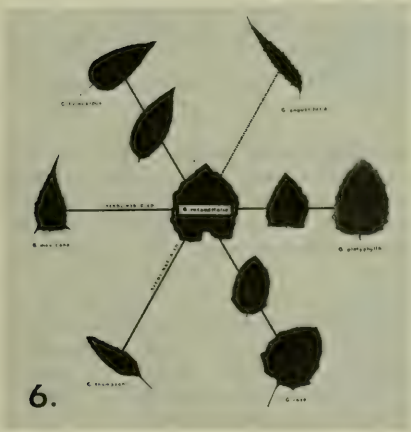
Figure 1. Experimental crosses in *Guardiola*. Heavy lines indicate successful seed set. Broken lines indicate crosses attempted but no seeds set. Figure 2. Experimental crosses using *G. mexicana* as the seed parent. A typical leaf of the seed parent is in the center of the figure. Typical leaves of pollen parents are around the periphery. Typical leaves of the F_1 obtained between the parents. Figure 3. Experimental crosses using *G. tulocarpus* as the seed parent.







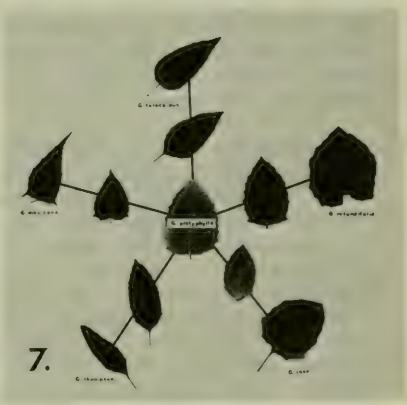


Figure 4. Experimental crosses using *G. thompsonii* as the seed parent. Figure 5. Experimental crosses using *G. rosei* as the seed parent. Figure 6. Experimental crosses using *G. rotundifolia* as the seed parent. Figure 7. Experimental crosses using *G. platyphylla* as the seed parent.

The disk florets are touch-sensitive when they mature. When touched, the style emerges a little from the tube formed by the connate anthers and carries some pollen out with it. At the same time the floret describes a small circle. Stamen irritability is also reported in *Arnica* by Vuilleumier (1969) and Small (1915) who state that there are two basic types of stamen irritability. One involves elongation of the style and the second, contraction of the filaments, causes tilting of the floret toward the tactile stimulus. Hoffman (1894) also noted filament irritability in some Cynareae, especially *Centaurea*, and in *Perezia multifloria* Less. and *Trixis discolor* Gill of the Mutisieae. The mechanism involved in *Guardiola*, whether elongation of the style or contraction of the filaments, is not known at this time. However, on occasion it was noted that the style of the ray florets also exhibited this movement. Therefore, it seems likely that stylar elongation, perhaps due to release of tension, is responsible for the pushing out of the pollen, and that the circular movement of the entire disk floret is due to sequential contraction of the filaments. Thus, when an insect lands on a mature disk floret, presumably to obtain nectar, it touches the style, thus initiating the circular movement of the floret, and a little pollen is pushed out and may be rubbed onto the ventral surface of the insect. When the insect then investigates a ray floret it may transfer the pollen to the ray stigma, thus effecting pollination. The disk floret requires about 15-30 minutes to recover from the touch-stimulated movement, and may repeat the process.

Table 1 shows that of 361 total crosses attempted, 213 or 59% were successful; that is, set seed. There were 39 attempts, none of which were successful, to self plants. If these selfing attempts are removed from the total attempts, then 213 of 322 attempts or 66.1% were successful. The success rates of interspecific (67.5%) and intraspecific (62.6%) were essentially the same. Successful seed set apparently depended on the condition of the plant at the time of pollination and on the viability of the pollen used. *Guardiola* pollen appears to be viable, and sticky, for only two or three days. Some crosses were made deliberately using pollen which was powdery and no longer sticky as it is when fresh. No seeds were set under these circumstances, and it is assumed that the pollen retains its viability for a rather short period of time. Some plants would successfully set seed following pollination with pollen from almost any source and then suddenly stop setting seeds for no apparent reason. Light level may have been important in some circumstances, for I had poor success with plants which were too tall to fit into the growth chamber and were maintained under reduced light conditions. Plants of *Guardiola angustifolia* were especially problematical because when a budding plant was brought into the laboratory from the greenhouse, the buds would abort before flowering.

The time required for maturation of the seeds (from pollination to release of mature seeds) varies considerably; broad-leaved and narrow-leaved species differ (Table 2). When a broad-leaved plant was the seed parent, seed maturation averaged 23.5 days with a median

of 23.5 days, and a range of 20-28 days. When a narrow-leaved plant was the seed parent, seed maturation averaged 19.5 days with a median of 19 days and a range from the remarkably short time of 9 days to 27 days.

Mean maturation time for crosses involving two broad-leaved parents was 23.20 days, while that for two narrow-leaved parents was 18.97 days. A t-test comparison of these means indicates that the difference is highly significant at the 5% confidence level. This data supports the contention of evolutionary divergence of those two species groups.

A t-test comparison of the influence of the pollen parent on the mean days required for seed maturation indicated acceptance of the means as the same at the 5% confidence level when a broad-leaved seed parent is involved and at the 2% confidence level when a narrow-leaved seed parent is involved in the cross. This suggests that the source of the pollen used does not significantly alter the mean days required for seed maturation.

Similar comparisons of the influence of the seed parent on the time required for seed maturation indicate highly significant differences at the 5% confidence level for both broad-leaved and narrow-leaved species groups. This suggests a strong seed parent influence on the time required for seed maturation.

Success in establishing hybrid plants in nature depends on seed viability, seedling vitality, and ability of the F_1 plants to reproduce. Viability of seeds set in these experiments was 96.1%. The embryo in apparently fertile seeds which did not germinate was either malformed or absent.

Approximately 75% of the F_1 seedlings survived at least long enough to produce plants of flowering size. Non-survival of the seedlings was due largely to unknown causes, but also contributing were greenhouse pests which destroyed a number of seedlings, and malfunctioning growth chambers, which on two occasions refrigerated to about .2°C, a temperature below the tolerance limits of some of the seedlings.

Very few of the surviving F_1 plants, many of which were nine months old, flowered under greenhouse conditions. Under similar conditions, plants grown from field-collected seeds flowered in 3 1/2 to 5 months.

INTRASPECIFIC MATING ATTEMPTS. Seed set occurred in 62.6% of the intraspecific mating attempts (Table 1). There were successful intraspecific matings within all *Guardiola* species studied except *G. angustifolia* in which the few florets available were all used in interspecific mating attempts.

Seeds produced from the intraspecific matings germinated. The resulting seedlings grew readily to flowering size. As expected, the range of variation of these plants was within the range of variation of these plants was within the range of variation of the parent species. However, only a few buds were produced by these progeny. Some of the buds were sacrificed in order to examine meiosis, in which pairing appeared normal. The rest of the buds were allowed to flower for use in various mating attempts, none of which were successful.

INTERSPECIFIC MATING ATTEMPTS. Interspecific mating attempts were 67.5% successful (Table 1), essentially the same as in the intraspecific matings.

There were no successful matings involving *G. angustifolia* as the seed parent. However, the 60% success rate when *G. angustifolia* was used as the pollen parent suggests that the problems were physical rather than genetic when *G. angustifolia* was used as the seed parent. Otherwise there was no clear pattern of success or failure.

Seeds resulting from the various interspecific matings were germinated and grew readily to flowering size. The plants varied, but as expected, were intermediate between the parental species. Figures 2-7 illustrate typical leaves from parent plants used in the crossing experiments and pictorially describe the leaves of the hybrid plants derived from the crosses. Almost none of these plants set flowers, but in those which did, meiotic pairing appeared normal. A few buds were allowed to flower and all mating attempts using them as either pollen or seed parent failed. While the sample is small, it suggests a fertility barrier in the progeny, a barrier which would prevent reproduction by any hybrid plant which might occur in nature and thus support the integrity of the various species. Because of the small sample, further work is necessary in order to make certain that such a reproductive barrier exists and what may be its nature.

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NOVELTIES IN CLERMONTIA AND CYANEA (LOBELIACEAE) HAWAIIAN PLANT STUDIES 79

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Below are described three new endemic members of the Lobeliaceae in the Hawaiian flora.

Clermontia tuberculata Forbes, var. subtuberculata var. nov.

Diagnosis Holotypi: A species differt in petiolis laminis et inflorescentiis cum tuberculis minutis et remotis.

Diagnosis of Holotype: Differs from C. tuberculata by having the tubercles of petioles, leaf surfaces, and inflorescence sparse and minute.

Holotypus: Hawaiian Islands, east Maui Island, Hana Forest Reserve, on ridge aboe n. rim of Kipahulu Valley, with Myrsine, Broussaisia, Cyrtandra, Metrosideros, and Cheirodendron, 6,000 ft alt., 29.VI. 1973, Betsy Harrison 289 (BISH).

Specimens Examined: Hawaiian Islands, east Maui Island, Hana Forest Reserve, along ridge above n. rim of Kipahulu Valley, with Brousassia, Vaccinium, and Cheirodendron, 5,950 ft alt., 29.VI. 1973, Harrison 288 (BISH).

Cyanea Grimesiana Gaud., var. Obatae var. nov. Fig. 1.

Diagnosis Holotypi: A specie differt in corollis in alabastris in parte ½ infera in lineis albi-hirsutulis nuper glabratis, lobis calycis 3-8 mm longis 2-2.5 mm latis integribus acutis eis majoribus planis ligulatis illis minoribus deltoideis.

Diagnosis of Holotype: Differing from var. Grimesiana by having the corolla tube in bud white hirsutulous in lines on the lower half, later glabrate; and in the calyx lobes 3-8 mm long, 2-2.5 mm wide, entire, acute, the larger ones plane, ligulate, but the smaller ones deltoid.

Holotypus: Hawaiian Islands, Oahu Island, Waianae Mts., Kaluaa Gulch, 2,000 ft alt., Nov. 28, 1965 John Obata (BISH).

Discussion: C. Grimesiana Gaud., var. Grimesiana also grows in the Waianae Mts., and commonly in the Koolau Range. It differs from the above variety by having the corolla tube glabrous, and the calyx lobes 15-38 mm long, 5-12 mm wide, lanceolate, with undulate margins.

This new variety is dedicated to the collector, John K. Obata (1925-), science teacher at Kawananakoa School, Honolulu.

Cyanea longissima (Rock) comb. nov.

C. scabra Hbd., var. longissima Rock, B. P. Bishop Mus., Mem. 7(2): 259, 1919; E. Wimm., Engler's Pflanzenreich IV, 276b: 66, 1956; St. John, Pacif. Trop. Bot. Gard., Mem. 1: 342, 1973.

Holotypus: Hawaiian Islands, Maui Island, Honomany ditch trail, swampy shaded woods, Mt. Haleakala, April, 1911, J. F. Rock 8,790 (BISH).

Discussion: This plant differs from C. scabra in being unarmed throughout; petioles 3-5 cm long, decurrent margined; blades 30-50 cm long, narrowly oblanceolate; peduncle 8-15 mm long; calyx lobes 2-3 mm long, narrowly deltoid, glabrous; corolla glabrous. C. scabra has the stems prickly; petioles 6.2-10 cm long, marginless, with stout prickles; blades 18-34 cm long, elliptic to broadly elliptic oblanceolate; peduncle 1.5-7 cm long, hispid; calyx lobes 4-6 mm long, obovate to oblanceolate, hispid; corolla tube hispid and the lobes muricate.

C. longissima, of the wet, north side of Haleakala, is judged to be specifically distinct from C. scabra, of both east and west Maui.

C. longissima is known only from the abundant type collection.

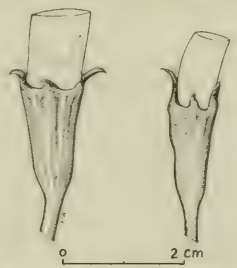

Fig. 1. Cyanea Grimesiana Gaud., var. Obatae St. John, calyx, corolla base, X 2.

PAST AND PRESENT PINES OF TURKEY*

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The genus Pinus L. comprises 66 species according to Shaw (1914), who employed a condensed classification by combining the related taxa, while Gaussen (1960) includes 120 species through a narrower species concept by raising the infraspecific taxa to the species level. Mirov (1967) in his monograph of the genus accepts 105 species, while Little and Critchfield (1969) recognize 94 species in the most recent classification of the genus Pinus. According to the distribution maps of the pines of the world by Critchfield and Little, the genus Pinus is distributed throughout the temperate zones of the northern hemisphere, dominating the forest lands more than any other conifer. Pinus merkusii Jungh & de Vriese is the only species of the genus which extends south of the Equator into Sumatra.

The highest concentration of species occur in the United States and Mexico, California alone having 19 species. Eurasia is another center of evolution with 34 species. Five distinct species are native to Turkey (Krause 1936, Birand 1952, Kayacık 1954, Davis 1965, Critchfield & Little 1966, Mirov 1967, Little & Critchfield 1969, Karamanoğlu, 1976). All five species of the Turkish pines belong to the Diploxylon section of the genus Pinus (Shaw 1914):

1) P. brutia Ten. = Turkish pine (Turkish name: Kızılçam)

2) P. halepensis Mill. = Aleppo pine (Turkish name: Halep Çamı)

3) P. nigra Arnold = Austrian pine (Turkish name: Karaçam)

4) P. pinea L. = Italian stone pine (Turkish name: Fıstık Çamı)

5) P. sylvestris L. = Scotch pine (Turkish name: Sarıçam)

The pines are the most dominant conifers of the forested land of Turkey. According to Güniz (1954), the total area of

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the forested land in Turkey is 10.5 million hectares and the share of the pine species of this total area is 38.5%. The total amount of timber produced in Turkey during 1954 (Güniz p. 15) was 1118 360 m^3 and more than half of this amount was obtained from the various pines (601 854 m^3 or nearly 54.5% of total timber production). The significance of pine products in the Turkish economy and their dendrological and silvicultural aspects have been thoroughly investigated by several Turkish foresters (Yiğitoğlu 1941, Fırat 1942, Öksal 1943, Berkel and Huş 1952, Gülen 1959, Alemdağ 1962, Saatçioğlu and Pamay 1962, Selik 1963, Eliçin 1971). However, I shall briefly point out the economic uses of the pine species of Turkey in the subsequent section of this paper.

I. The extant species of pines in Turkey:

1) Pinus brutia Ten., Prodr. Fl. Nap. I. 22, 1811.

(P. pityusa Steven in Bull. Soc. Nat. Mosc. XI. 49, 1838; P. carica Don in Ann. Mag. Nat. Hist. VII. 459. 1841; P. persica Strangways ex Endlicher, Syn. Conif. 157. 1847; P. eldarica Medwejew in Act. Hort. Tiflis VI - 2, 21, f. 1902)

Pinus brutia is a diploxylon pine belonging to the Sylvestres subsection of the section Pinus (Little and Critchfield 1969). It is a two needle pine with light green foliage. The ovoid cones are sessile, reddish brown or grayish brown, several of them forming whorls around the branches, horizontally oriented and not pendent. The Turkish name Kızılçam (Red pine) refers to the reddish bark of the stems.

This pine is primarily an eastern Mediterranean species distributed throughout the coastal Mediterranean zones of Turkey (Kasapligil 1952, Selik 1963, Şefik 1964). Outside Asia Minor (Anatolia), it also occurs in Cyprus, Crete, Aegean islands, north eastern Greece, as well as in Pitsunda between Gagra and Gudauta, northwest of Sukhumi, Georgia, U.S.S.R., central Transcaucasus, and near Soichi and the Crimean peninsula on the Black Sea coast of Russia (see map 31 in Critchfield and Little 1966). There is, indeed, a close genetic relationship between P. brutia Ten. and P. halepensis Mill. Several authors including Shaw (1914) considered P. brutia as a variety of P. halepensis and called it P. halepensis Mill. var. brutia (Ten.) A. Henry (Bailey & Bailey 1976). However, the present writer (Kasapligil 1947, 1952) and several other authors in recent publications (Czeczott 1954, Mirov 1955, 1967, Bean 1976) regard these two pines as distinct species since they present sharply distinguishable morphological and biochemical characteristics along with their two separate main distributional areas, i.e. Pinus halepensis primarily in the western Mediterranean region and

P. brutia in the northeastern mediterranean region. In the areas of overlapping distributions, these two species hybridize and consequently intermediate forms are found in such areas, as in northwestern Greece, the Aegean islands, and in Syria.

Pinus pithyusa Strangw., P. eldarica Medw., and P. stankewiczii (Suk.) Fom., are three species of pines described from the Black Sea Coast of Russia and Central Transcaucasus. These are closely allied to Pinus brutia Ten. Both Malejeff (1929) and Gaussen (1960) treat them as varieties of P. brutia. Three years ago, while I was in Pitsunda about 40 km. northwest of Sukhumi (= Sukum Kale), in Georgia S.S.R., I had the opportunity to visit a fine stand of P. brutia var. pithyusa on the edge of the coastal sands. This forest consists of tall, handsome trees of uniform age, associated with semixerophillous mediterranean elements intermingled with mesophytic Pontian elements (cf. Kolakovsky 1962, 1975): Juniperus oxycedrus, Acer campestre, Rhus coriaria, Cotinus coggygria, Eryngium maritimum, Foeniculum vulgare, Ilex colchica, Hedera colchica, Periploca graeca, Asparagus litoralis, Tamus Communis, Smilax excelsa, Vitis silvestris, Berberis vulgaris, Ruscus ponticus, Carpinus orientalis, C. caucasica, Corylus pontica, Lonicera caprifolium, Celtis australis, Cistus incanum, C. tauricus, Helianthemum tomentosum, Arbutus andrachne, Quercus iberica, Origanum vulgare, Teucrium chamaedrys, Polygala albovii, Paliurus spina-christi etc. The vegetative and the reproductive organs I collected from the Pitsunda pines proved identical with those of P. brutia. During the excursion, I came across the oldest specimen of the Pitsunda pine, which was fenced in. "The Patriarch" tree was 35 m. tall and 2 m. in diameter. Its age was estimated at over 300 years. Unlike any other specimen of the P. brutia groups I have seen, the lower portion of the stem of the Patriarch tree was covered by burls of different sizes (Fig. 2).

I did not have the opportunity to visit the relict forest of P. brutia var. eldarica in Çoban dağ near Tbilisi, but I have seen the cultivated cone-bearing specimens of this variety in the Eddy Arboretum of the Institute of Forest Genetics in Placerville, California. It is indeed quite similar to P. brutia rather than to P. halepensis. Likewise, P. stankewiczii of the Crimean peninsula should also be maintained as a variety of P. brutia as suggested by Gaussen (1960).

Pinus brutia var. agraphiottii Papajoannou (1936), described from the Lesbos island of Greece, is characterized by deformed stems branching from the base forming a bushy, compact crown without a main axis. Recently Selik (1962) described a columnar variety from Balıkesir in northwestern Anatolia, naming it P. brutia var. pyramidalis, which seems to have an ornamental potential.

Until a few years ago, Pinus brutia was a popular item for street and garden planting as a shade tree in California. It was available for a nominal price in supermarkets as well as in variety stores under the name of Turkish pine. However, older trees I observed in the parks, private gardens, and on various campuses proved to be P. halepensis which had been introduced from the western mediterranean region at an earlier date. In its native land, P. brutia is used primarily for timber production because of its hard, durable wood. It is also an important source of oleoresin (Okay 1940).

Fossil record:

Kolakovsky (1965) reported the occurrence of eight different pines from the Tertiary period of western Georgia in the Caucasus. Two of these fossil pines, P. euxina Kolak. (= P. pontica Kolak. non Koch) and P. praepithyusa Palib. (= P. pithyusa Strangw. fossilis) are clearly related to Pinus brutia and it is most likely that these two fossil species represent the ancestral forms of the P. brutia group including the Caucasian varieties mentioned earlier. As I judge from the cone illustrations, the outline of the apophyses of the ovuliferous scales in P. euxina is quite variable ranging from quadrangular to hexagonal shapes while the apophyses of the extant P. brutia are mostly rhombiform although the apophyses near the cone apex of the latter species often approach polygonal outlines. The P. praepithyusa cone has a more or less cylindrical outline while the cones of the extant species are conical or ovoid. However, the ovuliferous scales of P. praepithyusa are quite similar to those of P. brutia since the apophyses exhibit horizontal keels. The upper edges of the apophyses in P. praepithyusa cone are rounded. Such cone scales with rounded apophyses along the upper edges are confined to the basal portion of the cone in the extant species.

A summary of the fossil taxa related to P. brutia Ten. is given below (After Czeczott 1954, Kolakovsky 1965, Nemejc 1968 and others).

Fossil taxa	Age	Locality
P. praepithyusa Palib.	Oligocene to Meothian	Western Transcaucasus
P. pithyusa Strangw. fossilis	Tertiary, upper Pliocene	Western Georgia, Abkhasia, S.S.R.
P. palibinii Dorof.	Sarmatian	Paman Peninsula, Azov Sea, U.S.S.R.
P. paraeuxina Kolak.	Sarmatian	Kavaklık Hills, Western Georgia, USSR

Fossil taxa	Age	Locality
P. paraeuxina Kolak.	Meothian	Kodor River, Abkhasia, S.S.R.
P. euxina Kolak.	Pontian strata	Kavaklık hills, W. Georgia, U.S.S.R.
P. sarmatica Palib.	Miocene	Crimean Coastal region, U.S.S.R.
P. wassoewiczi Palib.	Miocene, Sarmatian	Transcaucasus, Georgia, U.S.S.R.
P. salinarum Partsch	Lower Miocene	Wielitzka, Poland
P. sp. aff. brutia Ten.	Miocene	Zemplen Mountains, N.E. Hungary
P. ferreri Massal	Miocene	Sinigallia near Ancona, Italy
P. saturni Unger	Middle Miocene	Radojob, Yugoslavia

Recently, Aytuğ and Şanlı (1974) reported the occurrence of carbonized wood remains of Pinus brutia from the late Tertiary brown coal deposits at Ağaçlı on the Black Sea Coast near Bosphorus.

2) Pinus halepensis Mill., Gard. Dict. 8th ed. Pinus No. 8, 1768.

(P. maritima Lambert, Gen. Pin. I. 13, t. 10, 1803;
P. arabica Sieber ex Sprengel, Syst. Veg. III, 886, 1826;
P. pyrenaica David in Ann. Soc. Hort. Paris, 186, 1833;
P. hispanica Cook, Sketches in Spain, II, 337, 1834;
P. abasica Carriere, Trait. Conif., 352, 1855.)

Pinus halepensis is also a diploxylon pine from the Sylvestres subsection of the section Pinus. Aleppo pine is a two-needle pine, with slim and tender foliage 6-12 cm. long, yellowish green in color. According to Krüssmann (1972) and Bean (1976), the number of needles varies from two to three, but I personally did not see any specimens with three needles in this particular species although I observed variation in the number of needles in several other pine species. The most distinguishing characteristic of the Aleppo pine is the recurved condition of the ovulate cones on firm peduncles 10-20 mm. long, 6-10 mm. thick (Fig. 31). In a closed state, the seed cones are 5-10 cm. long and 3-4.5 cm. wide at the base. The mature cones remain attached to the trees for several years.

The Aleppo pine is primarily a western mediterranean species most abundant in Spain and the Balearic islands, but extending eastward less commonly through southern Europe to the mediterranean coasts of Asia Minor. In north Africa, it is distributed from Morocco to Libya in many isolated occurrences. Strangely enough,

since it is not found in Aleppo, its name is misleading. However, it is indigenous to Israel, forming extensive forests in Gilead and reaching its southernmost limit near Hebron (Zohary 1973). It is the principal tree of the coniferous forests in northwestern Jordan (Kasaplıgil 1956 a and b). Isolated groves of P. halepensis occur along coastal areas of Syria, Lebanon, and Turkey. According to Dallimore and Jackson (1967), it is also a native of Cyprus, but the natural occurrence of the Aleppo pine in Cyprus requires verification.

The early records regarding the occurrence of P. halepensis in Turkey are based on cultivated material (Krause 1936). My first collections of this species were obtained during July 1944 from cultivated trees at the Stock Breeding Station in Çukurova, north of Adana (Birand 1952) during a field trip with Professor Savni Huş of the Forestry College at Istanbul. According to my field notebook, these cultivated specimens were transplanted from the "Sarıçam Forest," situated a few miles north of the station along the road to Kozan. Kayacık (1954) verified this locality and later, he discovered new localities (Kayacık 1973) which are marked on the distribution map. During the same field trip in July 1944, I made notes concerning the sympatric distribution of P. halepensis and P. brutia in the maquis around the Karayılanlı Village at an altitude of ca. 350-400 m., between Payas and Iskenderun. Unfortunately, I did not make specimens and this locality needs to be revisited for verification. The isolated distributions of Pinus halepensis in Turkey, Syria, Lebanon, Israel, and Jordan are an indication of the relict nature of this species in the Middle East.

Pinus halepensis is closely related to P. brutia and these two species cross naturally. However, it is a distinct species from P. brutia in regard to its chemical properties. The turpentine of P. halepensis is dextrorotatory while the turpentine of P. brutia is laevorotatory (Mirov 1955 and 1961). Likewise the needle anatomy of P. halepensis differs from that of P. brutia as described and illustrated by Selik (1963) and Harlow (1931). While P. brutia is resistant to the scale insect Matsucoccus, P. halepensis is susceptible to this disease. Another instance of a natural hybrid between P. halepensis and P. pinaster was reported by P. Schütt.

Pinus halepensis has several varieties which can be considered as ecotypes of diverse climatic zones of the western mediterranean region. It is noteworthy to mention P. halepensis var. algeriensis Gaussen described from Algeria. This variety is characterized by its profusely branched, compact form and by its large pollen wings.

Because of its irregular stem formation, Pinus halepensis is not as desirable as P. brutia for timber production. It is a

source of oleoresins and of fuel wood. In Spain and in other parts of the western mediterranean region, it is used for erosion control and in afforestation since it is tolerant to heat and drought and can grow in poor soils.

Fossil records:

Apparently, Pinus halepensis had a wide distribution during the Tertiary period. It extended from the shores of the Tethys sea to Poland in northern Europe and penetrated the central Anatolian plateau during the Miocene. This is verified by the recent discovery of Pinus halepensis ssp. alpanii in the Gürcü Valley of Güvem village near Kizilcahamam about 90 km. north of Ankara. Here I would like to summarize the list of the fossil taxa related to P. halepensis from the available literature. However, this is not a conclusive list and the correct identity of these fossil materials deserves a thorough revision. Possibly, many of these binomials are synonyms.

Fossil taxa related to P. halepensis Miller (after Czeczott 1954, Gaussen 1960, Nemejc 1968 and Klaus 1977)

Fossil taxa	Age	Locality
P. consimilis Sap.	Miocene	Rochesaure, Ardèche, France
P. cortesii A. Brong.	Tertiary	Northern Bohemia, Czechoslovakia; Dürkhelm, Lower Main Valley, Germany.
P. hageni Heer	Lower Miocene	Baltic region.
P. halepensis Mill.	Upper Miocene, Pannon E.	Near Vienna, Austria
P. halepensis Mill.	Pliocene	Sofia, Bulgaria; Romania
P. halepensis Mill.	Pleistocene	Saint Martial, Gard, France.
P. h. var. algeriensis Gauss.	Pleistocene	Pollen grains from Ahaggar (Hoggar) Mountains in Southern Algeria.
P. h. var. atavorum Marion	Plio-Pleistocene	Saint Marcel near La Valentine, France.
P. aff. halepensis Mill.	Middle Miocene	Leoben, Austria.
P. hepios Ung.	Tertiary	Serbia, Southern Yugoslavia; Lower Main Valley, Germany.
P. hepios Ung.	Pliocene	Northern Bohemia, Czechoslovakia.

Fossil taxa	Age	Locality
P. kotshiana Ung.	Miocene	Zemplen Mountains, northeastern Hungary; Transylvania, Romania.
P. leptophylla Sap.	Oligocene	Armisan, France
P. macroptera Sap.	Miocene	Near Narbonne, Southern France.
P. ornuta Stern.	Pliocene	Bohemia, Czechoslovakia.
P. platyptera Sap.	Oligocene	Armisan, France
P. pultonis (Bailey) Sew.	Eocene	England
P. salinarum Partsch.	Lower Miocene	Wielizca, Poland
P. setiformis Sap.	Oligocene	Armisan, France

Pinus plutonis (Bailey) Sew. illustrated by Gaussen (1960, p. 218, fig. 364/7) after Gardner is represented by three slender cones each with separate peduncles derived from a common stalk. This material seems to be quite remote from P. halepensis since the apophyses of the cone scales are mostly hexagonal and lack the transverse keels. It may represent a teratological specimen.

3) Pinus nigra Arnold, Reise Mariazell 8, t, 1785.

(P. laricio Poiret in Lamarck, Encycl. Meth. 5, p. 339, 1804; P. halepensis Bieb. (not Miller), Fl. Taur. Lauc. 2, p. 408, 1808, P. pinaster Besser (not Aiton), Fl. Gallic., 2, p. 294, 1809; P. maritima Aiton (not Lambert), Hort. Kew 5, p. 315, 1813; P. sylvestris Baumgart. (not Linn.) Baumgart, Stirp. Transsilv. 2, p. 304, 1816; P. pyrenaica Lapeyrouse, Hist. Pl. Pyren., Suppl. 146, 1818).

This species, having a wide distribution throughout central and southern Europe from Spain to Turkey, has several subspecies depending upon its genetic populations confined to isolated occurrences, altitudinal ranges, island adaptations. The Turkish materials I examined in the field or in herbaria may be referred to P. nigra ssp. pallasiana (Lamb.) Holmboe in Berg. Mus. Skr. 1, p. 29, 1914 (P. pallasiana Lamb. Pin. 2 ed. 2, 1828; P. laricio var. pallasiana Antoine, Conif. 6, 1840; Asch. and Graebn. Syn. 1, 2 ed. p. 333; E.V. Wulff, Fl. Krimea 1, 34; P. laricio M. Bieb. 3, p. 623, 1819; P. maritima Pall. Ind. Taur. p. 59, 1795; P. nigra var caramanica Rehder Man. Cult, trees N. Amer. p. 61, 1927; P. pinaster Stev., Verz. Taur. wildw. Pfl. 2, 1857; P. nigra Antoine var. pallasiana Antoine ex Bernhard, Mitteil. d. deutsch dendrolog. Ges. 39, 1931; P. fenzlii Ant. and Kotschy ex Carr., Traite gen. Conif. p. 496, 1867).

The Turkish black pine is a diploxylon pine with two needles and it belongs to the subsection Sylvestres Loud. of the section Pinus (Little and Critchfield 1969). It is characterized by dark green, stiff needles, 8-18 cm. long, brownish yellow twigs which match the color of the sessile cones, 5-10 cm. long, at maturity. The apophyses of the cone scales are more or less rhombic but often exhibit rounded upper edge, especially in the scales at the cone base or among those near the cone apex. The umbos are ovoid or rhombic with a short persistent mucro at maturity.

Pinus nigra Arnold ssp. pallasiana (Lamb.) Holmboe is widely distributed in northern, western and southern Turkey (see the map). The isolated groves of this pine are scattered in central Anatolia like little islets within the vast steppes (Kasapligil 1960), mostly associated with Quercus pubescens Willd. and other oaks. In Russia, it occurs along the Black Sea coast of the Crimean peninsula, which is the type locality of this subspecies. In the fall of 1976, while botanizing along the Black Sea Coast of Eastern Thrace, I saw fine stands of this pine between Kıyıköy (=Midye) and Kasatura (=Kastros) associated with Quercus hartwissiana, Arbutus unedo, Calluna vulgaris, Erica verticillata, Osyris alba and several other mediterranean elements. The Black pines in this locality were 15-20 m. high with the diameters ranging from 50-75 cm. at breast height. The oldest specimens in this forest were approximately 150 years old and they were branching into 2-3 sizeable stems at breast height. I was pleased to notice the abundance of young seedlings of all ages on the forest floor, which is a good indication of a successful regeneration. Many trees near the Black Sea Coast of Kasatura were destroyed by a forest fire in 1966 and such areas deserve immediate reforestation with the same subspecies.

Pinus nigra has several geographical varieties such as var. austriaca Endl. (Austrian pine), var. corsicana Endl. (Corsican pine), var. pyrenaica Grenier and Gordon (Pyrenese pine), var. calabrica Loudon (Calabrian pine) of Sicily and southern Italy. In addition to these, many horticultural varieties with golden or yellow leaves and dwarf, prostrate or drooping forms are well known garden favorites and readers are referred to Krüssmann's (1972) comprehensive descriptions. The closest relative of P. nigra is P. heldreichii Christ of the Balkan peninsula which is recognized as a distinct species by most recent workers, although it was submerged into P. nigra by Shaw (1914). An artificial hybrid between P. nigra Arnold and P. resinosa (N.E. United States and Canada) was described by Critchfield (1964) and Little and Righter (1965).

P. nigra ssp. pallasiana is a valuable timber tree for construction purposes. It also furnishes fuel wood and is a source for turpentine and rosin. In Turkey, it grows mainly in calcareous soils and can tolerate drought and low temperatures.

The ancestral forms of P. nigra are known from the Lower Cretaceous of Europe. The only fossil record pertaining to Turkey is based on thirteen carbonized wood specimens from the brown coal deposits of the late Tertiary period located at Ağaçli near Bosphorus which is not far from the Kasatura forests mentioned above (see Aytuğ and Şanli 1974). The related fossil taxa from the countries neighboring Turkey and from other localities are summarized below.

Fossil taxa related to P. nigra (After Gaussen 1960, Mirov 1967, Nemjc 1968 and others)

Fossil Taxa	Age	Locality
Pinus fittoni Carruth	Lower Cretaceous	England
P. heidingeri Ung.	Pliocene	Styria and Piedmont, N.W. Italy
P. hampeana Ung.	Miocene	Switzerland; Steiermark (Austria); Greece.
P. junonis Kovats.	Miocene (also Pliocene)	Erdöbenye, Hungary; Rochessauve aux Coirons, Ardeche, France
P. jovis Ung.	Miocene	Radaboj, Croatia, Yugoslavia
P. laricio Eng. & Kink	Tertiary, Pliocene	Lower Main Valley, Germany; Northern Bohemia, Czechoslovakia
P. laricio Ettingh.	Miocene	Leoban, Steiermark, Austria.
P. laricio Poir.	Pliocene	Sofia, Bulgaria.
P. laricio Poir.	Miocene, Tortonian	Slatiora, Romania.
P. laricio Poir. fossilis	Oligocene, Lower Miocene	Central Europe
P. laricioides Ung.	Oligocene, Lower Miocene	Central Europe
P. laricioides Menzel	Pliocene	Northern Bohemia, Czechoslovakia
P. aff. laricio Poir.	Oligocene	Samland, Eastern Prussia
P. laricio thomasiana Heer	Oligocene	Baltic Region
P. aff. laricio pliocenica Kink.	Upper Pliocene	Lower Main Valley, West Germany
P. laricio var. salzmanni Sap et Plan (= P. Pyrenaica Sap)	Pleistocene	Tuff deposits of Montpellier, S. France

Fossil Taxa	Age	Locality
P. massalongi E. Sism.	Miocene	Chieri, Piedmont, N.W. Italy
P. microcarpa Sap.	Oligocene & Miocene	Armissan, France
P. nigra Arnold	Pliocene	Romania.
P. nigra Arnold	Late Tertiary	Ağaçlı, Black Sea Coast, Istanbul, Turkey.
P. nigraeformis Bolkhov.	Cretaceous	Moscow Province, USSR
P. repanso-squamosa Ludw.	Miocene	Wetterau, Prussia
P. schnittspahni Ludw.	Miocene	Wetterau, Prussia
P. thomassiana (Goepp.) Reich.	Oligocene	Silesia, Poland.
P. thomassiana (Goepp.) Reich.	Oligocene, Lower Miocene	Central Europe
P. thomassiana (Goepp.) Reich.	Miocene	Kaliningrad (formerly Königsberg) USSR.
P. thomassiana (Goepp.) Reich.	Middle Miocene	Søby-Fasterholt, Central Jutland, Denmark.
P. thomassiana (Goepp.) Reich.	Pliocene	Kodor River, Georgia, U.S.S.R.
P. trichophylla Sap.	Oligocene	Armissan, France

Among these fossil taxa, P. thomassiana (Goepp.) Reich. is the species most frequently encountered in Europe. Kilpper (1967) reported the occurrence of a diploxylon pine closely related to P. thomassiana from the Tertiary of Fortuna-Garsdorf in the lower Rhine Valley. As far as I know, the northernmost Tertiary distribution of this fossil species was reported by Christensen (1975) from Central Jutland in Denmark. The compressed cones illustrated in his plate 1, figures 1-4, show remarkable similarity to the recent material. Apparently, the ancestral forms of P. nigra had much wider distribution than the extant species, reaching the Jutland peninsula in northern Europe and the Caucasian region in the east.

4) Pinus pinea L. Sp. Pl. 1000. 1753;

(P. sativa Lamarck, Fl. Franç. II. 200. 1778;
P. maderiensis Tenore in Ann. Sci. Nat. Ser. 4, II. 379. 1854).

This nut pine belongs to the subgenus Pinus and to the section Pinea and to the subsection Pineae (cf. Little and Critchfield 1969, p. 11). It is a two needle pine with large woody cones which require three years to mature (Fig. 4). The edible seeds are large with thick shells and rudimentary wings which detach readily.

The natural distribution area of the Italian stone pine extends from the Iberian peninsula through the Mediterranean islands and southern Europe to Turkey. Because of its nutritious seeds and widely spreading crown upon aging, this pine has been under cultivation for many centuries in the Mediterranean region as well as in other parts of the world with a mild Mediterranean climate. Fırat (1942, p. 15) gives a detailed account of the authenticity of the distribution of this pine in Turkey. It forms extensive pure stands in Kozak near Bergama (Pergamus) in western Turkey and between the Aksu and Manavgat rivers on the way from Serik to Side in southern Anatolia. Other localities of natural stands are between Aydın and Milos, Ayvalık (cf. Karamanoğlu 1976), along the Bay of Edremit and the vicinity of Gemlik (Kayacık 1957). The sizeable, old specimens along Bosphorus (Fig. 6) represent cultivated material as pointed out by Krause (1936). The isolated groves are located in Onsan Village near Maraş, Iskenderun (Alexandrette) in southern Turkey, and Düzköy (Kalanema) 20 km. south of Akçaabat and Çoruh Valley were botanized by Radde (1899) who gave a detailed description of the Pinus pinea forests he observed on the left slopes of the Çoruh river near the village of Naşviye (=Naswia). According to Radde (pp. 126-127), the name of the village is derived from the local name of Pinus pinea and that the pinion cones were sold for the extraction of the edible nuts in the markets of Artvin under the same name. Today, the same locality is known as "Fıstıklı" which is the Turkish equivalent for pine nuts. "Naşviye" is not a Turkish word and I assume it represents a Georgian term applied to the pine nuts since the Georgian language is spoken commonly among the villagers and forestry workers, even at the present time, in the vicinity of Artvin.

Bernhard (1929-31), Fırat (personal correspondence 1965) and Kayacık (1965) suggest that the stands of the pinion pine near Artvin possibly represent an introduction by man. During the summer of 1964, I visited Artvin and the Çoruh Valley for the first time while studying the variation and distribution of Corylus along the Black Sea Coast of Turkey. I was very impressed with the park-like aspect of the P. pinea stand near Fıstıklı Village about 7 km. west of Artvin on the way to Hatila Valley (Fig. 3). The trees were equally spaced, 8-10 m. high and their diameters at breast height ranged from 30 cm. to 40 cm. Age determination was made by obtaining core samples by an increment borer from selected trees as well as by counting the growth layers on the stumps of fallen trees. The average age of the stand was calculated 80 years, coinciding with the year A.D. 1884 during which northeastern Turkey was occupied by the Russians following the Russo-Turkish war, 1877-1878. Artvin, Kars, Ardahan, Bayazit, Sarıkamış, and Erzurum remained under the Russian occupation until 1918 when the northeastern provinces

of Anatolia were returned to Turkey upon a treaty with the Bolshevik forces. Curious elderly villagers stopped by to chat with me during my field work in the pinion pine forest near Artvin. Some of them did claim that this forest was established by planting during the Russian administration of the area. I checked this point through the foresters and old archives at the forestry headquarters in Artvin, but my attempts were fruitless since no one could find any written document about the past history of the pinion pine forest. I went back to the forest again and reexamined the vegetation associated with the pinion pines for an inventory. The typical mediterranean elements were abundant in the accompanying flora.

Twelve years later, I visited the Fıstıklı locality of Artvin, in September 1976. This time, I was accompanied by Prof. Daniel Axelrod and by several foresters from the forest districts of Trabzon and Artvin. My first impression was that the pinion pine stand had been heavily grazed and that the best specimens with straight stems and widely spreading umbrella-shaped crowns were selectively cut and removed, possibly for construction purposes by the encroaching villagers around the forest. Woody plants and the herbaceous perennials in the undergrowth were in prostrate forms under grazing pressure and the soil surface was largely exposed without any plant cover in many places. The eastern and northeastern slopes have a land inclination of 70% where I could hardly stand straight without leaning against a tree or holding on to the creeping shrubbery. The lower edge of the forest starts from 150 m. from sea level reaching the altitudes between 600 and 650 meters along the upper edge. The animal trails along the contours were my "life saver" to botanize within the pine stand. Once more, I collected and inventoried the accompanied flora many of which were typical members of the mediterranean maquis. I had the feeling that the pinion pine was really in its homeland with all its natural associates until I discovered the gulleys where the basal portions of the pinion pines were completely eroded, exposing the bottoms of the stems constricted by girdling of the lateral roots. Fig. 10 depicts one of these typical constructions which can easily be fatal in individual trees during further stages of development. In nursery practice, it is well known that pine seedlings raised in containers become root bound with the lateral roots strangling the main root or the base of the hypocotyl. That is why the young seedlings undergo root pruning upon transfer to larger containers during transplanting for afforestation or reforestation practices as a routine procedure. This common practice was not known until recently, hence, in all probability the pines of the Fıstıklı village by Artvin were cultivated by man, possibly during the Russian occupation which coincides with the ages of the oldest trees. During my recent visit last fall, I took four

core samples from the oldest specimens I could select. The ages were 76, 80, 83, and 92 (the sample tree in fig. 10 being 83 years old). The oldest specimen was dated back to the year 1884, thus coinciding with the Russian period. The pinion pine occurs in cultivation in Mingrelia (Caucasus) as well as in the southern shores of Crimea (Komarov 1934) which might have been introduced during the early kingdoms of Pontus and Colchis. Both of these kingdoms had extensive sea trades throughout the Black Sea coasts as well as with the Mediterranean countries. Pinion nuts were among the important commodities of the early civilizations and have been carried around through the early routes of human migration for centuries. Teamwork between archeologists and botanists may discover the origin and dispersal of Pinus pinea which is primarily a western Mediterranean element. The Tertiary fossils of P. pinea from Turkey were reported by Aytuğ and Şanlı (1974) from the brown coal deposits at Ağaçlı locality near Bosphorus. Zodda (1903) reported the occurrence of a Pinus pinea fossil from Messina in Sicily, but one would expect additional new fossil findings of Pinus pinea from the Iberian peninsula where it forms extensive forests in diverse environmental conditions.

Another locality for Pinus pinea in the Black Sea coast was reported by Hendel-Mazzetti (1907) from the Kalanema valley, southwest of Trabzon. Last fall, we entered this valley from the coastal town of Akçaabat, 12 km. west of Trabzon. The modern name for the Kalanema valley is Söğütlü dere which is also known as Düzköy deresi. We penetrated the valley up to the Düzköy village (Kalanema) 20 km. by a stabilized gravel road following the river bed where the main type of rock consists of agglomerates containing andesite. The vegetation of this valley is lush green with mesophytic broad-leaved trees such as Alnus barbata, Platanus orientalis, Carpinus orientalis, C. betulus, Populus nigra, Cornus mas, Ulmus campestris, Diospyros lotus mixed with a few mediterranean elements such as Arbutus andrachne, A. unedo, Pistacia terebinthus, Olea europea, Ficus carica, etc. Scattered Pinus pinea stands occur on both sides of the valley between the elevations of 50 m. to 500 m. In Yeşiltepe (Vasil or Vazil village), at the altitude of 320 m. above sea level, the residual small stands of rather young pinion pines were severely pruned (Figs. 7 & 9) by the villagers to be used as fuel wood. The principal rock of these steep slopes is augite olivene basalt exposed by soil erosion. Core samples obtained from the three largest specimens revealed their ages to be 40, 54, and 75 years. Professor Fırat informed me that he counted 70 growth layers on a stump 43 cm. in diameter when he visited the same locality in 1949. According to the information Professor Fırat gathered from the villagers, the older specimens with straight boles were extracted selectively and transported by the river to Akçaabat for timber and the remaining stands were maintained by cultivation for fuel wood extraction. In Yeşiltepe locality, the pinion pines are associated with Prunus laurocerasus, Cydonia oblonga, Acer campestre, Alnus barbata, Carpinus orientalis,

Quercus petraea, Corylus pontica, Pinus sylvestris ssp. hamata, and with a few Mediterranean elements such as Juniperus oxycedrus (arboreal forms), Cistus salviifolius, Ficus carica and Olea europaea. Most probably, like the figs and olives, pinion pines have been naturalized in this locality through the years, since the area in question was one of the early settlements of the Pontian Kingdom, 6th century B.C. (cf. Hammond's Historical Atlas 1963). The pinion pine stands of the Yeşiltepe locality (old Vasil village of Kalanema) are interspersed with corn fields and vegetable gardens in small lots where tobacco, eggplants, tomatoes, green peppers, string beans, cabbages, pumpkins, squashes and hazelnuts are cultivated. With the exception of the native filberts, all the vegetable crops are introduced to this area and it is quite possible that the pinion pines represent one of the earliest introductions.

Pinus pinea wood is utilized as timber for construction and fuel. According to Baytop (1963), the stem wood contains 7.75% oleoresin and the seeds are an export item, each tree yielding an average of 6-8 kg. (11-15 lbs.) of shelled pinion nuts.

5) Pinus sylvestris L. Sp. Pl. 1000, 1753.

(P. rubra Miller, Gard. Diet. ed. 8, 1768; P. tatarica Miller, Gard, Dict. ed. 8, 1768; P. mughus Jacquin (not Scopoli), Icon. Pl. Bar. 1. t. 198, 1781; P. resinosa Savi (not Aiton), Fl. Pisa, 2. 354, 1798; P. humilis Link in Abhandl. Akad. Berlin, 171, 1827; P. frieseana Wichura in Flora 42, 409, 1859; P. regensis Desf. Cat. Hort. Paris Arb. 2, 61.)

The so-called "Scotch pine" occupies a larger distribution area than any other species in the genus. Latitudinally, it extends from the Scandinavian peninsula to the Iberian peninsula in western Europe and longitudinally from Scotland to the Sea of Okhotsk in eastern Siberia. Due to the fact that Pinus sylvestris grows under a great variety of edaphic and climatic conditions, it has many ecotypes. The continuity of the general distribution area of the Scotch pine was disrupted by geological changes during the Tertiary period and by the following glaciations of the Neogene which resulted in geographical isolations and many geographical races. Therefore, the Scotch pine is a very complex species with many subspecies, varieties, and forms. Gaussen (1960) divided the "varieties" of P. sylvestris into seven groups. In a recent monograph of P. sylvestris, Pravdin (1964) distinguished five subspecies based on the variation of the geographical races:

- P. sylvestris L. ssp. sylvestris in western Europe and the European part of U.S.S.R., excluding Crimea and Caucasus.

- P. sylvestris L. ssp. hamata (Steven) Fomin. in Crimea and Caucasus.

- P. sylvestris L. ssp. lapponica Fries. Northern Europe and Asia, north of 62° N.

- P. sylvestris L. ssp. sibirica Ledeb. Distributed between 52° N. and 62° N. in Asia.

- P. sylvestris L. ssp. kulundensis Sukaczew. In the transitional zones to the steppes of U.S.S.R. in Asia, south of 52° N.

According to the comprehensive discussion of P. sylvestris in the Mediterranean region by Mirov (1967, pp. 257-261) and my earlier correspondence with him (Mirov 1965), the Turkish materials of P. sylvestris L. belong to the subspecies hamata (Steven) Fomin which is distributed throughout northern Anatolia from the Russian border in the northeast to the vicinity of Afyon in the west. According to Pravdin's infraspecific classification, P. sylvestris L. ssp. sylvestris does not occur in Turkey while P. sylvestris L. ssp. hamata (Steven) Fomin is represented by several ecotypic varieties and growth forms which need to be studied. The synonyms of this subspecies prevalent in Turkey are P. hamata (Steven) Sosnowsky and P. sosnowskyi Nakai.

Pinus sylvestris L. ssp. hamata (Steven) Fomin is a diploxylon pine with two needles and it belongs to the Sylvestres Loud. subsection of the section Pinus. It reaches a height of 20-30 m., and has reddish yellow bark, hence the Turkish name Sarıçam (= Yellow pine). Its crown is quite variable depending on the nature of branches such as "drooping type," "horizontally branching type," "erectly branching type," "pyramidal" and "compact" types (cf. Eliçin 1971). P. sylvestris ssp. hamata is distinguished from other indigenous pines of Turkey by its resinous buds, twisted needles (2.5-8 cm. long), yellow brown and shiny cones born on short stalks. The apophyses of the cone scales are projecting prominently, forming recurved hooks so characteristic for this pine.

Two causacian varieties of P. sylvestris ssp. hamata seem to be widely distributed along the coastal mountain range of northeastern Anatolia:

a) P. sylvestris L. ssp. hamata (Steven)Fomin var. armena (Koch) Pravdin

(cf. Pravdin 1964, p. 137-138) is depicted in fig. 12, Kasaplıgil No. 3879.

(Syn.: P. armena Koch in Linnaea 22, 297, 1849; Id. Dendrol. 2, 2, 281; Fom. in Monit. Jard. bot. Tbilisi 24, 20-22; Vseukr. A. N. Trudy Fiz. - Mat. Vidd. 11, No. 1, 26; P. sylvestris L. ssp. armena Koch (Fomin 1914); P. caucasica Fischer (1889); P. altissima Ledebour (1889); P. erzerumica Calvert (1858); P. sylvestris latifolia Gordon (1858); P. montana Mill. var. caucasica Medvedjev (1905); P. caucasica N. Busch, Tsennye derevya kavkaza 5 (KEPS) No. 16; P. sylvestris caucasica Hort.; P. sylvestris persica Hort.)

This is a small pine, 7-9 m. in height, with short needles (2.5-3.8 cm. long). The cones are slightly longer than the needles and attached to the stem with a short, stout peduncle. The surfaces of the apophyses are glossy, as if they had been varnished, and milk-coffee in color. Hook-like projections of the apophyses are prominent. The seeds are 5 mm. long with a tan colored wing 2-2.5 times longer than the seed. The secondary wood of the specimens I collected from the vicinity of Artvin was white. The needle anatomy is quite different from the next variety (var. kochiana) which seems to be a useful criterion for distinguishing the sterile specimens.

As seen in the cross-section (Fig. 12B), the epidermis is well-demarcated with a thick cuticle layer. The hypodermis is uniform, biseriate along the leaf margins and uniseriate on the dorsal and ventral sides of the leaf. The inner tangential walls of the hypodermal cells are thicker than the outer tangential walls. The mesophyll consists of three layers of chlorenchyma on the adaxial and abaxial sides of the leaf, but 4-5 layers occupy the spaces between the endodermal layer and needle margins. 8-11 resin canals are external in position. The epithelial cells are extremely thin-walled and flattened. The sheaths of sclerenchyma fibers around the resin canals vary between one and two layers and the diameters of the fiber cells are variable as seen in cross sections. The endodermis appears constricted in the middle. The outer walls of the endodermal cells are thicker than their inner walls. The transfusion tissue consists of isodiametric tracheids with relatively thin walls and parenchyma cells with thick walls. The transfusion sclerenchyma forms a massive tissue of very thick-walled cells interconnecting the two vascular bundles (compare the diagrams of the needle sections of two varieties). The vascular bundles are intersected by medullary rays extending continuously through the phloem and xylem tissues of each bundle.

In Komarov's (1934) Flora of U.S.S.R., this variety is treated as an independent species, P. armena Koch distributed in the Caucasus and Transcaucasus extending to Ardahan, Kars, Artvin and Oltu in eastern Turkey. Takhtajan (1954) in his Flora Armenii conbines this variety with Pinus kochiana Klotzsch.

His line drawing (vol. I: 82-87. plate 26) is very similar to my specimen (Kasapligil No. 3879) depicted in Fig. 12A, except that the cone is slightly rounded at the apex, appearing ovate in outline. I agree with Pravdin's (1964) treatment of it as a climatic ecotype of P. sylvestris L. ssp. hamata (Steven)Fomin. The extent of its distribution in Turkey deserves further study.

b) P. sylvestris L. ssp. hamata (Steven)Fomin var. kochiana (Klotsch)Fomin (cf. Pravdin 1964, p. 137) is depicted in Fig. 13, Kasapligil No. 3880. (Syn. P. kochiana Klotsch in Linnaea 22, 296, 1848).

This is a small, bushy pine with an irregular stem-formation, ascending branches and variable crown. The needles are bluish green 3.5-5 (2-8) cm. long and much wider than the needles of var. armena (see the diagram of the needle cross-section). As an average, the cones are 4-6 cm. long and they are usually shorter than the needles. The apophyses of the ovuliferous scales are gray with a glossy lacquer on their surfaces. The apophyses project prominently forming pyramidal extensions recurved like hooks. The seeds are 5-6 mm. long with slender wings three times longer than the body of the seeds. The secondary stem wood of the specimens I collected from the same locality near Artvin was yellow in color.

The needle anatomy of P. sylvestris L. ssp. hamata (Steven) Fomin var. kochiana (Klotsch)Fomin differs from that of var. armena (Koch)Pravdin in several ways. The cuticle is much thicker while the substomatal cavities are half as large as those in var. armena. The hypodermis is biseriate along the very margins of the needles, uniseriate elsewhere. The inner tangential walls of the hypodermal cells are much thicker than those of var. armena. The mesophyll consists of an outer layer of armed palisade cells with occasional internal ridges, followed by three layers of parenchyma cells with prominent invaginations. 9-10 resin canals are in external position. Thin walled epithelial cells were distorted during sectioning. The sheath of fibers is mostly one-layered, rarely two-layered. Unlike var. armena, the outermost layer of transfusion tissue of var. kochiana consists of tanniferous parenchyma right beneath the endodermis. The schlerenchyma fibers are two-layered on the abaxial sides of the phloem tissues and only one-layered between the two vascular bundles (see the diagram of the leaf cross-section).

According to Pravdin (1964, p. 137) var. kochiana is distributed in southwestern Transcaucasus, Turkey and in Iran. In Latschasvili's (1970) distribution map, it is evident that Koch's pine follows the Turkish border very closely in Georgia. According to the description given by Gulisashvili and Vasiliev (1961,

p. 147), the needles of Koch's pine are 3.5-5 cm. long while Eliçin (1971) gives the needle length 11.2 (9.3-13.2) cm., which seems to be extremely long for Koch's pine. Most likely, Eliçin's (1970) combination "Pinus sylvestris L. ssp. kochiana (Klotsch) Eliçin" represents another variety of P. sylvestris L. ssp. hamata (Steven)Fomin.

Pinus sylvestris L. sensu lato has many horticultural forms with silvery cones and needles or golden yellow young shoots, dwarf, compact or columnar crowns. It is a highly ornamental tree introduced in many parts of the world. For the nomenclature and description of the ornamental varieties and forms, the readers are referred to the comprehensive listings of Beissner-Fitschen (1930), Den Ouden (1965), and Krüssmann (1972). It grows in a great variety of habitats with a remarkable tolerance to the extremes of climatic conditions. It often occupies sandy soils, loams and calcareous soils. In northern Anatolia, it forms pure stands or grows associated with Pinus nigra ssp. pallasiana and Abies bornmülleriana in the vicinity of Bolu, Kastamonu, and Ayancık, with Fagus orientalis, Abies nordmanniana and Picea orientalis in northeastern Asia Minor. It reaches timberline between 1900-2000 m. above sea level in Zigana dağ, south of Trabzon (Kasaplıgil 1947). According to Karamanoğlu (1976), the vertical range of Pinus sylvestris is between 1400 and 2400 m. in Kars, Sarıkamış, Göle, and Oltu. In the continental climate of interior Anatolia, it ranges between the elevations of 1000-2000 m. in isolated groves (Tschermak 1950) where the growth rate is very slow as evidenced by extremely narrow annual rings (Gassner and Christiansen-Weniger 1942).

Pinus sylvestris is an economically important tree yielding valuable wood for construction and carpentry work as well as fuel wood and oleoresin products. It is often used for afforestations, sand fixation and park plantations.

The ancestors of Pinus sylvestris and P. nigra were widely distributed in Europe and Eurasia since the Oligocene, and natural hybrids between the two taxa could have occurred over a long period of time. Artificial hybrids between these taxa have been reported by Duffield (1952). Marginal resin ducts in Pinus sylvestris needles are characteristic for this species while the resin ducts of P. nigra are typically parenchymatous. The occurrence of partly parenchymatous resin canals in the needles of certain populations of P. sylvestris might represent the genetic influence of P. nigra especially in the areas where individuals of these two taxa commingle, as in Anatolia.

During the Ice Age, P. sylvestris retreated from the glaciated areas but survived in the refuges of unglaciated areas

of Scandinavia, Scotland, Caucasus, and northeastern Anatolia. However, it was a pioneer invader, especially in the early Holocene when the climate became warmer and P. sylvestris occupied enormous areas as the glaciation retreated. A brief summary of the fossil occurrences of P. sylvestris and related taxa are given below although no Turkish records are presently available.

Fossil records of P. sylvestris L. sensu lata and related taxa. (After Gaussen 1960, Pravdin 1964, Kolakovsky 1965, and Mirov 1967)

Fossil taxa	Age	Locality
Pinus hamata Sosn.	Post-Pliocene	Georgia, U.S.S.R.
Pinus kochiana Klotzsh fossilis	Pliocene	Kodor River, Georgia, U.S.S.R.
Pinus parvula Sap.	Oligocene	Shales of Aix, France.
Pinus sylvestris L.	Lower Pliocene	Northern Croatia, Yugoslavia
Pinus sylvestris L.	Tertiary	Kiev, Ukraine
Pinus sylvestris L.	Pliocene	Frankfurt am Main, West Germany
Pinus sylvestris L.	Upper Tertiary	Portugal
Pinus sylvestris L.	Middle Tertiary	Baltic and Western Siberia
Pinus sylvestris L.	Pleistocene	Sweden, France, Switzerland
P. sylvestris pliocenica Kink.	Pliocene	Lower main Valley, West Germany

I predict that future excavations in the Tertiary deposit sites of central and western Anatolia would yield several new records to this list.

II. The fossil pines of Turkey from the Tertiary deposits of Güvem locality near Ankara.

A) Geological remarks:

The fossil specimens of pines were collected from Güvem subdistrict of Kızılcahamam about 90 km. north of Ankara (see the maps in Fig. 15) during several visits since 1968. The vegetative parts such as long and spur shoots with needles and reproductive

parts such as ovulate strobili and seeds occur as impressions in lacustrine diatomites. During the summer of 1976, excavations with Dr. Daniel I. Axelrod and Mrs. Esin Gündüzhan, at different collecting sites along the Gürcü Valley, yielded fine specimens. Additional pine fossils from this locality were loaned to the author by the Museum of Natural History of the Mineral Research and Exploration Institute of Turkey (Maden Tetkik ve Arama Enstitütüsü is abbreviated as "M.T.A.."). Mr. Hicri Aksoy who accompanied me during my initial collections in the summer of 1968 made further collections in subsequent years and made them available for my studies. This work could not have been accomplished without the generous assistance of the Turkish colleagues both in academic and administrative institutions of the country.

The absolute age determinations of the fossil deposit sites were carried out by Teledyne Isotopes in Westwood, New Jersey by Potassium/Argon analysis of three isotope samples selected in the field by Dr. Axelrod. The report of Teledyne Isotopes regarding K/Ar age determination is summarized below:

Rock Sample	Isotopic Age (m.y.)	scc $Ar^{40}Rad/gm \times 10^{-5}$	% $Ar^{40}Rad$	%K
(A) Andesite tuff	14.1 ± 1	.262	55.4	4.37
		.236	43.2	4.39
(B) Rhyolite tuff	11.0 ± 1	.140	38.7	3.05
		.131	21.1	3.07
(C) Welded tuff	11.0 ± 1	.106	22.8	2.29
		.097	14.8	2.27

All samples are done in duplicate and biotite contained in the samples were the basis of determinations. The constants for the age calculation are $\lambda = 4.72 \times 10^{-10} yr^{-1}$, $\lambda_{\varepsilon} = 0.58 \times 10^{-10} yr^{-1}$ and $K^{40} = 1.19 \times 10^{-4}$ atom percent of natural potassium. Sample (A) andesite tuff was obtained from the Karga Creek site (Alt. ca. 1200 m.) which is the main source of the coniferous impressions. Therefore, these 14.1 ± m.y. old deposits belong to the upper Miocene and not to the Pliocene as reported earlier (Kasapligil 1975, 1977). Sample (B) Rhyolite tuff was obtained from the locality above Yukarı Çanlı Village from a land profile along the main road to Çerkeş at an altitude of 1350 m. (see the sketch map). A massif andesitic hill on the western side of the main road of Yukarı Çanli seems to represent more recent volcanic activity, with continuous release of hot steam along the fault at the summit of the hill. This andesitic massif is situated only 10 km. north of Seyhamam which serves as a health spa with its well known hot springs. Specimen (C) welded tuff was obtained from a locality near Kiliseköy which is also approximately 1350 m. above sea level.

Rhyolite tuff and welded tuff of these two localities are 11.0 ± 1 m.y. old.

According to the Geological Map of Turkey by C. Erentöz (1966), continental Neogene formations of the Güvem subdistrict are bordered by volcanic rocks, basic and ultrabasic intrusives. Erentöz (1975) points out that the general lithology of Central Anatolia comprises "lacustrine limestones, marls, clay tuffs and coarse clastic sediments with widespread horizontal extensions. These facies show some regional changes and have lagoonal, terrestrial and lacustrine characteristics." The regression of the Tethyan sea took place during the Oligocene and the main outline of the Black Sea coast was well defined with minor changes during the Miocene while eastern Anatolia remained under the sea. According to Brinkman (1976), the majority of Central Anatolia was a dry land and the vicinity of Ankara and Konya was a savanna during the late Miocene time. Brinkman's statement may be true for the southern sector of Central Anatolia, but the northern sector of the region was occupied by freshwater bodies of a great variety of sizes, and one of them was a freshwater lake which occupied the Gürcü valley extending from Güvem subdistrict to the foothills of Işıkdağ north of Kızılcahamam. As the tertiary period advanced, the sea of Tethys shrank further as the mountains continued to rise from southern Europe through the chains of the Balkan peninsula, Asia Minor, Caucasus and further east (cf. Brinkman 1959). During the Tertiary period, plant and animal life in Anatolia was similar to that in Europe, but the regression of the sea in the eastern part of the peninsula opened the migration routes from Central Asia to Anatolia, allowing the penetration of Irano-Turanian elements of the flora into eastern Anatolia (cf. Davis 1971). Further regression and desiccation of the Mediterranean Sea during Miocene (HsÜ 1978) established the route for floristic affinities between Central Europe and Asia through Anatolia along the southern shores of the Parathethys Sea.

As evidenced by the abundance of fresh water forms of diatomaceous frustules, impressions of cyprinid fish, frogs, salamanders and several genera of aquatic angiosperms, the sediments of the Gürcü valley represent the bottom of a freshwater body. Presently, I do not know the exact boundaries of this lake since further geological surveys are required, along with the exploration of additional fossil deposits, to establish new correlations of fossil plants and animals in the northern sector of Central Anatolia. At any rate, this Miocene lake at the locality given was surrounded by a Coniferous - oak forest particularly rich with pines (5 taxa), redwoods (2 taxa), oaks (12 taxa), and many evergreen and deciduous broad-leaved, woody plants, such as Acer, Ailanthus, Alnus, Arbutas, Betula, Carpinus, Castanea, Castanopsis, Cercidiphyllum, Cercis, Cinnamomum,

Comptonia, Diospyros, Fagus, Ficus, Ilex, Liquidamber, Magnolia, Mahonia, Myrica, Neolitsea, Pasania, Persea, Platanus, Populus, Rhododendron, Rosa, Salix, Sapindus, Sophora, Sorbus, Tilia, Ulmus, Vaccinium, Zelkova, and many other genera. Most likely, these genera flourished luxuriantly in a humid-temperate climate until repeated volcanic eruptions devastated the area with enormous volcanic ash storms.

On a sizzling hot summer day, I found a cool refuge in the shade of an old Black pine (Pinus nigra ssp. pallasiana) about 500 meters east of the Kerimler village. The mighty tree with its crown spreading over the village cemetery, is located at the top of a hill overlooking the desolate slopes of the Gürcü Valley. The cemetery was fenced in with barbed wire to exclude grazing animals, and those traveling to the villages, from entering. So far, I have not found any fossil remains of the Black pine, nor the remains of its ancestral forms. It must be a newcomer to the area.

About 15 million years ago the whole basin was the homeland of a lush green mixed coniferous forest with mighty Redwoods (Sequoia langsdorfii), deciduous swamp cypresses (Glyptostrobus europaeus), spruces, junipers, true cedars, white and yellow pines mixed with the broad-leaved angiosperms mentioned above. It must have been quite a dense woodland, hard to penetrate with woody lianas such as Smilax spp. Hedera, Menispermum and grape vines intertwining the tree trunks. It must have been a woodland of tranquility along the shores of the ancient lake, with bees, wasps, dragon flies and mosquitos buzzing around the cattails and reeds bordering the shallow waters.

All of a sudden, the whole land started to shake with enormous volcanic eruptions. Glowing lava, flowing down the hills set violent fires, and the blowing storms of volcanic ash broke the cones, branches, leaves, acorns and flowers, and scattered them over the lake. Hot volcanic debris settling on the lake and the fiery blobs of lava slipping into the shallow shores brought steamy temperatures which killed all forms of aquatic life instantly. Fishes and amphibians, insects and diatoms, cones, seeds and leaves settled to the lake bottom and quickly sandwiched between silt, volcanic ash and diatom sediments, layers upon layers. The volcanic eruptions must have been followed by torrents of rain, which carried leaves, needles, cones, seeds, flowers and pollen grains from the surrounding hills and all these remains also sunk to the lake bottom, after being soaked in hot waters. Partly broken and fragmented plant remains suggest long distance transportation. Saturated cone scales were closed so that the impressions of the cones appear almost intact. Unfortunately, most of the organic material decayed completely and no compressions were found suitable for cuticular studies. However, the leaf impressions have sufficient detail in

their venation patterns, useful for their identification.

Through the subsequent millenia, volcanic activities continued, new eruptions spread additional debris and lava flows over the silt. By resolution of ground water, diatom sediments were transformed into chert, very similar to obsidian. Alternating layers of sedimentation in cherts are beige, grey,, brown or black in color and the plant fossils are well preserved although the animal remains were destroyed completely. Hunting leaf fossils in chert deposits (marked on the sketch map of the Güvem basin) was a painful operation, since every one in the collecting party developed slashed fingers while breaking the flint-like stones, with their razor sharp edges.

Additional floods caused by streams flowing into the Güvem basin brought again a great variety of leaves, pollen grains, and fine silt, and deposited additional layers which were cemented with minerals dissolved in water, forming grey-colored paper shales. Tree trunks buried under sedimentation were petrified by the mineral deposits of percolating waters. These silicified wood samples are kept in the Museum of Natural History of the Mineral Research and Exploration Institute in Ankara. Likewise, all holotypes and hypotypes mentioned in this paper will be deposited in the same museum, while the replicas of the holotypes prepared with silicon rubber, counterparts, and some of the paratypes will be deposited in the Museum of Paleontology of the University of California at Berkeley.

B. Descriptions of the new taxa:

1) *Pinus canariensis* Smith ssp. *meteaensis* n. ssp. (Figs. 23, 26-29)

Ref. to *P. canariensis* Smith in Buch, Phys. Beschr. Canarins. 159, 1825.

Diagnosis: Ovulate cone 15.2 cm. long and 5 cm. wide; ovuliferous scales exposed at cone base 3 - 3.5 cm.long, 1.5 - 1.8 cm. broad at apophyses, sclerenchyma fibers on dorsal surface of scales forming conspicuous ridges radiating from scale base towards apophyses, bracts not evident at base; apophyses at cone center 12 - 18 mm. broad, 9 - 12 mm. high, umbos supra median marked with horizontal keels on both sides; spurs more or less pyramidal terminating into a dull apex, diamond shaped at the base, radial striations absent on surface of apophyses.

Discussion: A single cone impression of this new subspecies is beautifully preserved in diatomite with remarkable detail. A silicon rubber replica I prepared did not cause any damage to the actual specimen during the process of peeling the latex replica. This way, I had the advantage of examining the

cone specimen from the outside rather than observing from the inside out. The ovulate cones of the extant P. canariensis ssp. canariensis are very variable in size and structure. It is a subtropical pine endemic to the Canaries. According to Ceballos and Ortuno (1951), it grows between the elevations of 1200 m. and 2400 m. in Tenerife. It is cultivated extensively in the Mediterranean countries and in warmer parts of California. The cones of the cultivated trees vary from 15 to 23 cm. in length while the herbarium specimens I examined do not exceed 18 cm. The outline of the ovulate cone in P. c. ssp. canariensis is broad at the base, tapering towards the apex (cf. Kasapligil No. 4882 in Fig. 24). The umbos are conical, sharply defined, infra median at the cone base and median in the upper parts. Apophyses are characterized by conspicuous striations radiating from the umbos. Lateral, adaxial and abaxial views of the cone scales from the extant species are depicted in Fig. 25.

Unfortunately, I did not find any twig with the needles attached to it. However the twig impression (Kasapligil No. 5617) representing the older growth below and younger growth above is referable to P. c. ssp. meteaensis. The base of the bracts is decurrent, 6-10 mm. long and 1-2 mm. broad. The tips of the bracts are adpressed or free and divergent. The branch fragment is 9.5 cm. long and 0.6 cm. wide (Fig. 26).

Pinus canariensis is a three needle pine, characterized by long, slender and drooping needles with persistent sheath around the spur shoots. Individual leaves or needle fragments are abundant in the fossil deposits, but I could not find a complete spur shoot with complete needles. The incomplete three needles attached to a spur shoot and covered by persistent sheath (Kasapligil No. 5380) are referable to P. c. ssp. meteaensis. This impression in volcanic ash has three slender needles diverging from each other beyond the persistent sheath which is 0.6 cm. long. Other two specimens of three incomplete needles found in paper shale (PA-312, B.K. #6075) and in laminated diatomite (B.K. #5559A) are also referable to P. c. ssp. meteaensis, assuming the convergence of three needles at their bases (Fig. 27, 29). These needles are 1 mm. wide, but I do not know their length since I have no complete set of fossil leaves. Fossil pollen grains identical to those of the extant species are abundant in the substrate.

Affinities: The closest living relative of P. canariensis Sm. is P. roxburghii Sargent (syn.: P. longifolia Roxburgh) which is a native of the Himalayan region extending from northern Pakistan through northern India, Nepal, Sikkim to Bhutan, more than 8000 km. away from the Canaries. The apophyses of the ovuliferous scales of P. roxburghii are conically elongated and reflexed unlike those of P. canariensis. These two species of pines, of course including P. c. ssp. meteaensis belong to the

subsection Canarienses Loud. of the section Pinea Endl. of the subgenus Pinus.

Earlier fossil records of P. canariensis were reported from several localities in southern Europe. According to Wulff (1943), a fossil specimen discovered in Malaga, Spain is quite similar to P. canariensis. Likewise, P. o'donelli Teixeira, described from the Miocene epoch of Portugal, and P. ramesiana Sap., described from the Pliocene in Chambeuil, Cantal, France are closely related to P. canariensis. More recently, the cone remains related to P. canariensis from the Pliocene flora of the Kodor River near Sukhumi (Caucasus), were discovered by Kolakovsky (1964, 1965). From these data, it is reasonable to assume that ancestral forms of P. canariensis had a continuous distribution from the Canaries through the northern shores of the Tethys sea (Portugal - Spain - France) and through the southern shores of the Paratethys (Yugoslavia, Bulgaria, Anatolia, southern Caucasus and eastward) during the Middle Miocene (cf. Fig. 2, Paleogeographic map by Hsü et al. 1977).

Occurrence: Upper Miocene 14 ± 1 million yrs. old; Ankara Province, Kizilcanamam district, Guvem subdistrict; Karga Creek site, ca. 750 m. southeast of Demirciler Village, Alt. ca. 1200 m. above sea level, impressions in laminated diatomite, collected in 1975. Holotype: M.T.A. 75/698, Turkish Museum of Natural History, The Mineral Research and Exploration Institute, Ankara. The replica of the holotype: Univ. of California, Berkeley, Museum of Paleontology, Paleobot.; paratypes: Kasapligil No. 5380, 5617, PA-312/ B.K. 6075 and B.K. 5559A deposited at the Turkish Museum of Natural History in Ankara.

The name of the new taxon: The name of the subspecies is derived from the Turkish abbreviation "metea" (Maden Tetkik ve Arama Enstitüsü or M.T.A. The English translation of the Institute as it appears in their scientific bulletin is: "Mineral Research and Exploration Institute of Turkey." This institute is located in Ankara and it houses the Turkish Museum of Natural History. It is a pleasure to name the new subspecies in honor of the M.T.A., whose staff loaned the specimen to this writer in the summer of 1975.

2) Pinus halepensis Miller ssp. alpanii n. ssp. (Fig. 30)

Reference to P. halepensis Miller, Gard. Dict. 8th ed. Pinus No. 8, 1768.

Diagnosis: Ovulate cone straight, symmetrical, 8.3 cm.. long, 3.1 cm. broad at the lower one third of the cone; peduncle almost straight, 1.5 cm. long and .8 cm. thick, obscurely marked with bract scars on surface; apophyses mainly quadrangular, with

rounded upper edges near cone apex, radial striations absent, horizontal ridge prominent; umbos flat, with quadrangular markings resembling halos around them.

Discussion: A single cone impression in diatomite was loaned to me by the Turkish Museum of Natural History of the Mineral Research and Exploration Institute in Ankara. The specimen is well preserved in spite of the complete absence of any organic remains. The contrast photograph as well as the latex replica of the specimen were prepared by Mrs. Yvonne Arremo at the Paleobotany Department of the Swedish Museum of Natural History in Stockholm, while the cones of the extant species of P. halepensis were photographed by the author at the Institute of Forest Genetics of the U.S.D.A. Forestry Service in Placerville,, California. A comparison between the fossil and living cones immediately reveals the fact that the apophyses as well as the umbos of the extant species exhibit pronounced protuberances. . Furthermore, pentagonal apophyses are common in the upper half of the cones while the rounded edges are predominant in the basal portions of the cones. The halos are absent around the umbos. The herbarium specimens examined from the eastern Mediterranean region always have conspicuous striations extending radially from the umbo to the margins of the apophyses. The cones from the North African herbarium material, however, lack the striations, although the umbos are raised above the surface of the apophyses. In spite of these variations, P. halepensis ssp. alpanii differs from the extant material mainly by the presence of diamond-shaped or rounded halos around the umbos and by the absence of striations on the apophyses.

Unfortunately, the spur shoots, needles or seeds of P. halepensis ssp. alpanii are not available at the present, but further excavations in this locality may be fruitful in collecting additional vegetative and reproductive organs of this taxon.

Affinities: The closest living relative of P. halepensis Miller is P. brutia Ten. The fossil taxa related to these two species have been discussed earlier in this paper under the heading of each species.

Occurrence: Upper Miocene, 14 ± 1 million years old; Ankara Province, Kızılcahamam district, Güvem subdistrict, Karga creek site, about 750 meters south east of Demirciler village, alt. ca. 1200 m. above sea level, impression in laminated diatomite, collected in 1976. Holotype: B. Kasapligil No. 5623 ex. M.T.A. 2231, deposited in the Turkish Museum of Natural History, The Mineral Research and Exploration Institute, Ankara. The latex replica of the Holotype: U.C. Berkeley, Museum of Paleontology, Paleobot.

Pinus halepensis ssp. alpanii is named in recognition and appreciation of the generous support received from Dr. Sadrettin Alpan, Director General of the Mineral Research and Exploration Institute (M.T.A.) of Turkey.

3) Pinus nickmirovii n. sp. (Figs. 32 and 33)

Diagnosis: Cones ovoid, 7-8 cm. long, 2.3-2.5 cm. wide, symmetrical, tapering towards apex; peduncle absent; ovuliferous scales 2.5 cm. long and 0.9-1.4 cm. wide, apophyses rhomboidal, flat, slightly swollen at upper edge, but not projecting, sharply defined parallel edges, upper margins near cone apex somewhat rounded, horizontal ridges not projecting, but well demarcated, umbo median, smooth, 3-5 mm. long, 2-3 mm. wide, mutic, striations of apophyses absent or obscurely present.

Discussion: The first specimen of this taxon collected by Mr. Hicri Aksoy from the Beşkonak village of the Güvem subdistrict is a brown impression in diatomite. A second specimen, loaned to me by the Turkish Museum of Natural History (M.T.A., Ankara), was also an impression in diatomite with a considerable amount of dark-colored organic remains in the cone scales. The winged seed impression collected from the Karga Creek site of Demirciler village (Kasaplıgil No. 5403) is referable to this new species. The total length of this seed is 15 mm.; the wing alone is 11 mm. long and 4 mm. wide, resembling the seed of P. massoniana Lamb. described by Uyeki (1927). The wing is broadest in the middle part and slopes towards a rounded tip. The seed is 4 mm. long and 2.5 mm. wide.

Unfortunately, the needle pairs with the spur shoots belonging to this pine have not been discovered. The fragments of individual needles are abundant in Beşkonak and Karga Creek sites, but it is not possible to assign them to the new taxon since the needle impressions are not suitable for cuticular preparations.

Pinus nickmirovii differs from P. massoniana mainly by its longer and sessile cones. The apophyses of P. nickmirovii are flat and smooth with one horizontal ridge only, while the apophyses of the P. massoniana cones I examined are thicker and protruding somewhat from the surface. Furthermore, the apophyses of the herbarium specimens collected from Swangsi province of China (R.C. Ching No. 8486, U.C.) have supra median umbos, mostly elliptical in outline. According to Masters (1904), the umbos of P. massoniana are depressed, but contrary to this condition, the living specimens in the Eddy Arboretum (Institute of Forest Genetics, Placerville, Calif.) exhibit slightly projecting umbos. The specimens from northern China have a vertical ridge below the umbo on the basiscopic half of the apophyses.

Affinities: P. nickmirovii n. sp. is a diploxylon pine belonging to subsection Sylvestres of the section Pinus. Its closest living relative, P. massoniana Lambert occupies an enormous area from Honan in northern China to Hongkong in the south. It extends from Szechuan in western China to the shores of the China Sea in the east. Isolated populations of P. massoniana recur in North Viet-Nam and on the islands of Hainan and Taiwan. The following east Asian pines have taxonomic affinities to P. massoniana Lamb.: Pinus tabulaeformis Carr. (Chinese pine), P. densiflora Sieb. et Zucc. (Japanese red pine), and P. thunbergiana Franco (Japanese black pine). All of these diploxylon pines are classified under the Subsection Sylvestres (cf. Critchfield & Little 1966) together with the extant Turkish species P. nigra Arnold, P. halepensis Mill., P. brutia Ten., P. sylvestris L. Probably our living P. nigra is descended from P. massoniana, which possibly migrated from eastern Eurasia to western Eurasia along the northern shores of the Tethys Sea during the upper Cretaceous or early Tertiary. Presently, P. massoniana grows extensively in the mixed mesophytic forests of the Lower Yangtze Provinces of China associated with Acer, Alnus, Carpinus, Castanopsis, Fraxinus, Ilex, Kalopanax, Liquidamber, Magnolia, Pistacia, Populus, Pterocarya, Quercus (several species), Tilia, Ulmus, and Zelkova (Wang 1961). In southern Anhwei, the accompanying trees are Acer, Magnolia, Cladrastis, Tilia, Staphylea, Sorbus, Tsuga, Fraxinus, Symplocos, Ilex, Quercus and further west in the vicinity of Hwangshan, the associates are Platycarya, Liquidamber, Torreya, Morus, Pistacia, Sassafras, Tilia, Ulmus, Zelkova, etc. In southern Hunan the main constituents of sclerophyllous forests are evergreen trees such as Castanopsis, Pasania, Quercus, Magnolia, Cinnamomum, "Bucklandia" etc. in dry habitats and deciduous broadleaved trees such as Acer, Betula, Fagus, Liquidamber, Cercis, Rhus, Tilia, Sorbus, Carpinus, Diospyros in humid sites under maritime influence (Wang 1961, p. 145). It is very remarkable indeed that the genera listed above are represented in the tertiary flora of Güvem occurring together with Pinus nickmirovii. The fossils of P. massoniana Lamb. reported by W. Szafer from the Pliocene of Poland may be closely allied to Pinus nickmirovii.

Occurrence: Upper Miocene, 14 ± 1 million years old, Ankara Province, Kızılcahamam district, Güvem subdistrict, Gürcü valley, 1975. Holotype: M.T.A. No. 75-687, in Turkish Museum of Natural History, The Mineral Research and Exploration Institute (M.T.A.), Ankara. Paratype: Kasapligil No. 5618 ex Hicri Aksoy, complete cone impression in diatomite collected from the Beşkonak village of Güvem subdistrict from the banks of the main road from Kızılcahamam to Çerkeş and deposited at the Turkish Museum of Natural History, M.T.A., Ankara; Topotype: Kasapligil No. 5403 seed impression collected from the Karga Creek site, 750 m. S.E. of Demirciler village of Guvem subdist., also deposited in the

Turkish Museum of Natural History, M.T.A., Ankara.

Pinus nickmirovii is named for Dr. Nicholas T. Mirov of the Univ. of California, Geography Dept. in recognition of his contribution to the chemotaxonomy of the genus Pinus.

4) Pinus pinaster Aiton ssp. mioancyrensis n. ssp. (Figs. 34-36)

Reference to Pinus pinaster Aiton, Hort. Kew. 3:367, 1789.

Diagnosis: Ovulate strobili ovoid-conical, asymmetrical, 11-12 cm. long and 4-5 cm. wide near the base, tapering towards the apex and somewhat curved. Peduncle absent; apophyses of the ovuliferous scales rhomboidal, 12-17 mm. wide, 8-12 mm. thick, projecting but not deflexed, umbos and well-defined keels supramedian, vertical keels absent, radiating striations evident, umbos elliptical or rhombic projecting pyramydally 2-3 mm. above cone surface and terminating into a persistent bristle pointed towards the cone apex.

Discussion: The first cone specimen of this taxon collected by Dr. W. Fry in 1969 is an excellent impression preserved in diatomite with a high content of volcanic ash. A second cone impression representing two thirds of a complete cone was collected from the Karga Creek site in 1976. The latex replicas of these cone impressions were most helpful in observing the external structural details. Pinus pinaster Ait. (syn., P. maritima Poiret), French maritime pine, is a western mediterranean pine ranging from Portugal, Spain, and southern France to northwestern Italy, Corsica, and Sardinia. In north Africa, it extends from Tunisia to Morocco. Since it is widely cultivated along the coasts of the Mediterranean region for sand fixation and afforestation purposes, its exact natural distribution can not be defined with certainty. The distributions given for Dalmatia (cf. Jalas & Suominen 1973, p. 17) and Greece (cf. Dallimore & Jackson 1967) need verification. P. pinaster had a much wider distribution, from north Africa to Ireland and from the Iberian peninsula to Asia Minor during the Tertiary period.

The extant species has several varieties and geographical races which are hard to distinguish from one another. The herbarium materials from natural populations as well as the cultivated materials I examined have projecting cone scales with deflexed apophyses. In addition to transverse keels, they also have a vertical ridge. The transverse keels and the umbos in P. pinaster ssp. pinaster are median or infra median in position. The umbos are sharply pointed or dome-shaped and lack bristles.

A leafy impression with two stout needles attached with a long persistant sheath (Kasapligil No. 5489) is referable to P. pinaster ssp. mioancyrensis. Unfortunately, the base of the spur shoot is poorly preserved and the needles are incomplete. These fragmentary needles are 53 mm. long and slightly over 1 mm. thick. The stiff appearance of these two needles is a characteristic feature of the maritime pines in general (Fig. 36).

Affinities: P. pinaster Ait. ssp. mioancyrensis is a diploxylon pine which belongs to the Sylvestres subsection of the Section Pinus. Pin maritime de Corse or Corsican pine is described as an independent species, P. mesogeensis Fieschi et Gaussen, and seems to be quite identical with P. pinaster Ait.. (cf. Gaussen 1960, p. 112 and Fig. 332 on p. 117). According to Schütt (1959), P. pinaster crosses naturally with P. halepensis which indicates the genetic affinity between these two taxa. The fossil relatives of P. pinaster are summarized in the following table:

Fossil records of P. pinaster and the taxa related to it. (After Pilger 1926, Gaussen 1960, Mirov 1967 and Nemejc 1968)

Fossil Taxa	Age	Locality
Pinus fittonii Carr.	Lower Cretaceous	England
Pinus ornata Stern	Pliocene	Northern Bohemia, Czechoslavakia
Pinus oviformis Endl.	Pliocene	Northern Bohemia, Czechoslavakia
Pinus oviformis Endl.	Oligocene & Lower Miocene	Central Europe
Pinus pinaster Sol.	Upper Miocene-Early Pliocene	Coiron, Central France
Pinus pinaster Sol.	Pliocene	Sofia, Bulgaria
Pinus aff. pinaster	Miocene	Rochessauve-aux-Coirons, Ardeche (Rhone Valley) France.
Pinus pinastroides Ung.	Oligocene-Lower Miocene	Central Europe
Pinus plutonis Baily	Miocene	Antrium, Northern Ireland
Pinus praepinaster Teiera	Pliocene	Rio Major, Portugal
Pinus spinosa Herbst	Tertiary	Silesia, Poland

Occurrence: Upper Miocene, 14 ± 1 million years old; Ankara Province, Kızılcahamam district, Güvem Subdistrict, Gurcu Valley, 1968 Holotype: Kasapligil No. 6078, PA-312 ex Wayne Fry, in Turkish Museum of Natural History, The Mineral Research and Exploration Institute (M.T.A.), Ankara, the replica of the holotype in Univ. Calif. Museum of Palaeontology, Palaebot. Paratype: Kasapligil No. 5530, cone fragment, impression in diatomite, collected from the Karga Creek site, 750 m. south east of Demirciler Village of Güvem subdistrict, alt. Ca. 1200 m., Sept. 4, 1976; deposited in the Turkish Museum of Natural History, M.T.A. Ankara; replica of paratype No. 5530 is stored in U.C. Museum of Palaeontol., Palaeobot. Paratype: Kasapligil No. 5489, two needles attached to a spur shoot, Gurcu Valley of Guvem subdistrict, also deposited in the Turkish Museum of Natural History (M.T.A.), Ankara.

The name of this subspecies is derived from Ancyra which was the ancient name of the capital city of Ankara dating back to the 9th century B.C.

5) *Pinus firatii* n.sp. (Figs. 38-50)

Diagnosis: Cones ovoid or conical, pointing towards apex, 10-14 cm. long (according to restored outline), 3.5-4.5 cm. wide near base, peduncle lacking; ovuliferous scales 60-80 per cone, 2.2-2.6 cm. long, 1.2-1.7 cm. wide, abaxial surfaces ribbed lengthwise with prominant fibro-vascular bundles, apophyses oblique rhomboidal, rounded on lateral sides, 1.2-1.8 cm. wide (transversely), 0.8-1.2 cm. high (vertically); umbos terminal, rhombic or rhomboidal in dorsal view, deflexed, horizontal or pointed towards cone apex in closed condition, rhomboidal and pointed at tip, 3-4.5 mm. wide (transversely) 2-3 mm. high (vertically); striations of apophyses in continuity with dorsal ribs of seed scales, converging near the base of umbos.

Leaves in cluster of five needles, variable in length, ranging from 4 to 9 cm., 1 mm. wide, margins obscurely serrulate, tapering at apex; spur shoots 2 mm. long, with deciduous sheath around; scars of the subtending bracts on stems narrowly rhomboidal, 2.5-3 mm. wide, 0.5-1 mm. thick.

Seed wing adnate to seed, 13-19 mm. long, 4-6 mm. wide, rounded or tapering at apex; seeds 6-7 mm. long, 3-5 mm. wide, seed coat striate.

Discussion: Two cone impressions in diatomite were collected by Mr. H. Aksoy from two different sites of the Gürcü Valley of the Güvem locality. Both impressions have excellent structural characteristics although the very apices and the basal parts of the specimens are missing. These two cones show a

remarkable resemblance to the extant species Pinus morrisonicola Hayata, a native of Taiwan (cf. Li, 1963 p. 49 and fig. 9 on p. 50). Apparently both of the cones were fossilized in water, since the cone scales are in a closed position. Again, the replicas of these cones provided me with suitable study material for the structural details of the ovuliferous scales which are similar to the oblong-ovoid scales of P. morrisonicola as described by Li (1963). However, according to Cheng (1930), the ovuliferous scales of P. morrisonicola are elliptical in outline, 3 cm. long and total 40 scales per cone. According to reconstructed cone outlines of P. firatii, the number of seed scales per cone would vary between 60 and 80. The tips of the apophyses in P. firatii are thick and the umbos are sharply pointed, while the apophyses of the P. morrisonicola cones that I studied are thinner and terminate into a rounded umbo. Another cone impression borrowed from the Turkish Museum of Natural History (M.T.A. #75-687), of the same locality, is much larger than the first two specimens and its total length is estimated at 14 cm. This specimen has a small portion of the cone axis exposed at its base, but the peduncle is missing again.

I had the opportunity to study nine different specimens of needle clusters varying considerably in size. The shortest cluster (S. Başaran No. 3B) has four slender needles, one of them incomplete, the remaining three needles are nearly 4 cm. long and all of them are attached to a short shoot without a sheath at the base. Possibly, the fifth needle is missing or remains buried within the substratum. Another fine cluster of five complete needles attached to a spur shoot (S. Başaran # 3B) has the total length of 6.5 cm. Three diatomite impressions with scattered and overlapping dense foliage (Kasaplıgil No. 5619 ex H. Aksoy, Kasaplıgil No. 5621, H. Aksoy and Kasaplıgil No. 5622 ex. H. Aksoy) are all traceable to five needles per cluster and No. 5619 is a particularly good specimen since three long shoots appear with numerous spur shoots attached to them. These foliage specimens were collected from the Beşkonak site of the Gürcü Valley where the holotype (No. 5620) and paratype (No. 5193) cone impressions were discovered. During my 1976 visit to the Karga Creek site, I collected two impressions of 5 needles (Kasaplıgil No. 5520 and No. 5625) converging towards the base, but without the spur shoots. Another specimen (Kasaplıgil No. 5443) from the same locality has a long shoot with spur shoots and needle clusters. Although parts of the leaves were missing, the longest needle measured in this specimen was 9 cm., which indicates that the complete needles may be even longer. Finally, a hardened diatomite shale (Kasaplıgil 5492) collected from the chert deposit site on the main road near the cemetery has an impression of five needles with a spur shoot and two winged pine seeds also referable to P. firatii.

The seeds of P. firatii are similar to those in the description of P. formosana Hayata (a synonym of P. morrisonicola Hayata) by Uyeki (1927, p. 86). The wing size is variable, but the outline of the wing and its terminal position in relation to the seed are constant. Paratype B.K. No. 5626 shows the breakable nature of the wing while the specimen No. 21a of S. Başaran represents an unfertilized seed with a rudimentary ovule at base. Such abortive seeds were common in the herbarium material of P. morrisonicola I examined.

Affinities: Pinus firatii is an haploxylon pine belonging to subgenus Strobus section Strobus and subsection Strobi. Its closest living relative, P. morrisonicola of Kwangtung, Taiwan, and the Hainan islands (Lee 1973) is allied to P. parviflora Sieb. et Zucc. (comprising P. pentaphylla Mayr and P. himekomatsu Miyabe and Kudo) from Japan and with Pinus armandii Franchet; a native of southern China and Taiwan. The oleoresin chemistry of the latter species is quite similar to that of P. morrisonicola, suggesting genetic affinity (Mirov 1967). Although P. morrisonicola is included under P. parviflora by Shaw (1914), the latter differs strickingly from P. morrisonicola as well as from P. firatii by its concave umbos and broadly rounded wings, embracing the external margins of the seeds (cf. Uyeki 1927, plate 8, fig. C.). According to Wang (1961), P. morrisonicola Hay. grows in the evergreen broadleaved forests of Hainan together with Quercus, Castanopsis, Pasania, Magnolia, Cinnamomum, Rhododendron, Bucklandia, Engelhardtia, etc. all of which are the familiar genera of the Tertiary floras. Therefore, this author believes that P. morrisonicola Hayata is a Tertiary relict species with limited distribution in eastern Asia some 9000 km. east of the fossil beds of Güvem where the remains of P. firatii were collected.

The fossil relatives of Pinus firatii are summarized in the following table (after Pilger 1926, Miki 1957, MacGinitie 1953, Gaussen 1960, and Kolakowsky 1965).

Fossil Taxa	Age	Locality
Pinus echinostrobus Sap.	Miocene	Armisan, Aude, France
P. geanthracis (Goepp.) E. Reichenb.	Tertiary	Western Georgia, USSR
P. geanthracis (Goepp.) E. Reichenb.	Eocene	Silesia, Poland
P. hordacea (Rossm.) Engelh.	Tertiary	Western Georgia, USSR

Fossil Taxa	Age	Locality
P. hungarica Kov.	Upper Miocene	Northern mountain regions of Hungary.
P. monticola D. Don	Post Pliocene	Omoloi, Arctic Siberia, U.S.S.R.
P. palaeopentaphylla Tanai & Onoe	Mio-Pliocene	Ningyo-Toge between Tortori & Okayama prefectures, Japan.
P. palaeostrobus (Ettingsh.) Heer	Miocene	Zemplon Mts., N.E.. Hungary.
P. palaeostrobus (Ettingsh.) Heer	Miocene	Soma locality, Manisa and Sekbanbeli locality, Tavşanlı, Kütahya, Turkey
P. palaeostrobus (Ettingsh.) Heer	Eocene	Austria
P. palaeostrobus (Ettingsh.) Heer	Paleogene	Greenland
P. palaeostrobus (Ettingsh.) Heer	Oligocene	Middle Dnieper, Tim, U.S.S.R.
P. palaeostroboides Sism.	Miocene	Guarene, Piedmont, N.W. Italy
P. parviflora Sieb. et Zucc.	Pliocene to Pleistocene	16 localities from Japan (Miki 1957, p.247)
P. reussii Corda	Lower Cretaceous	Czenezic, Bohemia, Czechoslovakia
P. strobiformis Bolkhov.	Cretaceous	Moscow Province, USSR
P. strobus L.	Pliocene	Frankfurt am Main, West Germany
P. strobus L.	Pliocene	Romania
P. strobus fossilis Gayl. et Kink	Upper Pliocene	Lower Main Valley, Germany
P. wheeleri Cockerell (aff. P. montivola Douglas)	Oligocene	Florissant beds, near Colorado Springs, Colorado, U.S.A.

Most probably, the needle specimens of P. palaeostrobus (Ettingsh.) Heer at the Turkish Museum of Natural History, which were collected from western Turkey, should be referred to P. firatii. The specimen with four needles on a spur shoot from Tavşanli (M.T.A. No. 61051) possibly lost a needle during fossilization. Further search and collections at the Soma and Tavşanli localities may yield the cone and seed impressions which would bring additional evidence to ascertain the correct identification of the needle clusters.

The pollen grains extracted from diatomite and paper shale rocks from different collecting sites of Güvem locality have been surveyed and photographed. Both psilate and non-psilate types of pine pollens are abundant in the substrata. Since Pinus firatii is the only Haploxylon pine occurring in the Güvem deposits, the non-psilate pollen grains have been referred to Pinus firatii. These pollen grains will be described in a separate article. The dominance of the pine and oak pollens in every slide suggests that both haploxylon and diploxylon pines together with several species of oaks, were the dominant trees of this Tertiary conifer-broadleaved forest..

Occurrence: Upper Miocene, 14 ± 1 million yrs.; Ankara Province, Kızılcahamam District, Güvem subdistrict, Gürcü Valley. Holotype: Kasaplıgil No. 5620 ex. H. Aksoy, ovulate cone impression in diatomite, collected from the Beşkonak site deposited at the Turkish Museum of Natural History (M.T.A.) Ankara; the replica of the holotype in U.C. Palaeontol. Mus., Palaeobot. Paratypes: Kasaplıgil No. 5193 ex. H. Aksoy (cone) and M.T.A. No. 75-687 (cone) deposited in Turkish Museum of Natural History (M.T.A.) Ankara; the replicas in U.C. Palaeont. Mus, Palaeobot. Foliage paratypes: Semra Başaran 3B (two different specimens under the same number) in School of Pharmacy, Univ. of Ankara; Kasaplıgil No. 5619 ex H. Aksoy, 5621 ex H. Aksoy, 5622 ex H. Aksoy (all collected from Beşkonak site) deposited in the Turkish Museum of Natural History (M.T.A.) Ankara and the photographs in U.C. Palaeontology Museum, Palaeobot.; Kasapligil No. 5443, No. 5520, No. 5625 (all from Karga Creek site, 750 m. SE of Demirciler village) deposited in the Turkish Museum of Natural History (M.T.A.) Ankara; Topotype: Kasaplıgil No. 5492 a, Güvem-Çerkeş road, from the chert deposit site below the lone pine near the cemetery, alt. ca. 1150 m., The Turkish Museum of Natural History (M.T.A.) Ankara. Seed Paratypes: Kasaplıgil No. 5626, Karga Creek site, 750 m. S.E. of Demirciler village, alt. ca. 1200 m. in Turkish Museum of Natural History (M.T.A.) Ankara; S. Başaran No. 21 a, abortive seed from the Gürcü Valley, in School of Pharmacy, Univ. of Ankara; topotypes: Kasaplıgil No. 5492 b and c, Güvem-Çerkeş road, below the lone pine, near cemetery, in Turkish Museum of Natural History (M.T.A.) Ankara.

This fossil pine is named in honor of Professor Fehim Fırat of the Forestry College of the University of Istanbul in recognition of his contribution to the management of Pinus pinea L. forests in Turkey.

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Summary and Conclusions:

A review of the extant species of the genus Pinus in Turkey and their fossil representatives in Turkey or elsewhere was necessary for the identification and evaluation of the Miocene pine taxa collected from the Gürcü Valley of Güvem Subdistrict located 90 km. north of Ankara. The living taxa of pines of Turkey are discussed at specific and infraspecific levels. Out of five living pines present in Turkey only two occur in Gürcü valley from Işıkdağ in the north to Güvem in the south: Pinus nigra Arnold ssp. pallasiana (Lamb.) Holmboe and Pinus sylvestris L. ssp. hamata (Steven) Fomin (cf. Figures 1, 15 and 16). Neither one of these pines was present in the miocene forest which occupied the shores of a fresh water lake around the Gürcü Valley area approximately 15 million years ago. Five new taxa of fossil pines have been described and their affinities to the living pines are discussed. Pinus canariensis Sm. ssp. meteaensis n. ssp. is represented by impressions of a seed cone, of a twig without foliage, several leaf impressions and abundant pollen grains in the lacustrine sediments. Its closest relatives are Pinus canariensis Sm. of Canary Islands and Pinus roxburghii Sargent of the Himalayan region. The Canary Island pine is extinct in the Mediterranean basin but the fossil remains of its ancestral forms have been reported from Portugal, Spain, France and Caucasus. Possibly, it had a wider range extending eastward through the southern shores of Paratethys sea during Middle Miocene.

Pinus halepensis Aiton ssp. alpanii n. ssp. is represented by a single cone impression in diatomite. Its closest living relatives are P. halepensis Aiton ssp. halepensis and P. brutia Ten. which are distributed in the coastal regions of Turkey.

Pinus nickmirovii n. sp. is represented by two impressions of seed cones quite similar to the ovulate cones of P. massoniana Lamb., a native of China, Viet Nam and Taiwan.

Pinus pinaster Aiton ssp. mioancyrensis n. ssp. is represented by two cone impressions and two needles attached to a spur shoot. Pinus pinaster is extinct in Asia Minor, but during the Tertiary period, it had an extensive distribution from northern Ireland and England through Central Europe and the Balkan Peninsula to Anatolia.

Pinus firatii n. sp. is the only haploxylon pine of the Upper Miocene flora of the Güvem locality. This pine is represented by impressions of two cones, two seeds, long and spur shoots with clusters of five needles in diatomites. It is closely allied with Pinus morrisonicola Hayata, an extant species native of eastern Asia.

All holotype and paratype specimens of these fossil taxa are deposited in the Turkish Museum of Natural History, Mineral Research and Exploration Institute of Turkey (M.T.A.), Ankara. Silicon rubber replicas of the cone impressions and contrast photographs of the other type materials are deposited in the Paleontology Museum of the University of California, Berkeley.

From the survey of literature, I believe that most of the modern genera of the gymnosperms were differentiated as early as the beginning Eocene epoch of the Tertiary period. The new taxa described from the Upper Miocene of the Güvem flora in this paper are remarkably similar to the extant species. However, due to certain structural differences observed and the ecological changes which occurred during the past fifteen million years, the present author feels justified to apply new names to the Miocene materials described here. Obviously, some of the fossil specimens collected in the field are quite incomplete, lacking vegetative parts and seeds. Discovery of additional materials and of complete specimens with branches with the cones and foliage attached to them or a thorough survey of the allied fossil pines reported from other Tertiary floras of Europe and Asia may reduce some of the proposed names into synonymy. Until then, the nomenclature proposed in this article should serve the purpose of communication.

The occurrence of five different fossil taxa of pines in the Miocene flora of Güvem which occupies a relatively small area is not surprising at all. Martinez (1963) lists ten species of pines for Valle de Mexico, one of the smallest states of Mexico with a total area of 1555 square miles. Seven species of pines grow in the Lake Tahoe Basin (cf. Griffin & Critchfield 1972 and G. L. Smith 1973). It is very likely to discover additional taxa of pines by exploring the other Tertiary fossil deposits in Asia Minor.

Other gymnosperms associated with the Miocene pines of the Guvem locality are: Glyptostrobus, Sequoia, Taxodium, Keteleeria, Picea, Cedrus, Tsuga, Cupressus, Juniperus, Thuja, Libocedrus, Cephalotaxus and Ephedra. The broadleaved trees of this conifer-hardwood forest are represented by twelve species of fossil oaks and many other genera such as Acer, Alnus, Ailanthus, Arbutus, Broussonetia, Betula, Carpinus, Castanea, Castanopsis, Cercidiphyllum, Cercis, Cinnamomum, Crataegus, Diospyros, Fagus, Ficus, Gleditschia, Juglans, Liquidambar, Magnolia, Myrica, Neolitsea, Persea, Platanus, Populus, Salix, Sapindus, Symplocos, Tilia, Ulmus, Zelkova, etc. Several tree genera such as Glyptostrobus, Sequoia, Taxodium, Keteleeria, Tsuga, Thuja, Libocedrus, Cephalotaxus, Broussonetia, Castanopsis, Cerdidiphyllum, Cinnamomum, Magnolia, Myrica, Neolitsea, Persea,

Sapindus and Symplocos are extinct in the present flora. However, many other Tertiary genera are well-represented in the relict forest of Hatila Valley near Artvin in northeastern Turkey. This relict forest deserves the immediate attention of the Turkish Forestry Service for a strict preservation as a national park.

Among various fossil collecting sites along the Gürcü Valley of Güvem (see Figure 16), Karga creek site situated 750 meters southeast of Demirciler village is the richest source of the fossil remains. Unfortunately, thousands of fossil specimens in diatomite and paper shale slabs have been sold to the tourists by the children of the neighboring villages or smuggled out of the country by foreign visitors. The Miocene deposits of the Karga Creek area need to be fenced in for immediate protection as a natural monument.

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Figure 1:

The distribution of the extant species of pines in Turkey: (1) *Pinus brutia* Ten., (2) *P. halepensis* Mill., (3) *P. nigra* Arn. ssp. *pallasiana* Holmboe, (4) *P. pinea* L., (5) *P. sylvestris* L. (sensu lata). Note that the locality for the Tertiary pines is marked by crossed hammers underneath the word Güvem, north of Ankara.


BULGARIA
GREECE
BLACK
Kirklareli
Edirne
Tekirdağ
Istanbul
Zonguldak
Kastamonu
Izmit
Bolu
Güvem
Bursa
Ankara
Balıkesir
Eskişehir
Afyon
Salt Lake
Izmir
Konya
Karaman
Muğla
Antalya
Mersin
MEDITERRANEAN SEA

Figure 1


SEA
U.S.S.R.
IRAN
IRAQ
SYRIA
Artvin
Trabzon
Rize
Kars
Ordu
Erzurum
Erzincan
Sivas
Van
Malatya
Tigris
(Dicle N.)
G. Antep
Euphrates
(Fırat N.)
Distribution of Pines in Turkey
by B. Kasapligil
0 50 100 km.
(1) Pinus brutia Ten.
(2) Pinus halepensis Mill.
(3) Pinus nigra Arn. ssp. pallasiana Holmboe
(4) Pinus pinea L.
(5) Pinus sylvestris L. (S. L.)

Figure 2:

"Patriarch tree" of Pinus brutia var. pityusa in Pitsunda forest reserve between Gudauta and Gagra northwest of Sukhumi, Georgia, U.S.S.R. This specimen is approximately 300 years old. Note the burl formation around the basal portion of the stem.

Figure 3:

Pinus pinea forest in Fıstıklı locality near Artvin in north eastern Anatolia. Typical evergreen shrubs of maquis in foreground and the Çoruh River in the background. This photograph was taken during the summer of 1964. Note that the trees of this stand are more or less equally spaced.


2


3

Figure 4:

Pinus pinea L. (Kasapligil No. 3878 b, collected from the Fistikli village near Artvin). A: The vegetative branch with needle clusters and recurved bracts; B: The upper portion of a mature cone with prominent apophyses; C: Abaxial view of an ovuliferous scale with two immature seeds. Drawing by Miss Janet Duecy.

Figure 4

Figure 5:

A fine specimen of Pinus pinea L. near Fıstıklı village, about 7 km. west of Artvin, on the way to Hatila Valley. This picture was taken during the summer of 1964 when I visited this locality together with Mr. Orhan Ataman, a senior forestry officer from the Forest District Headquarter in Trabzon. Since then, trees suitable for timber production have been cut by encroachers and dense undergrowth suffered from overgrazing.

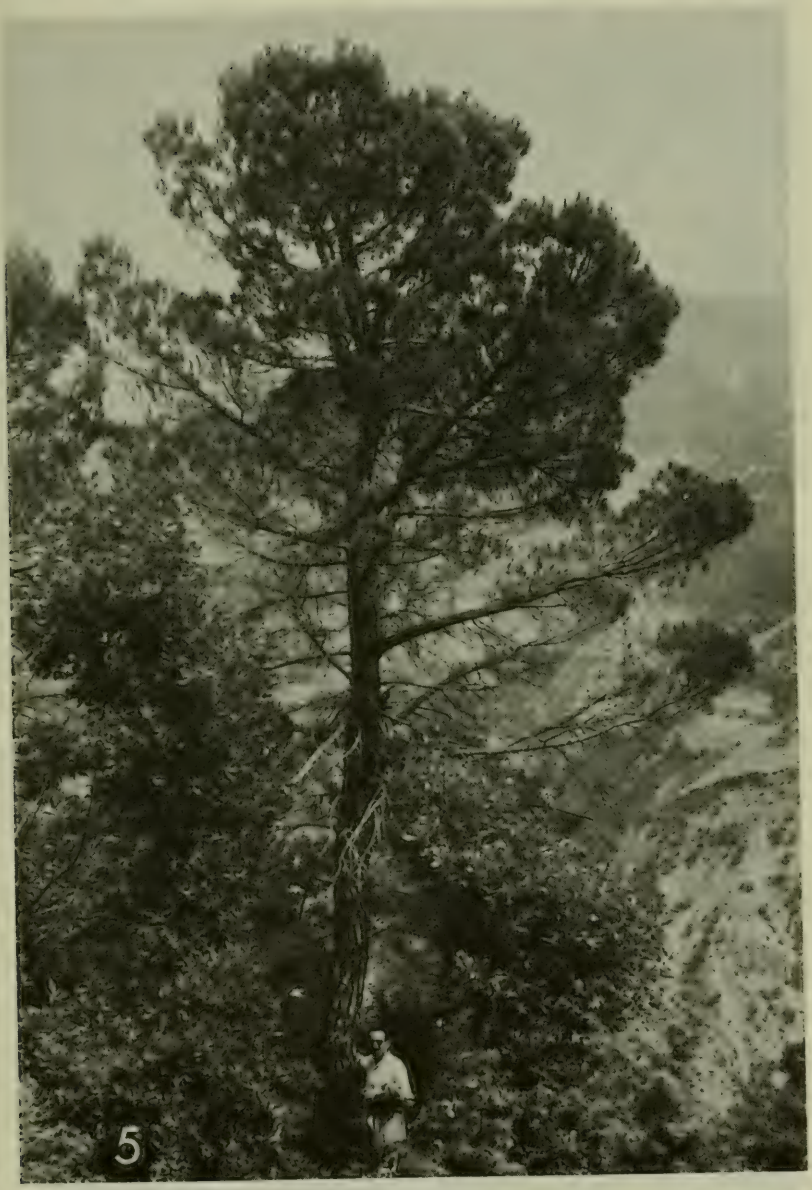
5

Figure 6:

Cultivated specimens of Pinus pinea along the shores of Bosphorus, Istanbul. Due to housing developments and population increase, these decorative trees are disappearing fast.

Figure 7:

A Pinus pinea L. stand near Düzköy Village (formerly Kalanema Village) about 20 km. south of Akçaabat on the Black Sea coast. Scattered stands of the Pinion pine occur between the elevations of 50 m. to 500 m. along the slopes of Söğütlü Dere (formerly Kalanema Valley).

Figure 8:

The Pinion pines growing in maquis along the Mediterranean Coast of Turkey between Aksu and Manavgat near Antalya. This photograph was taken in 1952 before the tourist industry developed in the area. The consequences of human pressure upon this grove deserve investigation.


6


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Figure 9:

A group of young Pinion pines along the roadside near Yeşiltepe village of Kalanema Valley about 20 km. south of Akçaabat on the Black Sea coast. These trees as well as those in the background are severely mutilated for fuel extraction.

Figure 10:

A Pinion pine at Fıstıklı locality near Artvin showing the constriction of the stem base through girdling of a lateral root. This sample tree was 83 years old and its base is exposed by erosion on this steep slope about 600 m. above sea level.

Figure 11:

Core sampling of a Pinion pine in Yeşiltepe village of Kalanema Valley by Mr. Hasret Atasoy, a forestry engineer who is a native of this valley. This specimen growing at an altitude of 320 m. was 75 years old. The associated flora had some Mediterranean elements such as Arbutus andrachne, A. unedo, Pistacia terebinthus, Juniperus oxycedrus, Cistus salviifolius a.s.o.


9


10


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Figure 12:

Pinus sylvestris L. ssp. hamata (Steven)Fomin var. armena (Koch) Pravdin. The specimen was collected from a magnificent young tree growing near the upper edge of the Pinion pine forest in Fıstıklı village 7 km. west of Artvin in 1964, Kasapligil No. 3879. Unfortunately, these pines are no longer in existence in this locality. A: a branch with a mature seed cone and short needles; B: photomicrograph of the needle cross-section showing epidermis, hypodermis, marginal resin canals, three-layered chlorenchyma, constricted endodermis, two vascular bundles interconnected by transfusion sclerenchyma; C: a mature seed with wing, slightly reduced. Drawing by Miss Janet Duecy.

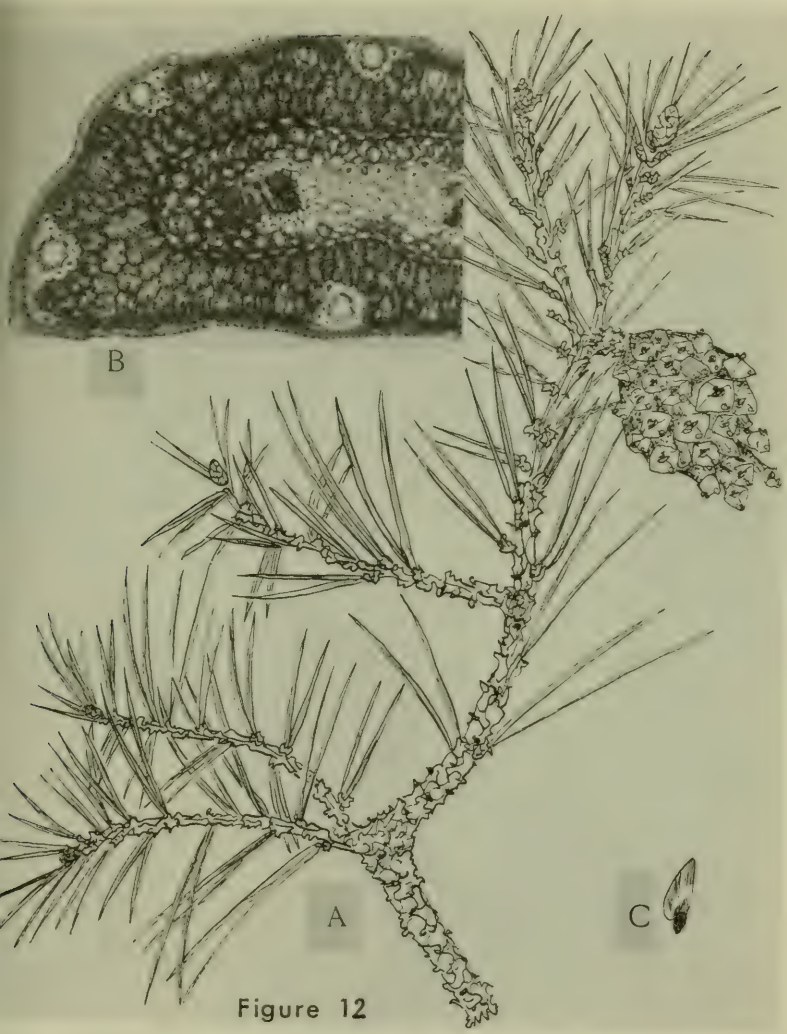

Figure 12

Figure 13:

Pinus sylvestris L. ssp. hamata (Steven)Fomin var. kochiana (Klotsch) Fomin. A branch with long needles, a mature seed cone and two developing ovulate cones (near the tip of the long shoot). A mature seed with its wing at the lower left corner is slightly reduced. This specimen also was collected (Kasapligil No. 3880) from the Fıstıklı locality of Artvin in 1964; again, they are completely eradicated since then. See the text for description and dimensions. Drawing by Miss Janet Duecy.

Figure 13

Figure 14:

Seoscope drawings of needle cross-sections of Pinus sylvestris L. Solid black areas represent the sclerenchyma tissues in all drawings. For explanation of anatomical features see the text. A: Pinus sylvestris L. ssp. hamata (Steven)Fomin var. armena (Koch) Pravdin. Artvin, Kasapligil No. 3879, U.C.B. Herbarium; B: Pinus sylvestris L. ssp. hamata (Steven) Fomin var. kochiana (Klotsch) Fomin. Artvin, Kasapligil No. 3880, U.C.B. Herbarium; C: Pinus sylvestris L. forma parvifolia Heer from Sweden, Vestrogothia, par Toasp, Tubbared, A. O. Olson, September 8, 1925 (specimen courtesy of Botany Dept., Swedish Museum of Natural History, Stockholm; D: Pinus sylvestris L. var. genuina (Heer) A. & G. forma plana Christ. All drawings are approximately 40X.

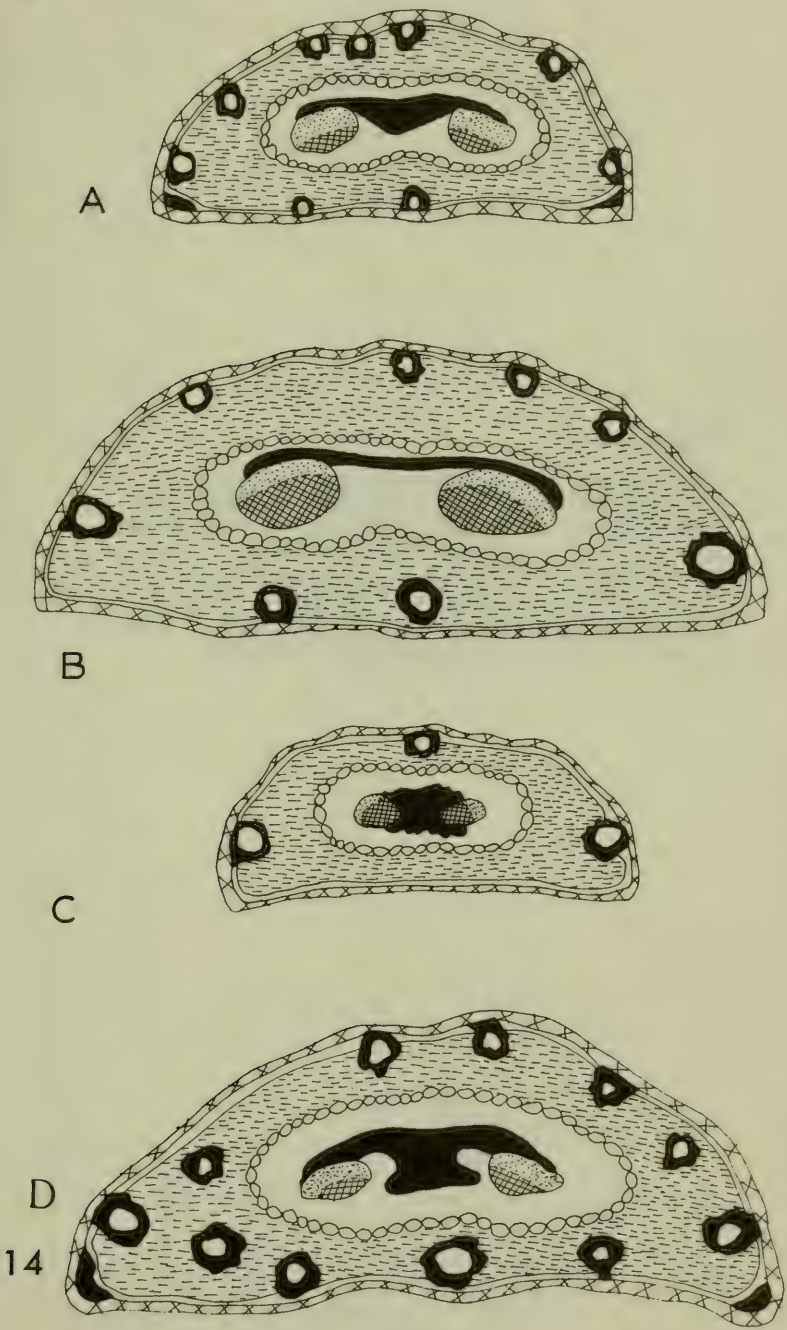

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Figure 15:

The Tertiary pines described in this paper were collected from the Güvem subdistrict (shaded area north of Kızılcahamam) about 90 km. north of Ankara. The map of Turkey at the lower right corner shows the Province of Ankara in relation to Anatolia. (Map courtesy of Professor Necmi Sönmez, Head of the Department of Agricultural Engineering, College of Agriculture of the University of Ankara).

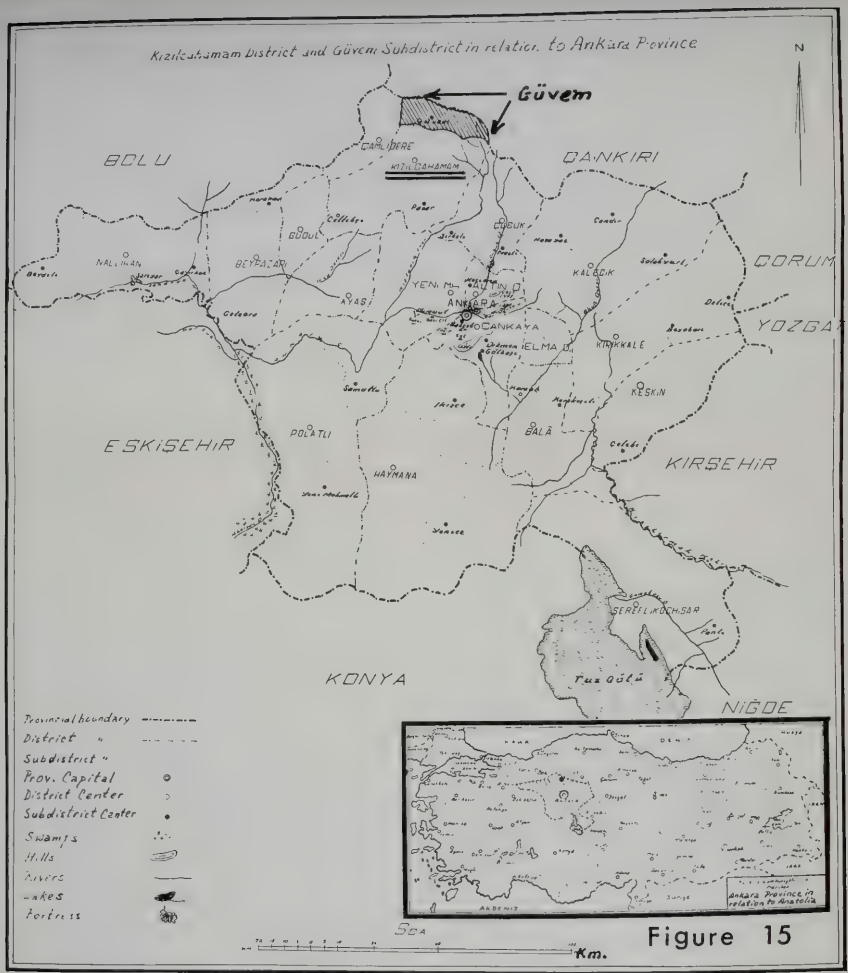
Kizilcahamam District and Güvem Subdistrict in relation to Ankara Province
N
Güvem
BOLU
ÇANKIRI
ÇORUM
YOZGAT
ESKISEHIR
KIRSEHIR
KONYA
NIGDE
ÇAMLIDERE
KIZILCAHAMAM
NALLIHAN
BEYPAZARI
GÖLÖL
AYAS
YENIMAHALLE
ANKARA
ÇANKAYA
ELMADAĞ
KALECIK
KIRIKKALE
KESKIN
BALA
POLATLI
HAYMANA
SEREFLIKOCHISAR
Tuz Gölü
Provincial boundary
District "
Subdistrict "
Prov. Capital
District Center
Subdistrict Center
Swamps
Hills
Rivers
Lakes
Fortress
Sea
Km.
Ankara Province in relation to Anatolia
ARDENIZ

Figure 15

Figure 16:

Sketch map of Gürcü Deresi (= Georgian Valley) showing the main road from Kızılcahamam to Çerkeş and the fossil collecting sites marked by crossed hammers and the dates of collections. The earliest collecting site, Beşkonak locality which was visited in 1968 is situated south of Ağaöz (= Aköz) village. Karga Creek site which is the richest source of well-preserved fossil impressions is located 750 meters south east of Demirciler (Bölükbaşı) village. The shaded areas represent the settlements; (A) andesite, (B) Rhyolite tuff and (C) Quarz latite, designate the locations of rock samples used for age determination.

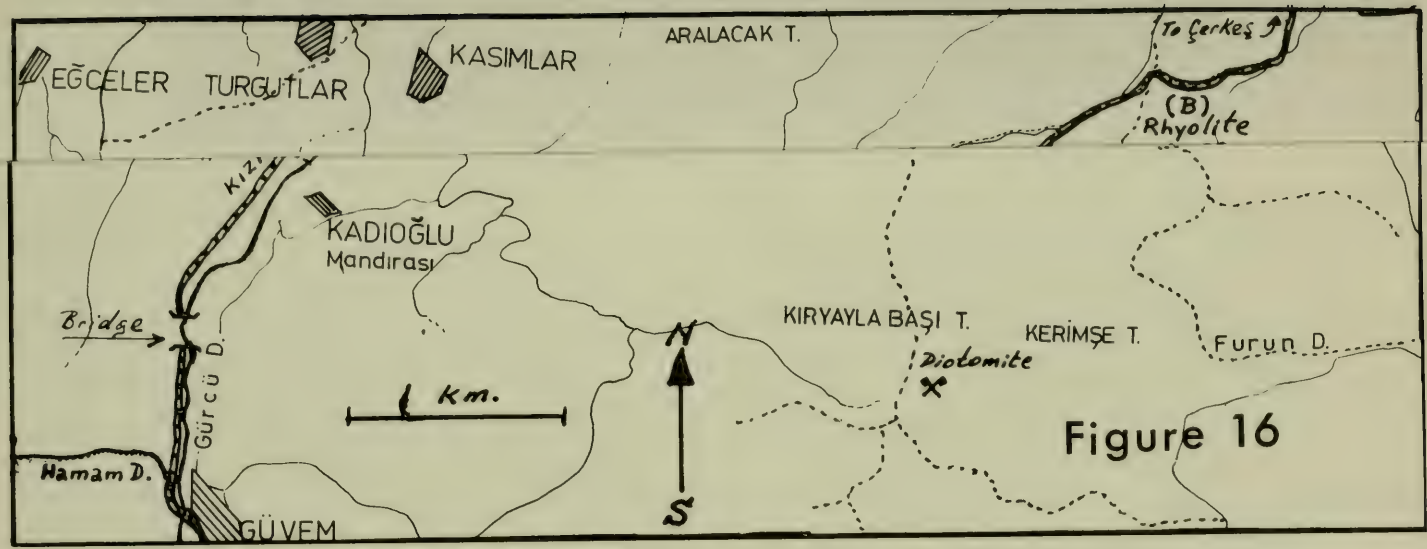
EĞCELER
TURGUTLAR
KASIMLAR
ARALACAK T.
To Çerkeş
(B)
Rhyolite
Kızı
KADIOĞLU
Mandırası
Bridge
Gürcü D.
Hamam D.
GÜVEM
Km.
N
S
KIRYAYLA BAŞI T.
KERİMŞE T.
Diatomite
Furun D.

Figure 16

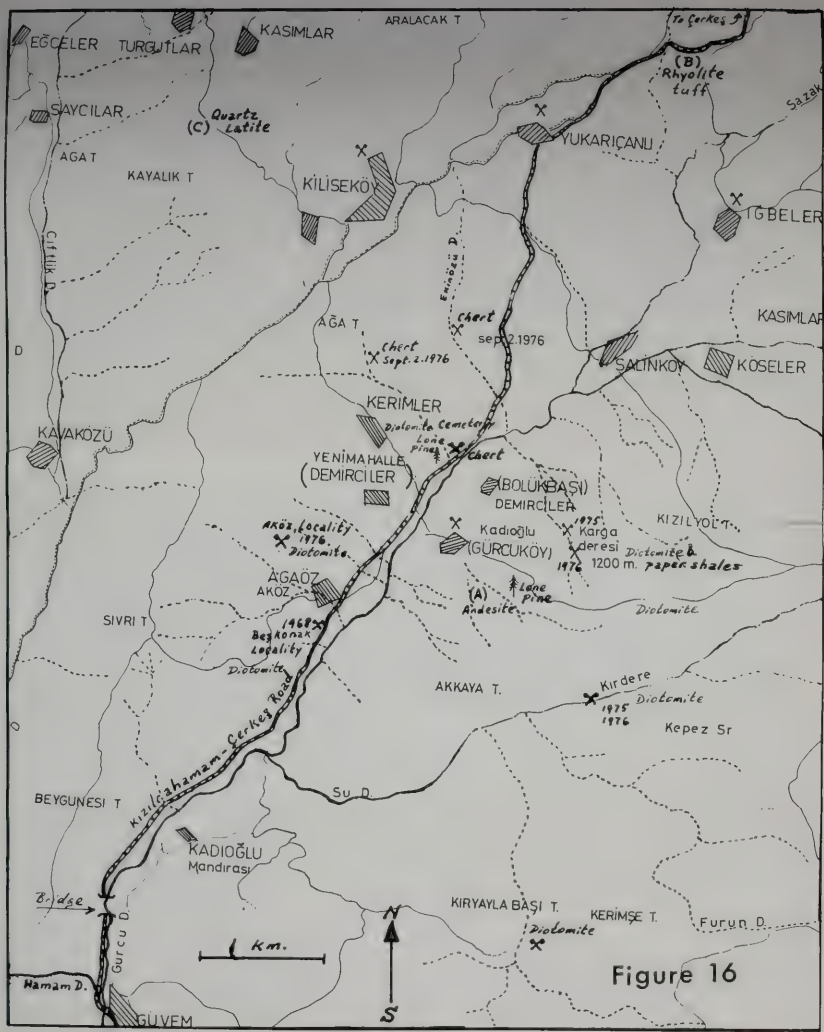
EĞCELER
TURGUTLAR
KASIMLAR
ARALACAK T
To Çerkeş
(B) Rhyolite tuff
SAYCILAR
Quartz Latite
(C)
AGA T
KAYALIK T
KİLİSEKÖY
YUKARIÇANLI
Sazak
İGBELER
Çıtlık D.
Eğinder D.
Chert sept. 2. 1976
AĞA T
Chert Sept. 2. 1976
KASIMLAR
SALİNKÖY
KÖSELER
KERİMLER
Diatomite Cemetery
Lone Pine
Chert
KAVAKÖZÜ
YENİMAHALLE (DEMİRCİLER)
(BOLUKBAŞI) DEMİRCİLER
Akköz Locality 1976 Diatomite
Kadıoğlu (GÜRCÜKÖY)
1975 Karga deresi 1976
KIZILYOLU
Diatomite & 1200 m. paper shales
ÄGAÖZ
AKÖZ
(A) Andesite
Lone Pine
Diatomite
SIVRI T
1968 Beykonak Locality
Diatomite
AKKAYA T.
Kirdere
Diatomite
1975 1976
Kepez Sr
Kızılçahamam-Çerkeş Road
BEYGUNESI T
Su D.
KADIOĞLU Mandırası
Bridge
KIRYAYLA BAŞI T.
KERİMŞE T.
Furun D.
Diatomite
Km.
Gürcü D.
Hamam D.
GÜVEM
N
S

Figure 16

Figure 17:

Kadıoğlu (=Gürcüköy) and Demirciler (= Bölükbaşı) villages as seen from the lone pine near Kerimler (compare with the sketch map in Fig. 16). Willows and Lombardy poplars along the stream of Gürcü Valley in foreground, scattered oaks, pines, junipers and wild pears (Pyrus elaeagrifolia) in background. A pile of volcanic rocks is seen on the edge of a grain field at the lower left corner.

Figure 18:

Fossil excavation site in Karga Creek, 750 meters South east of Demirciler Village, altitude ca. 1200 meters above sea level. The steep banks of this creek are the richest source for fossil impressions. The lacustrine deposits were 7 meters high in this particular spot. The trees on the left-hand side are Populus tremula L. and those to the right Quercus pubescens Willd.

Figure 19:

A laminated diatomaceous slab bearing the leaf impression of Acer trilobatum (Sternberg) A. Braun, one of the most abundant maples of the fossil flora and the fertile branchlets of Glyptostrobus europaeus (Brongn.) Heer with scale-like leaves and mature ovulate cones (to the right).

17

18

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Figure 20:

Fossil beds along the banks of Karga Creek near Demirciler Village. This important locality needs to be fenced in for proper protection against souvenir hunters. The trees in the upper part of the slope against the sky are Pinus nigra Arnold ssp. pallasiana (Lamb.) Holmboe.

Figure 21:

The general aspect of Gürcü Valley as seen from the Karga Creek collecting site near Demirciler Village. Aspens, Black pines and oaks in foreground and a gallery forest of willows and poplars along the stream bed of Gürcü Valley in background (marked by an arrow).

Figure 22:

Andesitic boulders on top of a hill near Yukarı Çanlı village by Soğuksu locality on the main road to Çerkeş, altitude ca. 1400 m. above sea level. According to the villagers, here it snows every winter covering the woody slopes, but the snow never persists upon the ridge and hot steams shoot out into the sky, which suggests the recency of the volcanic activity in the area. The denuded forest on the slope consists of Populus tremula L., Quercus pubescens Willd., Paliurus Spina-Christi Miller, Pinus nigra Arnold ssp. pallasiana (Lamb.) Holmboe and Juniperus communis L. ssp. nana Syme.

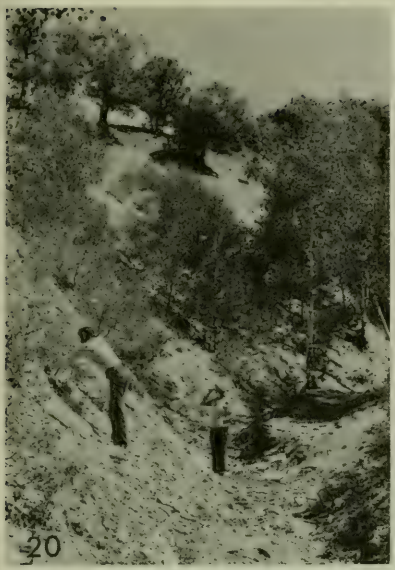

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Figure 23:

Pinus canariensis Smith ssp. meteaensis Kasapligil, holotype: M.T.A. 75/698, Turkish Museum of Natural History, The Mineral Research and Exploration Institute, Ankara.

Figure 24:

Pinus canariensis Smith, mature ovulate cone of the extant species, Kasapligil No. 4882, collected from the cultivated trees next to the Campanile (Sather tower) of the University of California campus, Berkeley.

23

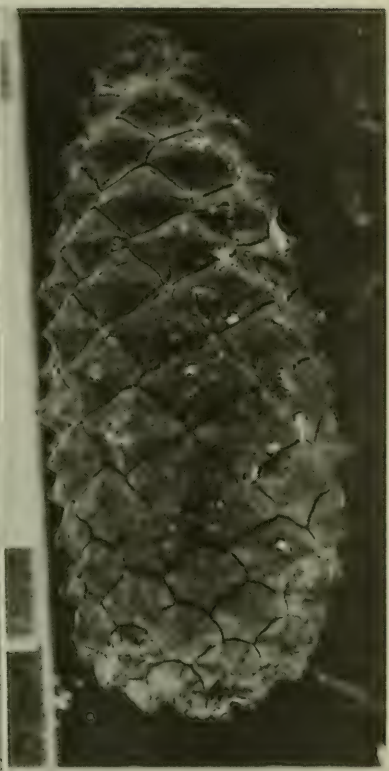

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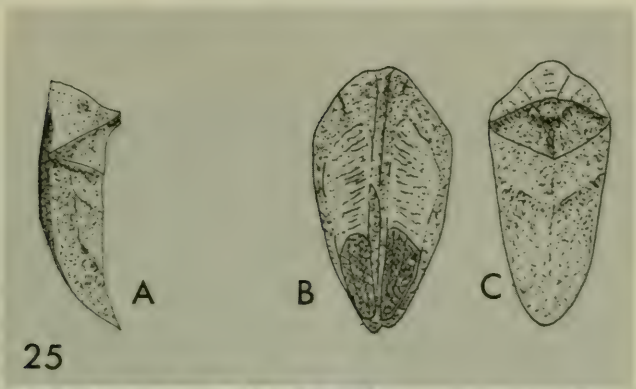
Figure 25:

Ovuliferous scales from a mature seed cone of *Pinus canariensis* Smith. Hermann Knoche No. 590 Febr. 1915-16, Excursion 35, in Dudley Herbarium of Stanford Univ. No. 394 556 (specimen courtesy of California Academy of Sciences, San Francisco). A: Lateral view of the cone scale with prominent apophyses and projecting conical umbo; B: Ventral view of the megasporophyll with two mature seeds, their undulate wings and a ridge between; C: Dorsal view with well defined apophysis and radiating striations. Drawings by Miss Angela vanPatten.

Figure 26:

Pinus canariensis Smith ssp. *meteaensis* Kasapligil. A twig representing the growth of two years. Paratype, Kasapligil No. 5617, Turkish Museum of Natural History, M.T.A., Ankara.



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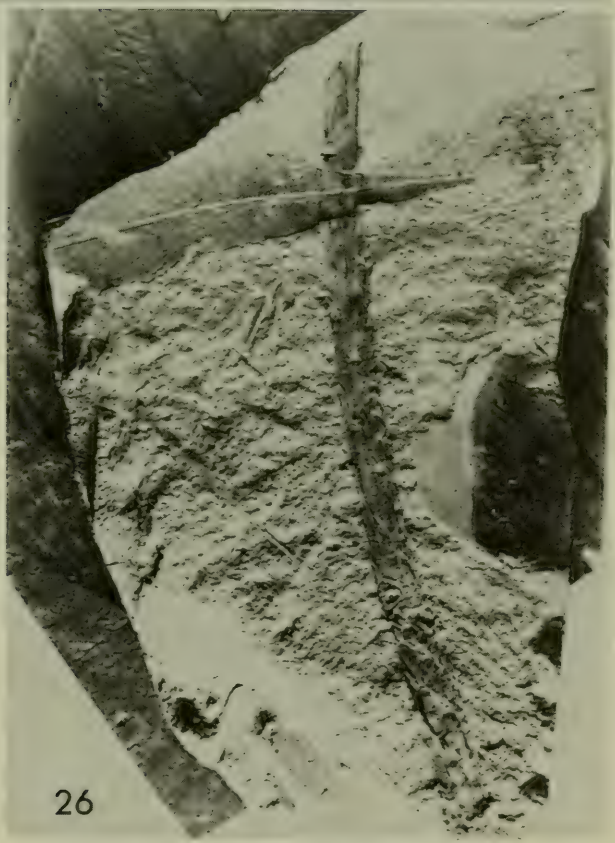

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Figure 27:

Pinus canariensis ssp. meteaensis Kasapligil. Fragments of three needles. Paratype, U.C., PA-312, Kasapligil No. 6075, Turkish Museum of Natural History, M.T.A., Ankara.

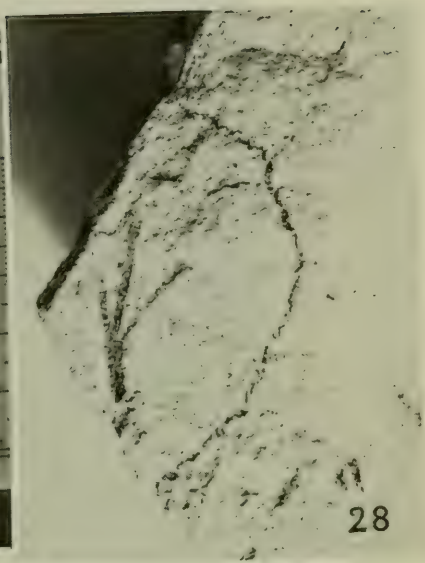
Figure 28:

Pinus canariensis ssp. meteaensis Kasapligil. A spur shoot with the basal portions of three needles with a persistent sheath around them. Paratype, Kasapligil No. 4380, Turkish Museum of Natural History, M.T.A., Ankara. (Slightly enlarged, see the text for measurements).

Figure 29:

A: Fragments of three needles referred to P. canariensis ssp. meteaensis Kasapligil, Paratype, Kasapligil No. 5559 A, Turkish Museum of Natural History, M.T.A., Ankara; B: Quercus sclerophyllina Heer; C: Quercus kubinyi (Kov.) Czecz.; D: Quercus seyfriedii A. Braun.


Kasapligil
cm.
27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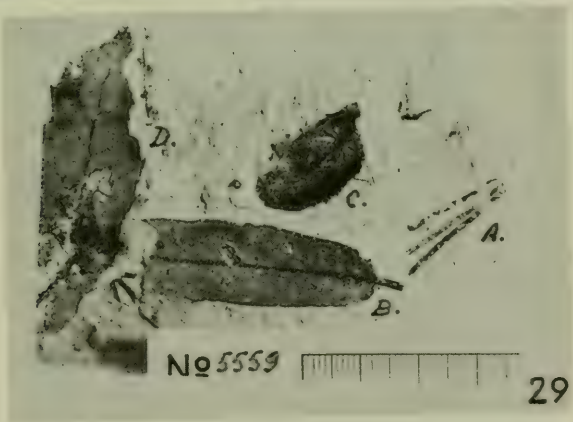
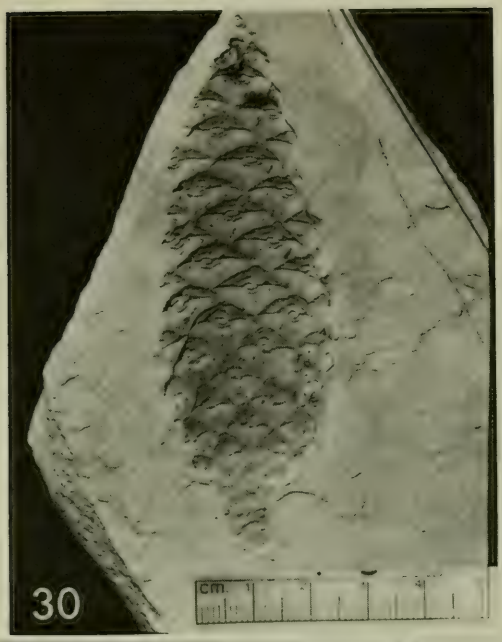

A.
B.
C.
D.
No 5559
29

Figure 30:

Pinus halepensis Aiton ssp. alpanii Kasapligil. Holotype: Kasapligil No. 5623 ex M.T.A. 2231, Turkish Museum of Natural History, The Mineral and Exploration Institute, Ankara. Phorograph by Mrs. Yvonne Arremo (Swedish Museum of Natural History, Paleobotany Dept., Stockholm).

Figure 31:

Two mature ovulate cones of Pinus halepensis Aiton. The specimens courtesy of Institute of Forest Genetics, Pacific southwest Forest and Range Experiment Station, Forestry Service, Berkeley, California.


30
cm.

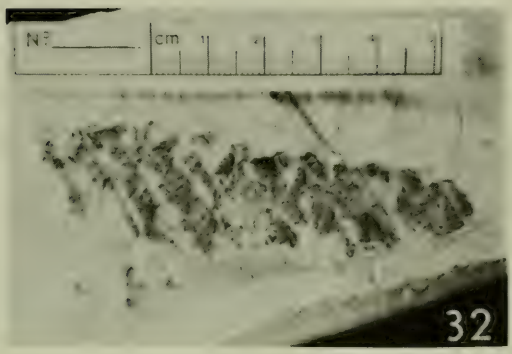

31
cm.

Figure 32:

Pinus nickmirovii Kasapligil. Holotype: M.T.A. No. 75-687, in Turkish Museum of Natural History, The Mineral Research and exploration Institute of Turkey (M.T.A.) Ankara.

Figure 33:

Pinus nickmirovii Kasapligil. Paratype: Kasapligil No. 5618 ex Hicri Aksoy, in Turkish Museum of Natural History, M.T.A., Ankara.


N°
cm
32

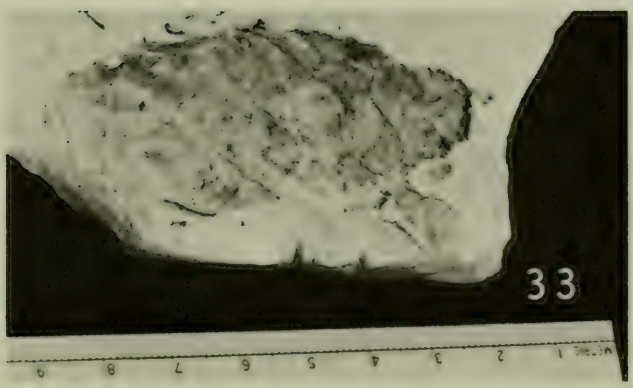

33

Figure 34:

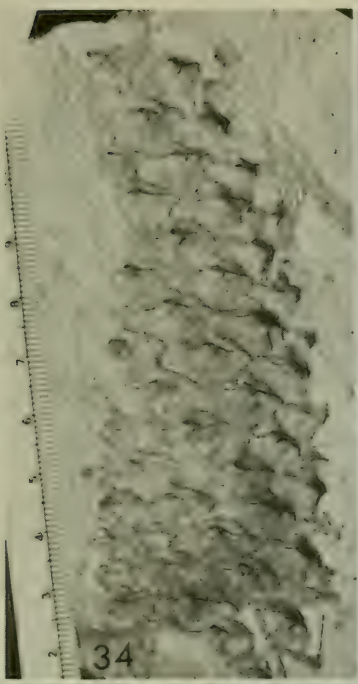
Pinus pinaster Aiton ssp. mioancyrensis Kasapligil. Holotype: Kasapligil No. 6078, ex Wayne Fry, U.C., PA-312.

Figure 35:

Pinus pinaster Aiton ssp. mioancyrensis Kasapligil. Paratype: Kasapligil No. 5530, cone fragment.

Figure 36:

Pinus pinaster Aiton ssp. mioancyrensis Kasapligil. Paratype: Kasapligil No. 5489, two needles attached to the spur shoot.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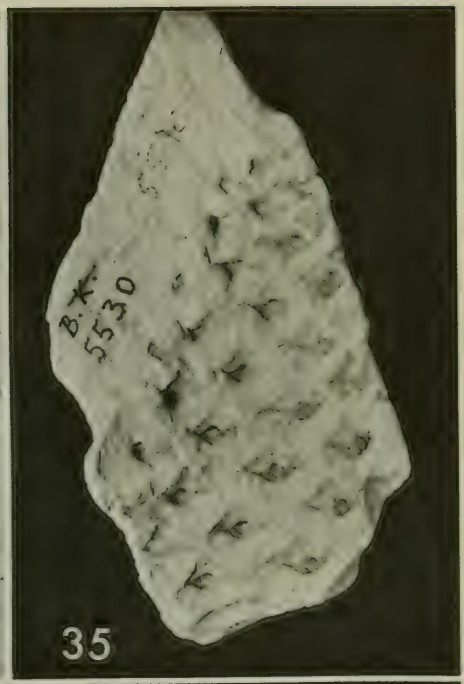
B.K.
5530
35


5489
36

Figure 37:

Pinus pinaster Aiton ssp. *pinaster*. Mature seed cone from Corsica. Specimen courtesy of Institute of Forest Genetics (Placerville), Pacific Southwest Forest and Range Experiment Station, U.S. Forestry Service, Berkeley, California. Drawing by Miss Lee-Ann Tegart, slightly enlarged.

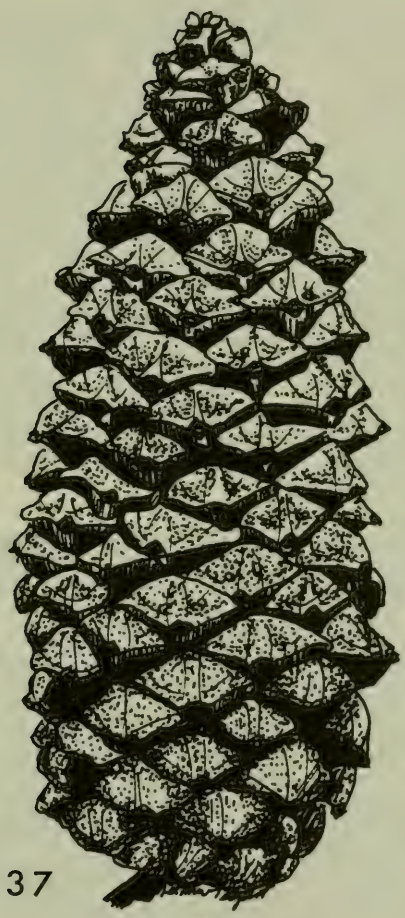

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Figure 38:

Pinus firatii Kasapligil. Holotype: Kasapligil No. 5620 ex Hicri Aksoy from Beşkonak site, in Turkish Museum of Natural History, M.T.A., Ankara.

Figure 39:

Pinus firatii Kasapligil. Paratype: Kasapligil No. 5193 ex Hicri Aksoy from Beşkonak site of Güvem locality, in Turkish Museum of Natural History, M.T.A., Ankara.

Figure 40:

Pinus firatii Kasapligil. Paratype: M.T.A. No. 75-687 in Turkish Museum of Natural History, M.T.A., Ankara.


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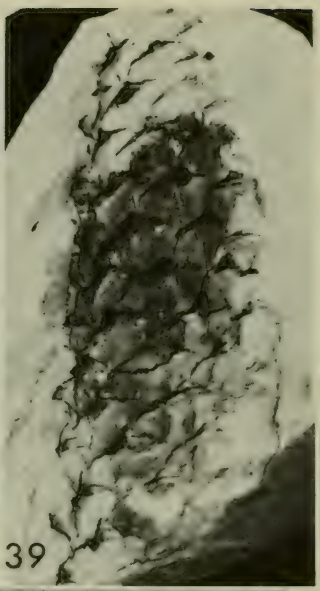
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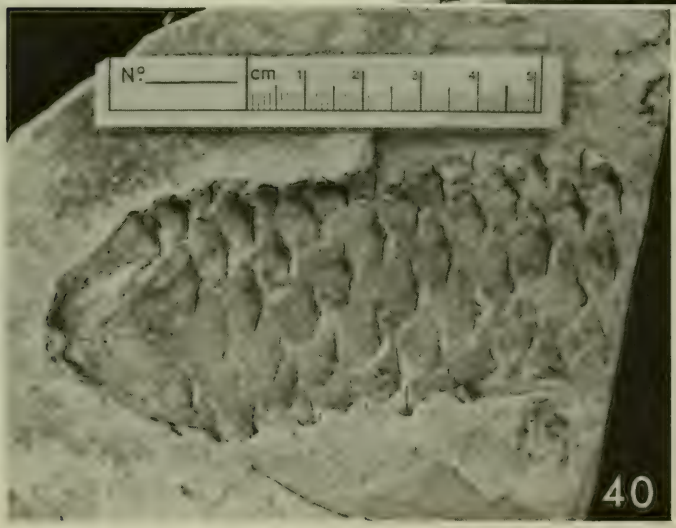

N°
cm
40

Figure 41:

Pinus firatii Kasapligil. Paratype: Semra Başaran No. 3 B. Five needles in a cluster, School of Pharmacy, University of Ankara, Ankara.

Figure 42:

Pinus firatii Kasapligil. Paratype: Semra Başaran No. 3 B. Four needles on a spur shoot, the fifth needle missing, in School of Pharmacy, University of Ankara, Ankara.

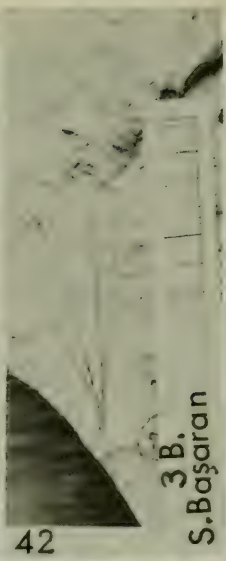
Figure 43:

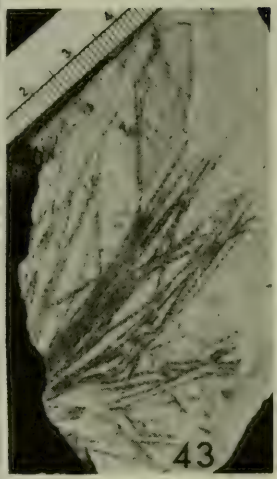
Pinus firatii Kasapligil. Paratype: Kasapligil No. 5621 ex Hicri Aksoy from Beşkonak collecting site, in Turkish Museum of Natural History, M.T.A., Ankara.

Figure 44:

Pinus firatii Kasapligil. Paratype: Kasapligil No. 5619 ex Hicri Aksoy, Beşkonak collecting site, in Turkish Museum of Natural History, M.T.A., Ankara. Note the long and spur shoots with needles attached.


N°.3B
Başaran
cm
41


3 B.
S.Başaran
42


43

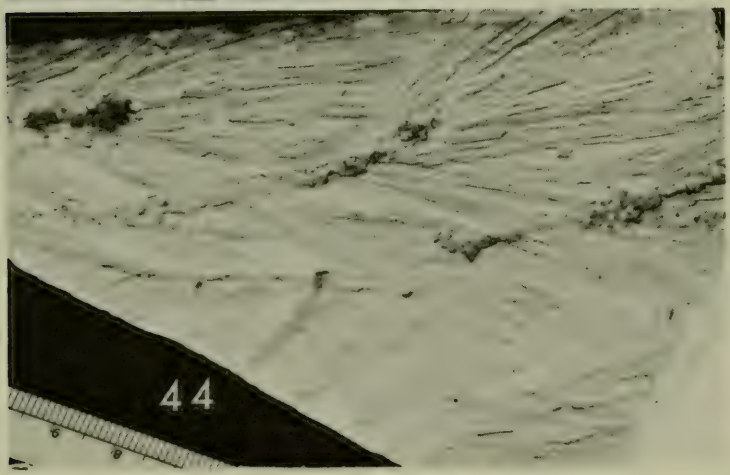
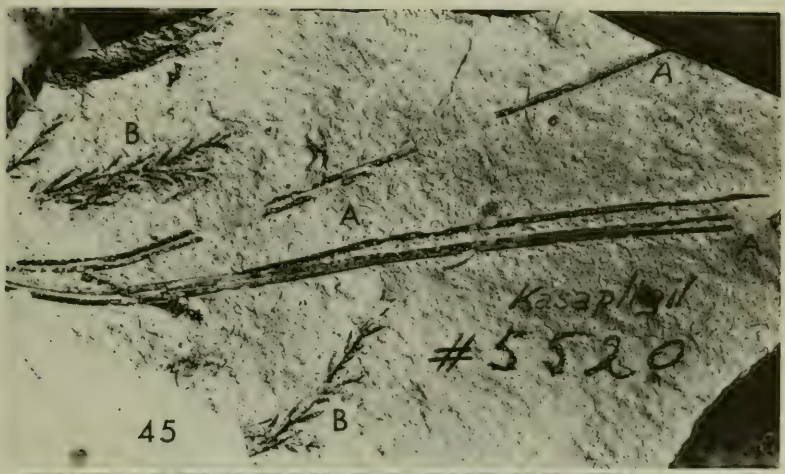

44

Figure 45:

Pinus firatii Kasapligil. Paratype: Kasapligil No. 5520, five needles slightly enlarged (A-A) in Turkish Museum of Natural History, M.T.A., Ankara. Vegetative branchlets of Glyptostrobus europaeus (Brongn.) Heer (B. & B.).

Figure 46:

Pinus firatii Kasapligil. Paratype: Kasapligil No. 5443. Long and spur shoots with the cluster of five needles attached to spur shoots (A. - A.); a branchlet of Sequoia langsdorfii Brongn. (B - B).


A
B
A
A
Kasapligil
#5520
B
45


46
A
B.K.#
5443
A

Figure 47:

Foliage paratype of *Pinus firatii* Kasapligil No. 5622 ex Hicri Aksoy, collected from Beşkonak site of Güvem, deposited in the Turkish Museum of Natural History, M.T.A., Ankara.

Figure 48:

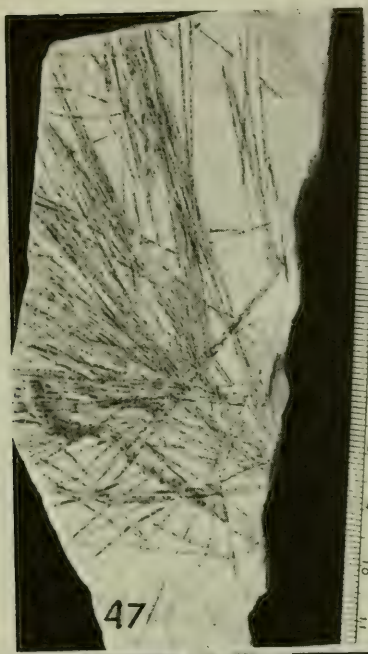
Incomplete needle cluster of *P. firatii* Kasapligil. Paratype: Kasapligil No. 5625, collected from Karga Creek site near Demirciler of Gürcü Valley.

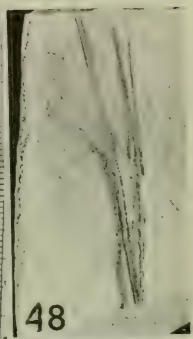
Figure 49:

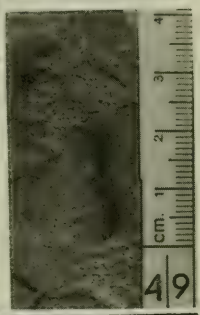
Pinus firatii Kasapligil. Seed paratype: Kasapligil No. 5626 collected from Karga Creek site. Deposited in the Turkish Museum of Natural History, M.T.A., Ankara. Note that the wing is adherent to the seed, but it is partly broken through the median part.

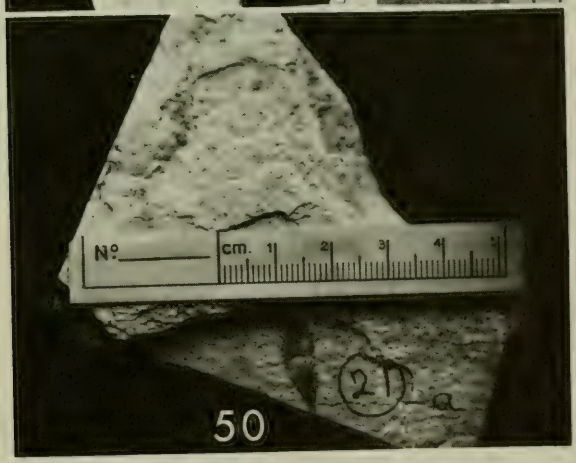
Figure 50:

P. firatii Kasapligil. Paratype: S. Başaran No. 21 a. Abortive seed impression deposited in the School of Pharmacy, University of Ankara, Ankara.


47


48


cm.
49


N°
cm.
21
50

ADDITIONAL NOTES ON THE GENUS LIPPIA. XIII

Harold N. Moldenke

LIPPIA Houst.

Additional bibliography: Stalter, Castanea 40: 13. 1975; J. F. Morton, Quart. Journ. Crude Drug Res. 15: 183. 1977; Ragonese & Piccinini, Darwiniana 21: 53 & 59. 1977; Craig, Proc. Fla. State Hortic. Soc. 90: 110. 1978; Genelle & Fleming, Castanea 43: 49. 1978; Moldenke, Phytologia 39: 434—456, 507—509, 511, & 512 (1978) and 40: 58—85. 1978; Shah, Biol. Abstr. 65: 671. 1978.

LIPPIA INDICA Moldenke

Synonymy: Lippia unica Ramakrishn. in Sundararaj & Ramakrishn., Journ. Bomb. Nat. Hist. Soc. 54: [925]—[927], pl. 1. 1957.

Additional & emended bibliography: Ramakrishn. in Sundararaj & Ramakrishn., Journ. Bomb. Nat. Hist. Soc. 54: [925]—[927], pl. 1. 1957; Prakasa, Journ. Bomb. Nat. Hist. Soc. 55: 396. 1958; Anon., Excerpt. Bot. A.1: 320. 1959; Sabastine, Bull. Bot. Surv. India 4: 223. 1962; G. Taylor, Ind. Kew. Suppl. 13: 81. 1966; Moldenke, Résumé Suppl. 16: 9. 1968; Moldenke, Fifth Summ. 1: 277 (1971) and 2: 892 & 895. 1971; Moldenke, Phytologia 39: 97, 102, & 105. 1978.

Illustrations: Ramakrishn. in Sundararaj & Ramakrishn., Journ. Bomb. Nat. Hist. Soc. 54: [927], pl. 1. 1957.

It appears quite certain that Ramakrishnan's species is co-specific with my earlier (1940) L. indica. His detailed description and discussion are worth repeating here: Perennial, gregarious, strongly aromatic, branching undershrub, 0.9—1.2 m. tall; stems tetragonal above, terete at the base, the young ones pubescent, the older ones glabrous; principal internodes 5—7.5 cm. long; leaves decussate-opposite or ternate, petiolate; leaf-blades elliptic to elliptic-lanceolate, 2.5—7.5 cm. long, 1.2—3.3 cm. wide, acute at the apex, serrate with pointed teeth along the margins, attenuate at the base, pale-green and villous above, grayish and pubescent beneath; primary veins 7—9, ascending, impressed above, prominent and villous beneath; inflorescence axillary, spicate; spikes solitary, subglobose, 6—12 mm. long, 7.5—10 mm. wide; peduncles 5—12 mm. long, terete toward the base, tetragonal and grooved above, villous; bractlets subcordate, acuminate at the apex, obscurely ridged on the upper surface, villous on the back, glabrous within, ciliate along the margins, with 4 or 5 prominent veins on either side of the prominent midrib; calyx distinctly 2-lobed, 1.25—1.75 mm. long, keel-shaped, connate at the base to form a ring, densely pubescent outside, glabrous within; corolla bilabiate, 6.5 mm. long, the upper lip 2-lobed, the lower lip 3-lobed, lilac with a yellow throat, the lower half white and curved, pubescent outside

and from the yellow throat downward inside; stamens 4, didynamous, inserted near the middle of the corolla-tube; filaments short; anthers ovate, with parallel thecae; ovary superior, sessile, subglobose, syncarpous, 2-carpellary, 2-celled; style terminal, short and stout, slightly curved; stigma terminal, oblique and recurved, thickened; fruit small, pyriform, enclosed in the slightly accrescent and appressed fruiting-calyx; endocarp hard and body, easily separated into two one-seeded pyrenes.

The type of L. unica was collected by V. Ramakrishnan in wet lands on the Agricultural College Estate, Coimbatore, India, on April 14, 1952, and is sheet no. 94281 in the Madras Herbarium. Sabastine (1964) and Taylor (1966) list the species from Madras.

Ramakrishnan (1957) tells us that "This striking species differs from its allied species L. geminata H. B. & K. in its solitary, axillary, condensed, subglobose spikes, elliptic to elliptic-lanceolate, acute, attenuate based leaves with upper surface villous and in its subcordate, acuminate, ciliate bracts. In L. geminata H. B. & K. the spikes are in one or two pairs, cylindric and elongate, the leaves ovate, subobtuse with upper surface scabrous-hispidulous hairs with papilose base and somewhat decurrent and the bracts ovate, apiculate.

"A shrubby species with virgate branches, strongly aromatic particularly the leaves and tender angular shoots smelling like citrol. The flowers are lilac with yellow throat. The plant thrives very well in moist loamy soils particularly along the bunds or irrigation channels. It easily roots at nodes."

LIPPIA TURBINATA Griseb.

Additional bibliography: Fester, Martinuzzi, Retamer, & Ricciardi, Acist. Esenc. Rep. Argent. 1961; Moldenke, Phytologia 40: 74—77. 1978.

LIPPIA VERNONIOIDES var. ATTENUATA (Mart.) Moldenke

Additional & emended synonymy: Aloysia attenuata (Mart.) Walp., Repert. Bot. Syst. 4: 42. 1856. Aloysia attennata Walp. ex Buek, Gen. Spec. Syn. Candoll. 3: 13. 1858. Aloysia attenuata Walp. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 89, in syn. 1893.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 89 (1893), imp. 1, 2: 95 (1894), imp. 2, 1: 89 (1946), imp. 2, 2: 95 (1946), imp. 3, 1: 89 (1959), and imp. 3, 2: 95. 1959; Moldenke, Phytologia 40: 83—85. 1978.

Walpers (1856) plainly based his new binomial on the earlier Lippia attenuata Mart. (1838) from Cujabá, Brazil

LIPPIA VILLAFLORIDANA Kuntze

Additional bibliography: Moldenke, Phytologia 40: 85. 1978.

Troncoso (1974) cites Martínez Crovetto 8421 from Corrientes, Argentina, in the San Isidro herbarium. The corollas are said to have been "yellow" on Rosengurtt Gallinal 5730.

Additional citations: URUGUAY: Rosengurtt Gallinal 5730 (Ba).

LIPPIA VINOSA Moldenke, Phytologia 28: 303. 1974.
Bibliography: Moldenke, Phytologia 28: 303 & 439. 1974; Hocking, Excerpt. Bot. A.26: 6. 1975.
Citations: BRAZIL: Mato Grosso: Hatschbach & Guimarães 24621 (Z—type).

LIPPIA VOLKII Moldenke
Additional bibliography: Moldenke, Phytologia 13: 169—170. 1966; Moldenke, Fifth Summ. 1: 254 (1971) and 2: 895. 1971; Moldenke, Phytologia 39: 392. 1978.
Recent collectors describe this species as an erect herbaceous perennial or shrubby virgate herb with woody basal stems, 3 feet tall, the leaves very strongly aromatic, and have found it growing on red sandy calcareous flats and on the slopes of flat-top mountains, flowering in April. The corollas are said to have been "white with yellow centers" on Winter & Leistner 5285 and "pale-cream with yellow centers" on Winter & Leistner 5526.
Additional citations: NAMIBIA: Winter & Leistner 5286 (Mu), 5526 (Mu).

LIPPIA WHYTEI Moldenke
Additional bibliography: Moldenke, Phytologia 14: 419. 1967; Moldenke, Fifth Summ. 1: 231, 234, 237, 241, 246, 248, 250, & 252 (1971) and 2: 895. 1971; Moldenke, Phytologia 39: 105. 1978.
Recent collectors describe this plant as a roadside shrub, 1—2 m. tall, and have found it growing at 1600 m. altitude, flowering and fruiting in January. The corollas are said to have been "white" on Robinson 6170.
Additional citations: TANZANIA: Tanganyika: Endlich 123 (Mu). ZAMBIA: E. A. Robinson 6170 (Mu, N). MOZAMBIQUE: Niassa: Rui Monteiro 34 (Z).

LIPPIA WILMSII H. H. W. Pearson
Additional & emended bibliography: H. H. W. Pearson in Thiselt.-Dyer, Fl. Cap. 5: 193 & 196. 1901; Friedrich-Holzhammer, Meeuse, & Meikle, Prodr. Fl. Südw. Afr. 13 (122): 2 & 7—8. 1967; Hocking, Excerpt. Bot. A.11: 104. 1967; Moldenke, Phytologia 14: 419. 1967; Hocking, Pharmaceut. Abstr. 9 (3): no. 1067. 1968; Wild, Kirkia 7: 20 & 57. 1968; Glover, Stewart, Fumerton, Marindany, & Andersen, Gloss. Botan.-Kipsig. Names 160, 216, & 256. 1969; Richards & Morony, Check List Fl. Mbala 238—239. 1969; Van der Schijff, Check List Vasc. Pl. Kruger Natl. Park 81. 1969; Moldenke, Fifth Summ. 1: 233, 238, 246, 248, 250, 252, 254, & 257 (1971) and 2: 541, 545, 549, & 895. 1971; Jacobsen, Kirkia 9: 172. 1973; Moldenke, Phytologia 38: 259 (1978) and 39: 392, 393, 439, 440, & 447. 1978.
Recent collectors describe this species as a perennial herb, subshrub, or undershrub, 1 1/2 to 4 feet tall, virgate and erect or cespitose, growing singly or in groups, "coppice-growing", the

whole plant srongly aromatic, the roots woody, the stems subherbaceous, hispid, semi-woody at the base, the sap colorless, the leaves opposite, dentate, hispid, with a lemon odor, the inflorescences borne in the leaf-axils, the flowers aromatic, and have found it growing in grassy fields, tall grassveld, and the red sandy soil of open bushveld, at altitudes of 1200—1700 m., flowering from October to February, fruiting from October to January. Tanner encountered it "in loam and gravel of grassland" and "in bare patches in valley near stream, open forest, sandy soil". Wild (1968) refers to it as a geophyte growing in copper-bearing soil in an area of 750 mm. annual rainfall. Schweicherdt refers to it as "common", but Acocks calls it "rare".

The corollas are said to have been "white" on Merxmüller 24 & 222 and on Mogg 14129, "white with yellow center" on Winter 4381, "cream" on Strey 3130 & 3166, and "yellow" on Tanner 4465. The Winter 7557 collection is voucher for material collected for chemical analysis.

Pearson (1901) distinguishes this taxon from related ones as follows:

Leaves crenate.....L. pretoriensis.
Leaves crenate-serrate.
  Bracts 4 mm. long or longer.....L. wilmsii.
  Bracts less than 4 mm. long.....L. rehmanni.

Friedrich-Holzhammer and his associates (1967) distinguish it from the more recently described L. pearsoni as follows:

"Jüngere Stengelteile und Blätter nur spärlich mit sehr kurzen, ± anliegenden Haaren bedeckt und ausserdem stark drüsig; Blätter ganzrandig bis sehr schwach und undeutlich gesägt. Köpfchen meist zu 4—6 an der Stengelknoten, bis ca. 15 mm lang gestielt, kugelig bis eiförmig, meist unter 10 mm lang. Tragblätter breit eiförmig, kurz zugespitzt, bis ca. 3 mm lang.....L. pearsoni.
Jüngere Stengelteile und Blätter ziemlich dicht mit längeren, abstehenden, steifen Haaren bedeckt, ausserdem drüsig. Blätter deutlich gesägt. Köpfchen meist zu 2—4 an den Stengelknoten, ca. 20—50 mm lang gestielt, eiförmig-länglich, ca. 10—15 mm lang. Tragblätter schmal-eiförmig, lang zugespitzt.....L. wilmsii."

They cite Dinter 692, 2334, & 5482, Rehm s.n., and Winter 4381.

Vander Schijff (1969) reports L. wilmsii "Scattered throughout" Kruger National Park, citing his nos. 1094, 1146, 1239, 1318, & 1952, Lang. 32208, and C.4904. Jacobsen (1973) reports it "common" in rocky ground in Brachystegia woodland in Rhodesia, citing his nos. 1517 & 1551. Richards & Morony (1969) encountered it on hills, in dry open burned ground, in sandy ground among granitic rocks, and in open sandy burned-over airfield areas, at 5000—5800 feet altitudes, describing it as herbaceous and citing their nos. 3617, 6326, 15965, & 22108.

Glover and his associates (1969) report the vernacular names,

"bek-ab-tarit" [=seed of the birds] and "maiywap-tarit", saying that the "small berries" [mericarps] are eaten by "children and birds".

Material of L. wilmsii has been misidentified and distributed in some herbaria as L. pretoriensis H. H. W. Pearson and as L. rehmanni H. H. W. Pearson, closely related taxa. On the other hand, the Baum 250, distributed as and previously (1966) cited by me as L. wilmsii, actually is L. rehmanni.

Additional citations: TANZANIA: Tanganyika: Tanner R.T.4465 (Ba), 4562 (Ba). RHODESIA: Fries, Norlindh, & Weimarck 2460 (Mu, N); Loveridge 550 (Mu). NAMIBIA: Kinges 665 (Mu); Rehm s.n. [8. 12.1939] (Mu); Winter 4381 (Mu). SOUTH AFRICA: Cape Province: Acocks 21938 (Mu). Transvaal: Meebold 12829 (Mu); Merxmüller 24 (Mu), 222 (Mu); Mogg 14129 (Mu), s.n. [10/1/38] (Mu); Schweickerdt 1299 (Mu); Strey 3130 (Mu), 3166 (Mu); Winter 7557 (Mu).

LIPPIA WILMSII var. SCABERRIMA (Moldenke) Moldenke

Additional bibliography: Moldenke, Phytologia 13: 175. 1966; Moldenke, Fifth Summ. 1: 248, 250, & 257 (1971) and 2: 549 & 895. 1971.

LIPPIA WILMSII var. VILLOSA (Moldenke) Moldenke

Additional bibliography: Moldenke, Phytologia 13: 174—176. 1966; Moldenke, Fifth Summ. 1: 231, 233, 234, 238, 241, 244, 246, & 248 (1971) and 2: 550, 568, & 895. 1971.

Recent collectors describe this plant as upright, 6—12 inches tall, "coppice growing", and growing in tight masses, with a woody taproot, the sap colorless, and the flowers either aromatic or not so [depending on time of day?], and have found it growing among gravel and stone on rocky hillsides, at 5000—6000 feet altitude, flowering in May and November. Maas Geesteranus encountered it "on deforested cattle-grazing hills sloping down to winding rivulets along which is a thin fringe of trees, laterite soil". The corollas are said to have been "lime-green" on Tanner 3226, "yellow-brown" on Tanner 1692, and "yellowish-white" on Maas Geesteranus 4786. The vernacular name, "sinoni", has been recorded.

Additional citations: TANZANIA: Tanganyika: Tanner R.T.1692 (Ba), R.T.3226 (Ba). KENYA: Maas Geesteranus 4786 (Go).

LIPPIA WOODII Moldenke

Additional bibliography: Moldenke, Phytologia 14: 419. 1967; Moldenke, Fifth Summ. 1: 248, 250, & 257 (1971) and 2: 895. 1971.

LIPPIA YUCATANA Loes.

Additional bibliography: Moldenke, Biol. Abstr. 47: 8471. 1966; Hocking, Excerpt. Bot. A.11: 104 (1967) and A.12: 425. 1967; Moldenke, Phytologia 14: 419. 1967; Hocking, Pharmaceut. Abstr. 9 (3): no. 1067. 1968; Moldenke, Biol. Abstr. 49: 4199.

1968; Moldenke, Fifth Summ. 1: 72 (1971) and 2: 550 & 895. 1971; Moldenke, Phytologia 39: 253. 1978.

Enriquez records the vernacular name, "htzinte", for this species and has found the plant in flower and fruit in October.

Additional citations: MEXICO: Yucatán: Enriquez 259 (W—2597462).

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ADDITIONAL NOTES ON THE GENUS AEGIPHILA. XXIV

Harold N. Moldenke

AEGIPHILA Jacq.

Additional & emended synonymy: Aegephila Jacq. ex Moldenke, Brittonia 1: 250, in not. 1934; Prelim. Alph. List Inv. Names [1], in syn. 1940. Aegiphyla Jacq. ex Moldenke, Brittonia 1: 250, in not. 1934; Prelim. Alph. List Inv. Names 4, in syn. 1940. Aegiphylla Jacq. ex Moldenke, Brittonia 1: 250, in not. 1934; Prelim. Alph. List Inv. Names 4, in syn. 1940. Aegyaphila Jacq. ex Moldenke, Brittonia 1: 250, in not. 1934; Prelim. Alph. List Inv. Names 4, in syn. 1940. Aeghyphylla Pohl ex Moldenke, Brittonia 1: 250, in not. 1934; Prelim. Alph. List Inv. Names [1], in syn. 1940. Egyphylla Jacq. ex Moldenke, Brittonia 1: 250, in not. 1934; Prelim. Alph. List Inv. Names 25, in syn. 1940. Brückea Karst. ex Moldenke, Brittonia 1: 250, in not. 1934; Prelim. Alph. List Inv. Names 8, in syn. 1940. Brückea Klotzsch ex Moldenke, Brittonia 1: 250, in not. 1934; Prelim. Alph. List Inv. Names 8, in syn. 1940. Aegyphilla Jacq. ex Moldenke, Phytologia 1: 182, in not. 1937; Suppl. List Inv. Names [1], in syn. 1941. Egiphila Jacq. ex Moldenke, Phytologia 1: 182, in not. 1937; Suppl. List Inv. Names 3, in syn. 1941. Aeguephila Jacq. ex Moldenke, Phytologia 1: 182, in not. 1937; Prelim. Alph. List Inv. Names 4, in syn. 1940. Aegiphita Jacq. ex Moldenke in Fedde, Repert. Spec. Nov. 42: 248, sphalm. 1937; Prelim. Alph. List Inv. Names 4, in syn. 1940. Egiphylla Jacq. ex Moldenke, Prelim. Alph. List Inv. Names 25, in syn. 1940. Echiphylla Jacq. ex Moldenke, Phytologia 1: 377, in not. 1940; Suppl. List Inv. Names 3, in syn. 1941. Stigmatococca Mart. ex Moldenke, Prelim. Alph. List Inv. Names 42, in syn. 1940. Aegyphylla Jacq. ex Moldenke, Suppl. List Inv. Names [1], in syn. 1941. Ageiphila Jacq. ex Moldenke, Phytologia 13: 318, in syn. 1966. Aegipjila Donn. Sm. ex Moldenke, Résumé Suppl. 18: 8, in syn. 1969. Aegyfilla Vell. ex Moldenke, Phytologia 28: 453, in syn. 1974. Stigmatococca "Mart. ex Mold." apud Soukup, Biota 11: 4, in syn. 1976 [not Stigmatococca Willd., 1827]. Aegyphyla Corad., in herb.

Additional & emended bibliography: Jacq., Select. Stirp. Amer. Hist. 18 & 26. 1788; Batsch, Tabl. Aff. Reg. Veg. 193. 1802; Pers., Syn. Pl. 1: 132 & 133. 1805; Pers., Sp. Pl. 1: 339, 342, & 343. 1817; Sweet, Hort. Brit., ed. 1, 1: 322 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Spach, Hist. Nat. Veg. Phan. 9: 226—227. 1840; P. DC. in A. DC., Prodr. 9: 512—513. 1845; Schau. in A. DC., Prodr. 11: 627, 639, & 647—655. 1847; Schnitzlein, Iconogr. Fam. Nat. 2: 137 Verbenac. [3]. 1856; Buek, Gen. Spec. Syn. Candoll. 3: 9, 19, 73, & 338. 1858; Kuntze, Rev. Gen. Pl. 2: 502 & 505. 1891; Rojas Acosta, Cat. Hist. Nat. Corr. 76, 172—173, & 206. 1897; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 432. 1904; Loes., Verh. Bot. Ver. Brand. 53: 81. 1912; Hubert, Trav. Lab. Nat. Méd. Fac. Pharm. Paris 13 (4): 65—67. 1921; Fedde & Schust. in Just, Bot. Jahresber. 44: 253. 1922; Pittier, Man. Pl. Usual. Venez. 189, 386, & 416. 1926; Wangerin in Just, Bot. Jahresber. 46 (1): 717. 1926; Fedde in Just, Bot. Jahresber. 44: 1358. 1927; Fedde & Schust. in Just, Bot. Jahresber. 47 (2): 244 (1927) and 48 (1): 496. 1927; Wangerin in Just, Bot. Jahresber. 49 (1): 301 & 522. 1928; Fedde in Just, Bot. Jahresber. 46 (2): 537 (1929) and 47 (2): 270. 1929; Fedde & Schust. in Just, Bot. Jahresber. 47 (2): 244. 1929; Fedde in Just, Bot. Jahresber. 49 (2): 379. 1932; Yuncker, Field Mus. Publ. Bot. 9: 329. 1940; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 432. 1963; Lombardo, Fl. Arb. & Arbores. Urug., ed. 2, 120, fig. 187. 1964; Krapovickas, Bol. Soc. Argent. Bot. 11: [256]. 1970; Rouleau, Guide Ind. Kew. 7. 1970; Anon., Commonw. Myc. Inst. Index Fungi 3: 823. 1972; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 25, 26, 52, 165, 709, 815, & 949. 1973; Altschul, Drugs & Foods 245 & 349. 1973; Anon., Biol. Abstr. 56 (6): B.A.S. I.C. S.190. 1973; Howard, Journ. Arnold Arb. 54: 444. 1973; J. Hutchins., Fam. Flow. Pl., ed. 3, 487 & 910. 1973; Kunkel, Excerpt. Bot. A.21: 115. 1973; Legname, Lilloa 33: [326]—333, fig. 1 & 2. 1973; Moldenke, Biol. Abstr. 56: 3000. 1973; Rogerson, Bull. Torrey Bot. Club 100: 192. 1973; Thorne in Meggers, Ayensu, & Duckworth, Trop. Forest Ecosyst. Afr. & S. Am. 35. 1973; Tomlinson, Journ. Arnold Arb. 54: 120. 1973; Moldenke, Phytologia 27: 352—376 (1973), 27: 505—509 (1974), 28: 426, 433—438, 440, 452—454, 460, 506, & 507 (1974), and 29: 23 & 32. 1974; Anon., Biol. Abstr. 57 (7): B.A.S.I.C. E.8. 1974; Asher, Guide Bot. Period. 1 (12): 57. 1974; R. F. V. Cooper, Biol. Abstr. 57: 3788. 1974; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Gibbs, Chemotax. Flow. Pl. 3: 1752. 1974; Heslop-Harrison, Ind. Kew. Suppl. 15: 4. 1974; Hocking, Excerpt. Bot. A.23: 291—293. 1974; Howes, Dict. Useful Pl. 244. 1974; "H. R.", Biol. Abstr. 57: 1904. 1974; León & Alain, Fl. Cuba, imp. 2, 2: 280, 305, 309—310, & 321, fig. 132. 1974; Little, Woodbury, & Wadsworth, Trees P. R. & Virg. Isls. 2 [U. S. Dept. Agr. Agric. Handb. 449]: xii, 854—856, 991, 994, 997, & 1021, fig. 678. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21 & 22. 1974; Moldenke, Biol. Abstr. 57: 3780, 3783, & 5679 (1974) and 58: 685. 1974; Rogerson & Becker, Bull. Torrey Bot. Club 101: 46, 109, & 170. 1974; Troncoso, Darwiniana

18: 297, 299, 302, 303, 307, 390—393, 401, 408, & 411, fig. 33 & 34. 1974; Hocking, Excerpt. Bot. A.26: 5. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 9—10, 22, 27, & 51. 1975; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: [353], 365, & 368. 1975; Moldenke, Phytologia 29: 505 (1975), 31: 456 (1975), and 32: 52, 70, 195, 220, 237, & 240. 1975; Molina R., Ceiba 19: 95. 1975; Follmann-Schrag, Excerpt. Bot. A.26: 502. 1976; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 365 & 368 (1976) and 32/33: 397. 1976; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 37—40 & 43. 1976; Steyerm. & Brewer-Carías, Bol. Soc. Venez. Cienc. Nat. 32/33: 197, 205, & 207. 1976; Moldenke, Phytologia 32: 506 (1976), 33: 506 (1976), 34: 162, 164, 252—258, 268, 271, & 498 (1976), and 36: 30—34, 36, 39—41, 47, 52, 53, & 500. 1977; Moldenke, Biol. Abstr. 64: 4787. 1977; J. F. Morton, Quart. Journ. Crude Drug Res. 15: 182—183. 1977; Silberbauer-Gottsberger, Morawetz, & Gottsberger, Biotropica 9: 257 & 259. 1977; Moldenke, Phytologia 38: 256 & 502. 1978.

Airy Shaw (1973) still regards Pseudaegiphila Rusby as a valid monotypic genus.

The Endlicher (1838) reference cited in the bibliography above is often cited as "1836—1856", but the pages involved here were actually issued in 1838.

Thorne (1973) claims 160 valid species in the genus Aegiphila, all restricted to the Americas. The Stigmatococca of Willdenow, referred to in the synonymy above, is a synonym of Ardisia Sw. in the Myrsinaceae.

Gibbs (1974) reports that saponins are absent or probably absent and tannins present or absent in Aegiphila.

The Holm-Nielsen, Jeppesen, Løjtnant, & Øllgaard 2842, Lindeman & Haas 2002, Plowman, Sheviak, & Davis 3976, R. F. Steinbach 449, and Vaupel 670, distributed as Aegiphila sp., are not verbenaceous, while Strang s.n. [Herb. Brad. 45715] is Clerodendrum inerme (L.) Gaertn.

An additional excluded species:
Aegiphila spathulata Hayek = Aloysia spathulata (Hayek) Moldenke.

AEGIPHILA ALBA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 74 & 157. 1973; Anon., Biol. Abstr. 57 (7): B.A.S.I.C. E.8. 1974; Hocking, Excerpt. Bot. A.23: 293. 1974; Moldenke, Biol. Abstr. 57: 3783. 1974; Thomazini, Øyton 32: 53—60. 1974; Hocking, Excerpt. Bot. A.26: 5. 1975; Moldenke, Phytologia 31: 381, 382, 384, 387, 392, 393, & 405. 1975; Thomazini, Biol. Abstr. 59: 7457. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 37. 1976; Moldenke, Phytologia 34: 257. 1976.

Little and his associates encountered this species in wet subtropical rainforests, at 1200—1500 m. altitude, in fruit in October.

López-Palacios (1976) cites Duque Jaramillo 4135 and Jiménez SAA.1838, but comments that "Este taxon es muy dudoso y mucho del

material colocado en él no es seguro. El Dr. Moldenke en carta de 17 de diciembre de 1975 me dice: 'Yes, I think the A. grandis-truncata-sessiliflora-alba complex should be studied in the field', y yo agrego que a más del trabajo de campo, debe reinterpretarse todo el material de herbario." He describes his Ecuadorean material of A. alba as from trees 8—15 m. tall, the cymes glomerate, subsessile, very abundant, the flowers 5- or 6-merous, the calyx green, 5-dentate, and the corollas white, and found it flowering in December at 1650 meters altitude.

The Little & Campusano 145, distributed as A. alba, actually is A. bogotensis (Spreng.) Moldenke.

Additional citations: ECUADOR: Esmeraldas: Asplund 16369 (Ld); Játiva & Epling 1166 (W—2707002). Morona Santiago: Little, Ortega, Samaniego, & Vivar 616 (Ld). Pichincha: Játiva & Epling 543 (N, W—2707178); López-Palacios 4077 (Z), 4235 (Ld).

AEGIPHILA AMAZONICA Moldenke

Additional bibliography: Moldenke, Phytologia 25: 289. 1973; Soukup, Biota 11: 4. 1976.

Recent collectors refer to this plant as a rather frequent shrub, 1—1.5 m. tall, the stamens white, the fruit orange, and have found it growing in open forests, along disturbed roadsides, and "on savannas with dense trees to 8 m. tall, the predominant species being Physocalymma scaberrima, Curatella americana, and Orbignya speciosa, along with grasses to 1.8 m. tall and other herbs", in flower in March and in fruit in March and July. The corollas are said to have been "white" on Gottsberger & Morawetz 116-13375 and on Prance & al. 20534.

Additional citations: BRAZIL: Amazônas: Gottsberger & Morawetz 116-13375 (Ac); Lleras, Steward, Ongley, Coêlho, Ramos, & Lima P. 16584 (Ld, N); Prance, Campbell, Ongley, Ramos, & Monteiro 20534 (Ld, N).

AEGIPHILA ANOMALA Pittier

Additional bibliography: Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102—104 & 144. 1973; Moldenke, Phytologia 27: 74, 163, & 371 (1973) and 28: 433. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 37. 1976.

López-Palacios (1976) says: "Como tal fue determinado y distribuido por el Mo. Bot. Gard. el pliego Gentry & Forero 7364 (COL), near mouth of Rio Mutatá, Chocó, ejemplar de cuya determinación dudo, y que más bien parece alguna forma de A. integrifolia."

Other recent collectors have found A. anomala growing along roadsides and in disturbed tropical wet forests and somewhat disturbed premontane wet forests, flowering in May, and fruiting in January, describing it as a spreading tree, 5—7 m. tall, with musky-fragrant flowers, and the fruit "turning pale-yellow". The corollas are said to have been "white" on Nee & Stockwell 11570.

Additional citations: PANAMA: Coclé: Nee & Dwyer 9172 (W—2787119). Panamá: Nee & Stockwell 11570 (W—2787281).

AEGIPHILA ARCTA Moldenke

Additional bibliography: Kunkel, Excerpt. Bot. A.21: 115. 1973; Moldenke, Phytologia 27: 290. 1973; R. F. V. Cooper, Biol. Abstr. 57: 3788. 1974; Hocking, Excerpt. Bot. A.23: 293. 1974; Moldenke, Biol. Abstr. 58: 685. 1974.

AEGIPHILA AUSTRALIS Moldenke

Additional bibliography: Moldenke, Phytologia 25: 290 (1973) and 34: 258. 1976.

Lindeman & Porto describe this species as an "arbusto de 3 m., flor amarelada, folhas com cheiro desagradavel" and found it flowering in November.

Additional citations: BRAZIL: Rio Grande do Sul: Lindeman & Porto ICN.9114 (Ut—320443).

AEGIPHILA BOGOTENSIS (Spreng.) Moldenke

Additional synonymy: Amerina tomentosa DC. apud Buek, Gen. Spec. Syn. Candoll. 3: 19. 1858. Aegiphila mutisii Moldenke, Phytologia 34: 271, in syn. 1976 [not A. mutisii H.B.K., 1817].

Additional & emended bibliography: P. DC. in A. DC., Prodr. 9: 512. 1845; Buek, Gen. Spec. Syn. Candoll. 3: 19. 1858; Moldenke, Phytologia 27: 290, 367, & 368 (1973) and 28: 435 & 437. 1974; Hocking, Excerpt. Bot. A.23: 292. 1974; Moldenke, Phytologia 31: 392. 1975.

López-Palacios describes this species as an "Árbol 10—12 m. Ramas pulverulentas. Cáliz trunco, pero hendido irregularmente en fruto áte verde umbonado cuando inmaturo, amarillo en maduros" and found it growing at 2550—3100 meters altitude, flowering and fruiting in January. His Ecuadorean collection is described by him as from an "arbolito 5—7 m., fl. amarillo crema, 5-mera, fr. amarillento, indumento marrón sucio, cimas 3-floras".

Romero-Castañeda refers to the species as a tree, 12 m. tall, the calyx green and ferrugineous, the corollas yellow, the anthers cream-color, and the immature fruit green. He found it in flower and fruit in March at 2000—2400 m. altitude and identified it as "Aegiphila mutisii Moldenke".

Material of A. bogotensis has been misidentified and distributed in some herbaria as A. alba Moldenke.

Additional citations: COLOMBIA: Antioquia: López-Palacios 3583 (Ld, N). Cundinamarca: López-Palacios & Jaramillo Mejía 3668 (Ld, N). Magdalena: Romero-Castañeda 7483 (N, N, N). ECUADOR: Napo: Little & Campusano 145 (N). Napo-Pastaza: Asplund 17204 (Ld). Pichincha: López-Palacios 4209 (Ld).

AEGIPHILA BOGOTENSIS var. AEQUINOCTIALIS Moldenke

Synonymy: Aegiphila meridensis López-Palacios, Pittieria 5: [34]—[37], fig. 8. 1973.

Additional bibliography: Moldenke, Phytologia 27: 74—75, 151, & 153 (1973), 28: 435 & 437 (1974), 31: 392 (1975), and 34: 271. 1976.

Ruiz-Terán and his associates describe this plant as an "Árbol erecto, inerme, perennifolio, 8 m. Ramitas jóvenes con tomento ferrugíneo. Ramitas adultas pardo grisáceo claras. Hojas simples, 3-verticiladas en retoños, opositidecusadas en ramitas adultas, cartáceo-coriáceas, lisas, verde obscuradas, lucientes, por la haz, verde claras sublucientes por el envés, enteras, sin ocelos glandulíferos.....Drupas 4-pirenas, subtendidas por el cáliz acrescente y 2-labiado, rara vez 3-lobado, obovoide-subglobosas" and have found it growing at altitudes of 2550—2700 meters, fruiting in December.

The E. W. Davis 236 collection, cited below, represents a remarkably small-leaved form which may prove to deserve nomenclatural recognition if it proves to be constant; the collector speaks of it as a tree to 4 m. tall and found it growing at 3400 m. altitude, the corollas creamy-yellow, its lobes imbricate, the ovary superior, the fruit "a berry" [actually it is a drupe], 4-seeded, green, ripening yellow. He found it in flower and fruit in December.

Aegiphila meridensis was based by López-Palacios on his no. 3031 from El Valle, near Mérida, Mérida, Venezuela, collected on January 1, 1973. All the information previously (1973) given by me under that name in this series of notes should now be transferred here.

Additional citations: VENEZUELA: Mérida: López-Palacios 3013 (N, Z); Ruíz-Teran, López-Figueiras, & López-Palacios 8245 (Ac), 8250 (Z). ECUADOR: Imbabura: E. W. Davis 236 (G, Ld).

AEGIPHILA BOGOTENSIS f. TERNATA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 75 & 368. 1973; Hocking, Excerpt. Bot. A.23: 292. 1974.

AEGIPHILA BOLIVIANA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 352. 1973; Hocking, Excerpt. Bot. A.26: 5. 1975.

Additional citations: BOLIVIA: Cochabamba: R. F. Steinbach 381 (Ut—328621B).

AEGIPHILA BRACHIATA Vell.

Additional & emended bibliography: Schau. in A. DC., Prodr. 11: 650—651. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Lombardo, Fl. Arb. & Arbores. Urug., ed. 2, 120. 1964; Moldenke, Phytologia 25: 292—293 & 319. 1973; Troncoso, Darwiniana 18: 390 & 408. 1974.

The corollas on Hatschbach 35152 are said to have been "greenish-cream" when fresh, while those on Hatschbach 37343 were "cream" and those on Tressens & al. 314 were "white". Hatschbach describes the plant as a shrub, 2—3 m. tall, found it growing in

"capoeira xiloteca", and records the vernacular name, "peloteira", for it. Lindeman & Haas found it growing in rainforests. It has been collected in fruit in December.

It should be noted here that the fig. 33 given by Troncoso (1974) as the male-predominant form of A. hassleri Briq. matches very well most of the specimens at present regarded as representing A. brachiata, as does the Tressens & al. from Corrientes cited below. The two taxa need further intensive investigation. If they prove to be conspecific, A. brachiata is the older name and will have to be adopted.

Additional citations: BRAZIL: Paraná: Hatschbach 30331 (N, W—2706991), 35152 (Ld), 37343 (Ld); Lindeman & Haas 3404 (Ld, Ws). Santa Catarina: Smith & Reitz 12451 (Au—249871). PARAGUAY: Woolston 1201 (W—2692381). ARGENTINA: Corrientes: Tressens, Arbo, Carnevali, & Correa 314 (Mi).

AEGIPHILA BRACTEOLOSA Moldenke

Additional bibliography: Schau. in A. DC., Prodr. 11: 649. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 25: 293 & 325. 1973; Soukup, Biota 11: 4. 1976; Moldenke, Phytologia 36: 40. 1977.

Maas describes this plant as a common shrub in secondary vegetation along roadsides, 1 m. tall, with white flowers and yellow fruit in March, while Davis describes it as a tree, 4 m. tall, growing in the moist remnants of primary forests, with creamy-white corollas, flowering in October.

The Lindeman & Haas 373, distributed as A. bracteolosa, actually is A. sellowiana Cham.

Additional citations: COLOMBIA: Vaupés: E. W. Davis 103 (G). BRAZIL: Amazônas: Maas & Maas 214 (Ut—328608B, Ut—328609B).

AEGIPHILA BRASILIENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 25: 294. 1973.

AEGIPHILA BREVIFLORA (Rusby) Moldenke

Additional bibliography: Moldenke, Phytologia 27: 352. 1973.

AEGIPHILA BUCHTIENII Moldenke

Additional bibliography: Moldenke, Phytologia 27: 352. 1973.

AEGIPHILA CANDELABRUM Briq.

Additional bibliography: Moldenke, Phytologia 27: 75. 1973; Troncoso, Darwiniana 18: [392], fig. 34j. 1974; Moldenke, Phytologia 36: 33. 1977.

Illustrations: Troncoso, Darwiniana 18: [392], fig. 34j. 1974.

Lindeman & Haas describe this plant as a "leaning shrub, 2.5 m. tall, fruit via olive-yellow turning red (7 1/2R4/12), also the pulp, 4 seeds", and found it growing in varzea land at the border of a forest on slopes at 180 m. altitude, fruiting in June. Irwin and his associates refer to it as a liana, to 6 m. long,

the "receptacle" [=calyx?] green, and the fruit orange, and have found it growing in gallery forests in an area of cerrado and gallery forest, at 525 m. altitude, fruiting in March.

Additional citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 26809 (N). Paraná: Lindeman & Haas 1664 (Ld).

AEGIPHILA CAPITATA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 290. 1973.

AEGIPHILA CASSELIAEFORMIS Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 290. 1973.

AEGIPHILA CAUCENSIS Moldenke

Synonymy: Aegiphila causensis López-Palacios, in herb.

Additional bibliography: Moldenke, Phytologia 27: 148 (1973) and 28: 434. 1974; Moldenke, Biol. Abstr. 57: 5679. 1974; Hocking, Excerpt. Bot. A.26: 5. 1975; Moldenke, Phytologia 34: 254. 1976; Soukup, Biota 11: 4. 1976.

López-Palacios and Idrobo refer to this plant as an "Arbusto 1--2 m. Tallos blanquecinos. Frutos amarillos, inmaturos aramillo-verdosos", found it growing at 1050 m. altitude, fruiting in August.

Additional citations: COLOMBIA: Arauca: López-Palacios 3943 (Ld). Valle del Cauca: López-Palacios & Idrobo 3710 (N, Z).

AEGIPHILA CEPHALOPHORA Standl.

Additional bibliography: Moldenke, Phytologia 27: 75. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102, 104--105, & 144. 1973; Moldenke, Phytologia 34: 253. 1976.

Croat describes this species as a vine, to 8 m. long, with white caducous flowers. The Burgers, who are the first collectors to have encountered this species outside of Panama, describe it as a woody climber, climbing to 10 feet into forest trees, with its leaves pale yellowish-green and the corollas yellowish-white. They found it growing in areas of remnant original forest now being logged on small hills of otherwise cleared agricultural land, at an altitude of 150--250 meters, in flower in August. Gentry & Mori describe it as a shrub, 2.5 m. tall, or a small tree, 5 m. tall, with cream-colored corollas and green fruit in January. They found it in lower montane wet forests at 1300--1420 m. altitude. Mori & Dressler refer to it as a "small tree, 4 m. tall", the corollas white.

The Gentry, Tyson, & Dwyer 3491, distributed as A. cephalophora, appears to be A. hoehnei var. spectabilis Moldenke instead.

Additional citations: COSTA RICA: Heredia: Burger & Burger 8133 (N). PANAMA: Colón: Mori & Dressler 7911 (N). Darién: Gentry & Mori 13622 (Ld), 13755 (Z). Barro Colorado Island: Croat 11465 (W--2730182).

AEGIPHILA CHRYSANTHA Hayek

Additional bibliography: Moldenke, Phytologia 27: 352 & 376 (1973) and 31: 384. 1975; Soukup, Biota 11: 4. 1976.

Recent collectors describe this species as a shrub, 1—2 m. tall, or as a vine or liana climbing to treetops, the leaves undulate, shiny, deep-green, the flowers fragrant, the calyx green, the stamens and stigma white, and the fruit at first green, then turning bright-orange. They have found it growing on terra firma along roadsides, in cacao plantations, high woods, and rainforests, at altitudes of 680—1290 meters, flowering in December, and fruiting in April, July, and November. Pinheiro found it "em brotos".

The corollas are said to have been "yellow" on Santos 767, "deep yellow-green" on Schunke 5200, and "brilliant yellow 5Y9/9" on Schunke 5852.

Material of this species has been distributed in some herbaria as Solanaceae. On the other hand, the Hatschbach & Guimarães 19047, distributed as A. chrysantha, actually is A. lanceolata Moldenke, a closely related taxon.

Additional citations: ECUADOR: Los Ríos: Asplund 15539 (Ld). PERU: Huánuco: Schunke Vigo 5200 (N, W—2746350); F. Wolfe 12361 (F—1728087). Loreto: Schunke Vigo 5852 (Ld). BRAZIL: Amazônas: Prance, Maas, Woolcott, Monteiro, & Ramos 15922 (Ws). Bahia: Pinheiro 1023 (N); T. S. Santos 767 (Ld).

AEGIPHILA CHRYSANTHA var. GLABRA Moldenke

Additional bibliography: Moldenke, Phytologia 25: 296 & 297. 1973; Soukup, Biota 11: 4. 1976.

AEGIPHILA CORDATA Poepp.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 75 & 164 (1973) and 34: 257. 1976; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 38. 1976; Soukup, Biota 11: 4. 1976.

Recent collectors describe this species as a vine, 3 m. long, or as a shrub, 4 m. tall, with pubescent leaves, the fruit yellow (immature?) or red. The corollas are said to have been "brilliant-greenish-yellow (7.5 Y 9/9)" on Schunke 5684. The plant has been encountered at 210—300 m. altitude, flowering in December, fruiting in June and December.

The Holm-Nielsen, Jeppesen, Løjtnant, & Øllgaard 2844, distributed as A. cordata, is not verbenaceous.

Additional citations: PERU: Amazonas: Ancuash 543 (W—2786610). Loreto: Schunke Vigo 6652 (W—2703809). San Martín: Schunke Vigo 5684 (N).

AEGIPHILA CORDATA var. COLOMBIANA Moldenke

Additional bibliography: Moldenke, Phytologia 25: 297—298 & 321. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes

17: 38. 1976.

López-Palacios (1976) cites Cuatrecasas 13993 from Valle del Cauca, Haught 1885 from Santander, and Uribe 5874 from Antioquia, Colombia, but comments: "No serán más bien alguna forma de Aegiphila fendleri? Al examinar sus floras vi en ellas las brácteas (bractéolas) 3-laciniadas características de la Ae. fendleri. Yo he colocado en este último taxon a Uribe 1357 (COL), Acacías, Meta, y en mis notas he escrito lo siguiente: 'Ojo! Cáliz glabro, cubierto por brácteas trífido-laciniadas, muy similares a las que aparecen en los ejemplares colocados bajo Ae. cordata var. colombiana, pero en ésta el cáliz es indumentado'. En verdad que fuera do lo anterior no encuentro entre ellas ninguna otra diferencia."

AEGIPHILA CORDATA var. VILLOSISSIMA (Moldenke) Moldenke

Additional bibliography: Moldenke, Phytologia 25: 298 (1973) and 34: 257. 1976.

Plowman describes this plant as a shrub with scandent branches, 2.5 m. tall, the calyx dull yellowish-green, and the fruit orange, and encountered it in rocky woods, flowering and fruiting in April.

Additional citations: PERU: Huánuco: Plowman 5816 (Ld). BRAZIL: Acre: Prance, Maas, Kubitaki, Steward, Ramos, Pinheiro, & Lima 11828 (N). Mato Grosso: Krukoff 1300 (W—photo of type).

AEGIPHILA CORDIFOLIA (Ruíz & Pav.) Moldenke

Additional & emended bibliography: Pers., Syn. Pl. 1: 133. 1805; Pers., Sp. Pl. 1: 343. 1817; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 27: 290—291 & 364. 1973; Soukup, Biota 11: 4. 1976.

AEGIPHILA COSTARICENSIS Moldenke

Additional bibliography: Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102 & 144. 1973; Moldenke, Phytologia 27: 291 (1973) and 28: 452. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 43. 1976.

Gentry & Mori describe this species as a treelet, 5 m. tall, with white corollas, and encountered it in "lower montane wet forest — premontane wet forest transition" areas, at 1400 m. altitude, flowering in February.

Additional citations: PANAMA: Bocas del Toro: Kirkbride & Duke 593 (N). Darién: Gentry & Mori 14170 (Ld).

AEGIPHILA COWANI Moldenke

Additional bibliography: Moldenke, Phytologia 27: 63, 76, & 82 (1973) and 28: 437. 1974; Moldenke, Biol. Abstr. 57: 3780. 1974.

Additional citations: GUYANA: Cowan & Soderstrom 2022 (N—isotype).

AEGIPHILA CUATRECASASI Moldenke

Synonymy: Aegiphila cuatrecasasii Moldenke, Phytologia 36: 40, in syn. 1977.

Additional bibliography: Hocking, Excerpt. Bot. A.21: 30. 1972; Moldenke, Phytologia 27: 76 & 361 (1973) and 36: 40. 1977.

AEGIPHILA CUATRECASASI var. NITIDA Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.21: 30. 1972; Moldenke, Phytologia 27: 76. 1973.

López-Palacios & Idrobo describe this plant as an "árbol de 4—7 m., meduloso y quebradizo. Infructescencias erectas. Drupas verdosas de 2 cm. de diámetro" and found it growing at 1700 m. altitude, fruiting in September.

Additional citations: COLOMBIA: Cauca: López-Palacios & Idrobo 3755 (Ld, N).

AEGIPHILA CUNEATA Moldenke

Synonymy: Aegiphila cuneata var. cuneata Simpson ex Moldenke, Phytologia 31: 392, in syn. 1975.

Additional bibliography: Moldenke, Phytologia 25: 300—301 (1973) and 31: 392. 1975; Soukup, Biota 11: 4. 1976.

Material of this species has been misidentified and distributed in some herbaria as Cephaëlis sp. or Faramea sp. On the other hand, the Schunke Vigo 1337, distributed as A. cuneata, actually is A. umbraculiformis Moldenke.

Additional citations: PERU: Madre de Díos: R. E. Schultes 6455 (W—1953408).

AEGIPHILA CUNEATA var. HIRSUTISSIMA Moldenke

Additional bibliography: Moldenke, Phytologia 25: 301. 1973; Soukup, Biota 11: 4. 1976.

The Schunke Vigo 1374, distributed as A. cuneata var. hirsutissima, actually is A. umbraculiformis Moldenke.

AEGIPHILA DEPPEANA Steud.

Additional & emended bibliography: Schau. in A. DC., Prodr. 11: 654—655. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Loes., Verh. Bot. Ver. Brand. 53: 81. 1912; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 103, 119—120, & 144. 1973; Moldenke, Phytologia 27: 291 (1973), 28: 452 (1974), and 36: 40. 1977.

Recent collectors have found this plant growing in black sandy soil covered by primary vegetation, at 6 m. altitude, flowering in December. Martínez Calderón refers to the flowers as "green".

Material of A. deppeana has been misidentified and distributed in some herbaria as "Clerodendron sp."

Additional citations: MEXICO: Oaxaca: Orcutt 3057 (E—1716559), 3418 (E—2168581). Veracruz: Martínez Calderón 1221 (N); Edw. Palmer 464 (E—778764). COLOMBIA: Magdalena: H. H. Smith 881 (Ld), 1864 (Ld).

AEGIPHILA ELATA Sw.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 103, 117—118, & 144. 1973; Moldenke, Phytologia 27: 291—292 & 359 (1973) and 28: 434, 435, 452, & 453. 1974; Howes, Dict. Useful Pl. 244. 1974; León & Alain, Fl. Cuba, imp. 2, 2: 309 & 310, fig. 132. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 51. 1975; Molina R., Ceiba 19: 95. 1975; Moldenke, Phytologia 31: 381 (1975), 34: 254 (1976), and 36: 39. 1977.

Additional illustrations: León & Alain, Fl. Cuba, imp. 2, 2: 310, fig. 132. 1974.

Breteler describes this plant as a shrub, 2 m. tall, slightly straggly in growth, the leaves papery in texture, with glands along the midrib, slightly glossy and medium-green above, paler beneath, the calyx pale-green, the corolla yellow, its tube about 8 mm. long. He found it growing in an open site at the edge of a rivulet, at 350 m. altitude, flowering in May. Dwyer & Dieckman encountered it at sealevel to 50 feet altitude. The leaf-blades on J. V. Santos 2315 are conspicuously acute basally.

The Breteler 3921 collection, cited below, was previously misidentified by me as possibly being A. floribunda Moritz & Moldenke and I am indebted to Santiago López-Palacios for this correction in determination. He describes the species in Colombia as an "arbusto de unas 3 m. Inflorescencias terminales. Cáliz fructífero erodado. Frutos amarillos". He found it in fruit in December. Other recent collectors refer to the plant as a shrub with arching branches or as a scrambling shrub, 10—12 feet tall, and have found it growing in premontane wet forests from sealevel to 300 feet altitude, flowering in August.

The corollas on Dwyer 11111 & 11174 and on Fernández-Pérez & Jaramillo Mejía 7103 are said to have been "yellow" when fresh, while on Pittier 12017 they were "yellowish", on Dwyer & Dieckman 13033 & 13040 "lemon-yellow", and "cream" on Gentry 8601. On Adams 8069 the corolla-buds are said to have been "yellow, open-in pale-yellow".

Both Sweet (1830) and Loudon (1832) call this species "tall aegiphila" and list it as among the cultivated plants of Great Britain, introduced from the West Indies in 1823.

The Storck 48 1/2, distributed as A. elata, actually is A. panamensis Moldenke.

Additional & emended citations: MEXICO: Veracruz: J. V. Santos 2315 (Au—263538). GUATEMALA: El Petén: Contreras 3374 (Au—228048), 9905 (W—2795349). BELIZE: Dwyer 11111 (N), 11174 (N); Dwyer & Dieckman 13033 (W—2787809), 13040 (W—2787798, Ws); A. Gentry 8601 (W—2788520). COSTA RICA: Puntarenas: Pittier 12017 (P). JAMAICA: C. D. Adams 8069 (Mu); Collector undetermined s.n.

[Port Royal Mts., Aug. 1840] (Pd); Morley & Whitford 763 (W—2724784); Proctor 23913 (Ld). TRINIDAD AND TOBAGO: Trinidad: Herb. Trin. Bot. Gard. 2384 (W—1361144). COLOMBIA: Caldas: Fernández-Pérez & Jaramillo Mejía 7103 (N). Norte de Santander: López-Palacios 3575 (Ld, N). VENEZUELA: Barinas: Breteler 3921 (W—2465845).

AEGIPHILA ELATA var. MACROPHYLLA (H.B.K.) López-Palacios

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 292 & 359 (1973) and 28: 435, 452, & 453. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 51. 1975; Moldenke, Phytologia 34: 254. 1976.

López-Palacios refers to this plant as an "arbusto escandente de unos 4 m. Flores amarillas muy claras". He found it in flower in November.

Additional citations: COLOMBIA: Arauca: López-Palacios 3940 (Ld, N). MOUNTED CLIPPINGS: Moldenke, Brittonia 1: 470—471. 1934 (W).

AEGIPHILA ELEGANS Moldenke

Additional bibliography: Moldenke, Phytologia 27: 353. 1973; Soukup, Biota 11: 4. 1976.

AEGIPHILA EXIGUIFLORA Moldenke

Additional bibliography: Rizzini in Ferré, Simpos. Sôbre Cerrado 119. 1962; Moldenke, Phytologia 25: 308. 1973.

AEGIPHILA FALCATA Donn. Sm.

Additional bibliography: Moldenke, Phytologia 27: 79 & 166. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102, 113—114, 144, & 145. 1973; Molina R., Ceiba 19: 95. 1975; Moldenke, Phytologia 34: 252. 1976.

Molina (1975) records this species from Honduras. Kirkbride & Duke describe it as a shrub, 3 m. tall, with orange-yellow fruit, and found it fruiting in April.

The Warner & White 61, distributed as A. falcata, actually is A. integrifolia var. guianensis (Moldenke) López-Palacios.

Additional citations: GUATEMALA: Quezaltenango: Tonduz & Rojas 148 (E—869008). PANAMA: Bocas del Toro: Kirkbride & Duke 464 (N).

AEGIPHILA FARINOSA Moldenke

Additional bibliography: Moldenke, Phytologia 25: 309. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 38. 1976.

López-Palacios (1976) says: "Existe el ejemplar típico de Cuatrecasas 21696 (VALLE), hoya del rio Cali, lado derecho del Pichindé, La Palma, 24-7-1946, 2500 m., y la cita López-Figueiras 8307 (US), Phytologia 2: 392. 1947. El ejemplar de Cuatrecasas corresponde a otros interpretados por mí como Ae. odontophylla,

Debe hacerse una comparación de los tipos de ambos taxa, pues es muy posible que tanto el material colombiano como el venezolano colocado en Ae. odontophylla necesite nuevo estudio."

AEGIPHILA FASCICULATA Donn. Sm.

Additional bibliography: Moldenke, Phytologia 25: 310. 1973; Molina R., Ceiba 19: 95. 1975; Moldenke, Phytologia 34: 252. 1976.

Molina (1975) records this species from Honduras.

AEGIPHILA FENDLERI Moldenke

Additional bibliography: Moldenke, Phytologia 27: 292. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 38. 1976.

López-Palacios (1976) suggests that A. cordata var. colombiana Moldenke may belong in the synonymy of A. fendleri, and, indeed, this is very possible. I await his further field studies.

AEGIPHILA FERRUGINEA Hayek & Spruce

Additional bibliography: Moldenke, Phytologia 25: 310 & 413. 1973.

López-Palacios describes this species as an "arbol 8--12 m., muy meduloso, frs. esféricos, umbilicados, cáliz florifero aparentemente trunco o 4-apiculado, fructífero erodado y verruculoso" and found it growing at 2000 m. altitude, in flower and fruit in December.

Additional citations: ECUADOR: Pichincha: López-Palacios 4075 (Z).

AEGIPHILA FILIPES Mart. & Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 353, 354, & 376 (1973), 28: 437 (1974), and 34: 256. 1976; Soukup, Biota 11: 4. 1976.

Recent collectors describe this plant as a shrub, 6--10 feet tall, or a tree, 4--5 m. tall, the leaves "shiny dark-green above, pale-green beneath", the calyx pale-green, the immature fruit yellowish-green or yellow, and the mature fruit orange. They have found it growing in high woods or at the edges of woods or in low frequently inundated forests, at altitudes of 75--2000 m., flowering in January and July, fruiting in May and September

The corollas are said to have been "yellowish-white" on Mc Daniel, Fernando, & Leonel 2644 and "yellowish-green" on Garcia Barriga, Stout, & Jaramillo M. 18953, while on Killip & Smith 26882 they are described as with "petals greenish-white, anthers white".

McDaniel and his associates report that in Peru the plant is used medicinally externally in treating skin troubles: "one spoonful of leaves rubbed gently on affected area 3 times per day until well". They report the vernacular name, "arco sacha", for this species as well as for species of Cestrum.

Díaz Piedrahita and his associates describe A. filipes as "frútices de ramas péndulas, haz foliar verde oscuro, envés verde pál-

ido; frutos naranja, cáliz y pedúnculo verde oscuro; los frutos inicialmente son verdes, al madurar viran hacia amarillo y luego a naranja hasta pasar a negro". They found it in fruit in July at 1300 m. altitude.

The Steyermark, Delascio, Dunsterville, & Dunsterville 103520, distributed as A. filipes, actually is A. floribunda Moritz & Moldenke.

Additional citations: COLOMBIA: Cundinamarca: García-Barriga, Stout, & Jaramillo Mejía 18953 (Oa). Huila: Díaz Piedrahita, Lozano C., & Torres R. 678 (Ld). PERU: Loreto: Croat 19233 (W—2800333, Ws), 19748 (N, W—2800329, W—2800330, Ws), 20207 (W—2800334, Ws); Killip & Smith 26882 (E—1017497); McDaniel, Fernando, & Leonel 2644 (W—2667256). San Martín: Schunke Vigo 4002 (Ld).

AEGIPHILA FLORIBUNDA Moritz & Moldenke

Additional bibliography: Moldenke, Phytologia 27: 292. 1973.

Steyermark and his associates describe this species as a tree, 3 m. tall, the leaves membranous, rich-green above, dull-green beneath, the pedicels pale-green, and the corollas creamy-yellow. They encountered it at 1750—1800 m. altitude, flowering in August.

Material of A. floribunda has been misidentified and distributed in some herbaria as A. filipes Mart. & Schau. On the other hand, the Breteler 3921, previously cited by me as A. floribunda, actually seems to be A. elata var. macrophylla (H.B.K.) López-Palacios.

Additional citations: VENEZUELA: Lara: Steyermark, Delascio, Dunsterville, & Dunsterville 103520 (Mu).

AEGIPHILA FLUMINENSIS Vell.

Additional synonymy: Aegiphilla fluminensis Vell. ex Moldenke, Phytologia 34: 271, in syn. 1976.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. Paris 13 (4): 67. 1921; Moldenke, Phytologia 27: 292 (1973) and 34: 271. 1976.

Hubert (1921) reports of this species that "les feuilles sont employées comme diaphorétiques".

Recent collectors describe this plant as a vine or shrub, 2—3 m. tall, the calyx green, and the fruit green (in June), and have found it in anthesis and fruit in June. The corollas are said to have been "white" on Pereira 5646, Pinheiro & Santos 2335, and Santos 2653 and "cream" on Pinheiro 1340.

Additional citations: BRAZIL: Bahia: Pinheiro 1340 (N); Pinheiro & Santos 2335 (N); T. S. Santos 2653 (Ld). Espirito Santo: Pereira 9843 [Herb. Brad. 36974] (Mu, N). Guanabara: E. Pereira 5646 [Herb. Brad. 21235] (Mu). Rio de Janeiro: Vianna 998 [Oliveira 292; Herb. Dept. Conserv. Ambient. 11652] (Ld); Vianna, Oliveira, Araujo, & Carauta s.n. [Vianna 988; Herb. Dept. Conserv.

Ambient. 12627] (Ac).

AEGIPHILA FOETIDA Sw.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 25: 313—314 (1973) and 36: 39. 1977.

Both Sweet (1830) and Loudon (1832) call this species the "fetid aegiphila" and list it as cultivated in Great Britain, introduced from the West Indies in 1800. Howard & Proctor describe it as a shrub, 9 feet tall, with cream-colored sessile fruit in January, and encountered it on wooded limestone hilltops at 2000 feet altitude.

Additional citations: JAMAICA: Howard & Proctor 15047 (Ld); Purdie s.n. (Pd).

AEGIPHILA FROESI Moldenke

Additional bibliography: Moldenke, Phytologia 25: 314. 1973.

Additional citations: BRAZIL: Acre: Prance, Maas, Kubitaki, Steward, Ramos, Pinheiro, & Lima 12505 (N).

AEGIPHILA GLABRATA Moldenke

Additional bibliography: Moldenke, Phytologia 25: 287 & 314. 1973; Soukup, Biota 11: 4. 1976.

AEGIPHILA GLANDULIFERA Moldenke

Additional bibliography: Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102, 108—109, & 144. 1973; Moldenke, Phytologia 27: 292—293, 296, & 298 (1973) and 28: 435 & 452. 1974; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Soukup, Biota 11: 4. 1976; Moldenke, Phytologia 34: 255 (1976) and 36: 33. 1977.

Additional citations: COLOMBIA: Meta: López-Palacios 3923 (Ac, N).

AEGIPHILA GLANDULIFERA var. PARAËNSIS Moldenke

Additional bibliography: Moldenke, Phytologia 25: 315 (1973) and 36: 33. 1977.

Prance and his associates refer to this plant as a tree, 4 m. tall, with greenish-white corollas, and found it growing in partially cleared varzea forest, white-water flooded, flowering in July.

Additional citations: BRAZIL: Amazônas: Prance, Lleras, Steward, Ongley, Coêlho, Ramos, & Lima 16746 (Ld, N).

AEGIPHILA GLOMERATA Benth.

Additional bibliography: Moldenke, Phytologia 27: 79. 1973.

López-Palacios describes this species as a tree, 6—8 m. tall, with yellowish-green 4-merous flowers, conspicuously bracteolate, male-predominant, the bractlets green, and found it growing at

44 m. altitude, flowering in December. The corollas on Barclay 632 are said to have been "yellow" when fresh, and this collector encountered the plant in loam soil in woods, flowering in November.

Additional citations: ECUADOR: Guayas: Asplund 15355 (Ld). Manabí: López-Palacios 4081 (Z). SALANGO ISLAND: G. W. Barclay 632 (W—2779779).

AEGIPHILA GLORIOSA Moldenke

Additional bibliography: Moldenke, Phytologia 25: 316. 1973; Hocking, Excerpt. Bot. A.22: 291. 1974; Moldenke, Phytologia 31: 384 (1975) and 36: 40. 1977.

Anderson found this species growing in dense inundated vegetation of trees and vines along the edge of a river at flood level, at 200—300 m. altitude, flowering in February. He describes the plant as having vine-like stems to 3 m. tall and yellow corollas. Santos describes the species as "planta herbáceo-arbustiva raminosa", the corollas yellow, and found it in anthesis in May.

Additional citations: BRAZIL: Bahia: T. S. Santos 3016 (N). Pará: W. R. Anderson 10849 (N, Z).

AEGIPHILA GLORIOSA var. PARAENSIS Moldenke

Synonymy: Aegiphila gloriosa var. paraensis Hocking, Excerpt. Bot. A.23: 291. 1974.

Additional bibliography: Moldenke, Phytologia 25: 316. 1973; Hocking, Excerpt. Bot. A.23: 291. 1974; Moldenke, Phytologia 36: 40. 1977.

AEGIPHILA GRANDIS Moldenke

Additional & emended bibliography: Moldenke in Fedde, Repert. Spec. Nov. 33: 125 & 141. 1933; Moldenke, Brittonia 1: 263, 284—286, 289—290, 473, 475, & 476. 1934; Moldenke, Phytologia 1: 206, 207, 224, & 271. 1937; Fedde & Schust. in Just, Bot. Jahresber. 60 (2): 568 & 569. 1940; Moldenke, Phytologia 2: 91. 1944; Moldenke, Alph. List Cit. 1: 133, 222, 243, & 326 (1946), 2: 335, 337, 344, & 352 (1948), 3: 694 & 758 (1949), and 4: 1005, 1006, 1068, 1069, 1074, 1076, & 1078. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 58, 59, 62, & 175. 1949; Moldenke, Phytologia 4: 354 & 415. 1953; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 714. 1960; Moldenke, Phytologia 7: 506 (1961) and 8: 17. 1961; Moldenke, Biol. Abstr. 37: 215. 1962; Moldenke, Phytologia 13: 326 & 341. 1966; Moldenke, Fifth Summ. 1: 114, 121, & 379 (1971) and 2: 846 & 848. 1971; Moldenke, Phytologia 27: 80, 293, 362, & 370—371 (1973), 28: 434, 435, & 452 (1974), and 34: 255. 1976; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 38—41. 1976; Moldenke, Phytologia 36: 31, 33, 40, & 41. 1977.

López-Palacios and his associates describe this plant as an "Árbol erecto, inerme, de 8—22 m. Tronco cilíndrico, 40 cm. D. A.P. Corteza pardo rojiza, fisurada. Unas hojas enteras y otras con denticulaciones, verdes, pero algunas jóvenes con envés de tinte ligerísimamente violáceas. Flores blancas pentámeras en

cimas axilares [or "en cima reducidas"]. Cáliz verde trunco. Corola blanca. Fruto verrucoso cerca da 1/2 cm. de diámetro." He feels, after extensive field studies, that A. grandis, A. sessiliflora, and A. truncata are all conspecific and adopts A. grandis as the name for the taxon. I am inclined to agree, but feel that the mostly distinctly lobed calyxes (and fruiting-calyxes) of A. sessiliflora are indicative of a varietal status for it. On a number of specimens previously cited by me as A. sessiliflora the calyx-rim is not plainly visible so I am tentatively re-citing these specimens here under typical A. grandis.

Recent collectors describe A. grandis as a large, erect, unarmed, leafy tree, 4—25 m. tall, often heavily laden with fruit clusters, the trunk cylindric, 25—40 cm. in diameter at breast height, the bark gray or "pardo rojiza", fissured in many small plates, "de copa muy ancha", the flowers small, borne in small axillary clusters (cymes, not "panicles" as stated by some collectors), pentamerous, very fragrant, the calyx green, the filaments white, anthers brownish, style and stigma white, the fruit persistent, clustered, green, and the fruiting-calyx green-ferruginous. They have found it growing on wooded and steep river slopes, in coffee plantations, and in matorrales. It is said to be "rare" by Archer.

The corollas are described as "white" on Barclay & al. 3330, García-Barriga 10941, 11009, & 12494, López-Palacios 3893, and Uribe 4433. Recent collectors have found the plant in flower in April, July, August, and from October to January, fruiting in January, March to June, August, and September, growing at 950—2650 m. altitude. They record the vernacular names, "oreja de burro" and "queso fresco".

Lasser describes the plant as an "Árbol tronco recto, copa irregular, ± 10 m."

It should be noted that one twig on García-Barriga 12494 in the Britton Herbarium exhibits a few plainly lobed calyxes, although all the other calyxes on the specimen are truncate-rimmed. The fruit on Cuatrecasas 21007 is mostly solitary or in 2's and sessile or subsessile.

What seems to be this same species has recently been found by López-Palacios at altitudes of only 5—900 meters in Ecuador, fruiting in December.

Luteyn and his associates refer to A. grandis as a small tree, to 6 m. tall, the flowers very sweet-smelling and attractive to bees, the "perianth pale-green, fruit white", asserting that it is used as a hedge between pastures.

Material of A. grandis has been misidentified and distributed in some herbaria as A. cuatrecasasi Moldenke, A. integrifolia (Jacq.) Jacq., A. sessiliflora Moldenke, and even Lucuma sp. The López-Palacios 3615, cited below, was previously regarded by me as A. truncata Moldenke, while his nos. 3625 & 3672 were regarded by me as A. sessiliflora.

On the other hand, the Cuatrecasas 17075, previously regarded by me as A. grandis, is better placed as A. grandis var. sessiliflora (Moldenke) Moldenke, while Cuatrecasas 8700 is A. moldenkeana López-Palacios and Core 723, Daniel 3282, García-Barriga 8386, Metcalf & Cuatrecasas 30072, Mutis 3657 & 4554, Tomas 1512, and Triana 2080 are A. novogranatensis Moldenke.

Additional & emended citations: COLOMBIA: Antioquia: Archer 589 (W—1517393); López-Palacios 3893 (N, Z). Caldas: López-Palacios 4031 (Ld); López-Palacios & Idrobo 3850 (Ld, N). Cundinamarca: Barclay, Juajibioy, & Gama 3330 (W—2702383), 3519 (W—2702146), 3591 (W—2702108); Cuatrecasas 9635 (W—1795903), 13610 (N, W—1851421); García-Barriga 10941 (W—1852169), 11009 (N, W—1852206), 12494 (N, W—1901295); López-Palacios 3625 (Ld, N), 3672 (N, Z); López-Palacios & Jaramillo Mejía 3672 (Z); Luteyn, Dumont, & Buritica 4837 (Ld, N); Mutis 5191 [Macbride photos 30183] (F—photo, G—photo, Kr—photo, N, N—photo, W—1560083, Z—photo); Uribe-Uribe 4433 (W—2569890). Huila: Little 7940 N, N, W—2140408). Santander: López-Palacios 3614 (Ac, N, Z), 3615 (Ld, N). Valle del Cauca: Cuatrecasas 21007 (N, W—2512524). VENEZUELA: Trujillo: Lasser 1167 (W—1908975); Ruiz-Terán & López-Palacios 7609 (Z). ECUADOR: El Oro: López-Palacios 4104 (Ld), 4108 (Ld). MOUNTED CLIPPINGS: Moldenke, Brittonia 1:289-290.1934(W).

AEGIPHILA GRANDIS var. CUATRECASASI (Moldenke) López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 39—40. 1976.

Synonymy: Aegiphila sessiliflora var. cuatrecasasi Moldenke, Phytologia 8: 385. 1962. Aegiphila grandis var. cuatrecasasii (Moldenke) López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 39. 1976.

Bibliography: Moldenke, Phytologia 8: 385. 1962; Hocking, Excerpt. Bot. A.6: 455. 1963; Moldenke, Biol. Abstr. 42: 1517. 1963; Moldenke, Phytologia 13: 340. 1966; Moldenke, Fifth Summ. 1: 114 (1971) and 2: 848. 1971; Moldenke, Phytologia 27: 361—362 (1973), 28: 435 (1974), and 34: 255. 1976; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 39—40. 1976; Moldenke, Phytologia 36: 31, 40, & 41. 1977.

López-Palacios & Idrobo refer to this plant as an "árbol de 12 m. x 0.40 cms. DAP" [surely an error for either 4 or 40 cm.!], found it at 1750 m. altitude, fruiting in September.

Citations: COLOMBIA: Magdalena: Cuatrecasas & Castañeda 25404 (W—orig. descr., Z—type). Valle del Cauca: López-Palacios & Idrobo 2824 (Ld).

AEGIPHILA GRANDIS var. SESSILIFLORA (Moldenke) Moldenke, Phytologia 36: 31 & 41, hyponym. 1977; comb. nov.

Synonymy: Aegiphila sessiliflora Moldenke in Fedde, Repert. Spec. Nov. 33: 139. 1933.

Bibliography: Moldenke in Fedde, Repert. Spec. Nov. 33: 139.

1933; Moldenke, Brittonia 1: 255, 264, 301—302, & 472. 1934; Moldenke, Phytologia 1: 267 (1937), 1: 398 (1940), and 3: 46—47. 1948; Moldenke, Known Geogr. Distrib. Avic. 18. 1939; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 1], 30 & 85. 1942; Moldenke, Alph. List Cit. 1: 11 & 133 (1946) and 4: 1064, 1076, 1078, & 1296. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 59 & 175. 1949; Moldenke, Phytologia 4: 412. 1953; Moldenke, Résumé 65 & 441. 1959; Moldenke, Phytologia 7: 502. 1961; Moldenke, Résumé Suppl. 12: 2 & 3. 1965; Moldenke, Phytologia 13: 328 & 339-340 (1966) and 27: 361—362. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 9 (13): 50—51. 1973; Moldenke, Phytologia 36: 31, 32, & 41. 1977.

Recent collectors describe this plant as a small or large tree, 5—12 m. tall, with white wood, the leaves "herbáceas, gruesas, verde grisáceas", the fruit green, borne in "glomerules", the fruiting-calyx more or less lobed. They have found it growing in the open, at altitudes of 5—1700 meters, fruiting from March to May and August, flowering in July.

Additional & emended citations: COLOMBIA: Antioquia: Archer 392 (A—photo of type, B—photo of type, D—photo of type, F—photo of type, G—photo of type, K—photo of type, N—photo of type, P—photo of type, S—photo of type, W—1470995—type, W—photo of type, W—mounted orig. descr., Z—photo of type). Cauca: E. L. Core 206 (W—2059687). Cundinamarca: Cuatrecasas 13600 (N, W—1851414); Fernández & Mora 1402 (W—2144385). Huila: Little & Ramírez 7800 (N, W—2140373). Valle del Cauca: Cuatrecasas 17075 (N).

AEGIPHILA GRAVEOLENS Mart. & Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. Paris 13 (4): 67. 1921; Moldenke, Phytologia 27: 293. 1973.

Hubert (1921) reports that this species "dont les fleurs ont une odeur repoussante, ce qui leur fait donner le nom de fleurs de Bouc. La décoction de feuilles est employée, en lavage pour certaines maladies de peau, et in bains, dans le cas de rheumatismes articulaires". Santos describes the species as a tree, 5 m. tall, the "flor exverdeada" in November.

Additional citations: BRAZIL: Bahia: Santos 2507 (Z). São Paulo: Leitão Filho 380 [Herb. Inst. Agr. Camp. 19916; Herb. Cent. Conserv. Nat. 6289] (Fe, Z).

AEGIPHILA GUIANENSIS Moldenke

This taxon is now known as A. integrifolia var. guianensis (Moldenke) López-Palacios, which see.

AEGIPHILA HASSLERI Briq.

Additional synonymy: ? Aegiphila poliantha Rojas, Cat. Hist. Nat. Corrient. 76, 172—173, & 206, hyponym. 1897. Aegiphila polyantha Rojas apud Heslop-Harrison, Ind. Kew. Suppl. 15: 4.

1974.

Additional bibliography: Rojas Acosta, Cat. Hist. Nat. Corrient. 76, 172—173, & 206. 1897; Lombardo, Fl. Arb. & Arbores. Urug., ed. 2, 120 & 121, fig. 187. 1964; Krapovickas, Bol. Soc. Argent. Bot. 11: [256]. 1970; Moldenke, Phytologia 27: 75, 81—82, & 358. 1973; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Heslop-Harrison, Ind. Kew. Suppl. 15: 4. 1974; Troncoso, Darwiniana 18: 390—393 & 408, fig. 33 & 34 a—i. 1974; Moldenke, Phytologia 31: 387 & 392 (1975) and 34: 268. 1976.

Illustrations: Lombardo, Fl. Arb. & Arbores. Urug., ed. 2, 121, fig. 187. 1964; Troncoso, Darwiniana 18: 391 & [392], fig. 33 & 34 a—i. 1974.

It seems quite probable to me that this taxon does not deserve more than varietal rank under the very similar A. brachiata Vell., or, if Troncoso's interpretation in regard to its sexual dimorphism is correct, then it must be reduced to synonymy under A. brachiata, the earlier name.

The corollas on Schinini & al. 26016 are said to have been "white". Porto & Oliveira refer to the fruit as "verdes e amarelados" in February.

The Krapovickas & al. 21326 collection, cited below, exhibits remarkably small and hairy leaves and certainly bears very close resemblance to typical A. brachiata. The collectors describe it as a tree, 4 m. tall, with white flowers, and found it in woods. The Tressens, Arbo, Carnevali, & Correa 314, distributed as A. hassleri, certainly represents classical A. brachiata.

Aegiphila poliantha is a poorly described taxon which probably belongs in the synonymy here. The original description is merely: "139. Salvia silvestre, aegiphila poliantha (Roj.) Corrientes. Esta planta voluble es propia de los vallados; de flores parecidas á las de la margarita morada i frutos pequeños, globulosos i negruzcos en la madurez. Propiedades: Análogas á las AEg. salutaris de H. B. Kth....120— Salvia silvestre, ægiphila poliantha (Roj.) Planta de fruto negro-morado que sirva para tinta. En medicina pueda servio como sudorifico (?) para badona (?)..Salvia cimarrona." Nothing else is known of it.

Additional citations: BRAZIL: Paraná: Hatschbach 24186 (W—2705826), 32890 (Ld). Rio Grande do Sul: Porto & Oliveira ICN. 9631 (Ut—320444). PARAGUAY: Hassler 8632 (E—1575072). ARGENTINA: Corrientes: Krapovickas, Cristóbal, Maruñak, Mriginsky, Pire, & Pueyo 21326 (Ld). CULTIVATED: Argentina: Krapovickas, Cristóbal, Schinini, Arbo, Quarín, & González 26016 (Ld).

AEGIPHILA HAUGHTII Moldenke

Additional bibliography: Moldenke, Phytologia 25: 319—320. 1973; Soukup, Biota 11: 4. 1976.

Schunke Vigo describes this plant as a shrub, 3—4 m. tall, "las láminas de las hojas son onduladas brillosas de color verde pálido" or "de color verde amarillenta", the corollas white, the

sepals pale-green or yellowish-green, the stamens white, and the "anteras pardas". He encountered it in high woods, flowering in September and October.

Material of A. haughtii has been misidentified and distributed in some herbaria as "Clerodendron tessmannii Moldenke". On the other hand, the Croat 17922 and McDaniel 16155, distributed as A. haughtii, actually are Clerodendrum tessmani Moldenke.

Additional citations: PERU: San Martín: Schunke Vigo 4484 (N, W—2746273), 5005 (N, W—2746330).

AEGIPHILA HIRSUTA var. COLOMBIANA Moldenke

Additional bibliography: Moldenke, Phytologia 25: 320 (1973) and 27: 164. 1973.

AEGIPHILA HIRSUTISSIMA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 293. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 103, 116--117, & 144. 1973; R. F. V. Cooper, Biol. Abstr. 57: 3788. 1974.

AEGIPHILA HOEHNEI Moldenke

Additional bibliography: Moldenke, Phytologia 27: 293. 1973: Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102, 103, 118—119, & 144. 1973.

AEGIPHILA HOEHNEI var. PUYENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 27: 293. 1973.

Lugo refers to this plant as a shrub, 3 m. tall, with yellow corollas, and found it in flower in March.

Additional citations: ECUADOR: Napo-Pastaza: Asplund 19426 (Ld). Pastaza: Lugo S. 678 (W—2781665).

AEGIPHILA HOEHNEI var. SPECTABILIS Moldenke

Additional bibliography: Moldenke, Phytologia 25: 296 & 321. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102, 103, 118—119, & 144. 1973.

Gentry and his associates describe this plant as a shrub with "straggly" branches and orange-colored fruit.

Additional citations: PANAMA: Panamá: Gentry, Tyson, & Dwyer 3491 (N).

AEGIPHILA HOFFMANNIOIDES Standl. & Steyerm.

Additional bibliography: Moldenke, Phytologia 25: 321—322. 1973.

Additional citations: GUATEMALA: Huehuetenango: J. A. Steyermark 48843 (Au—190684--photo of type).

AEGIPHILA INSIGNIS Moldenke

Additional bibliography: Moldenke, Phytologia 25: 322 (1973) and 27: 355. 1973; Soukup, Biota 11: 4. 1976.

Schunke Vigo, who has recently re-discovered this rare species, describes it as a liana, 8—9 m. long, the corollas "brilliant yellow (5 Y 9/9)", and found it in flower in January at 450 m. altitude.

Additional citations: PERU: San Martín: Schunke Vigo 5746 (W—2703924).

AEGIPHILA INTEGRIFOLIA (Jacq.) Jacq.

Additional & emended bibliography: Jacq., Select. Stirp. Amer. Hist. 18: 1788; Pers., Syn. Pl. 1: 132 & 133. 1805; Pers., Sp. Pl. 1: 342. 1817; Sweet, Hort. Brit., ed. 1, 1: 322 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Schau. in A. DC., Prodr. 11: 647 & 649. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 9 & 73. 1858; Howard, Journ. Arnold Arb. 54: 444. 1973; Moldenke, Phytologia 27: 353 & 373 (1973) and 28: 434, 435, 437, 438, & 452. 1974; Hocking, Excerpt. Bot. A.23: 293. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21. 1974; Troncoso, Darwiniana 18: 393 & 408. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 9. 1975; Moldenke, Phytologia 31: 382 (1975) and 34: 162, 164, & 255. 1976; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 37. 1976; Soukup, Biota 11: 4. 1976; Moldenke, Biol. Abstr. 64: 4787. 1977; Moldenke, Phytologia 36: 32, 40, & 53. 1977.

Recent collectors describe this widespread species as a ligneous, spreading or subscandent herb or shrub, 1—2 m. tall, or a tree, 3.5—18 m. tall, the stems pithy, inflorescence axillary, umbelloid, flower-buds greenish-white, flowers fragrant, and fruit yellow, red-orange, or reddish. They have found it growing in capoeira, open areas, weedy habitats along roads and agricultural fields, open savannas, secondgrowth forests, subtropical and mountain forests, poorly drained forests, mature tropical moist forests, and the "edge of banana fields near the upper limit of cultivation", at altitudes of sealevel to 2100 meters, flowering from April to June, August to October, and in December, fruiting in January, July, and December.

The corollas are said to have been "white" on Gentry & Berry 14654, Grant 10163, Klug 3468, López-Palacios 3654 & 4184, Purseglove P.6483, and Wurdack & Adderley 42905, "whitish" on Hatschbach 34084, "purplish-white" on Schunke 6531, "greenish" on Croat 20529, and "yellow" on Chrostowski 70-353 and Lugo S. 175.

López-Palacios and his associates say of it "Arbusto, árbol, arbolito [or "sufrútice"] de 2—7 m., erecto, ramificado, inerme. Hojas opositidecusadas, flaccido-membranosas. Flores blancas 4-meras. Cálix verde amarillento. Corola blanca al principio, luego marrón. Androceo blanco. Drupas primero verdes, luego amarillas a amarillo anaranjadas. Especie esparcida....La hoja macerada da una especie de jabón que se usa contra erupciones." He also notes of it: "Sólo para control de localidad" in Venezuela. McCurdy refers to it as "common"; Wurdack & Adderley found it to be "an occasional shrub", but Irwin and his associates call it a "common shrub". Chrosrowski encountered it "in low purma (brush) at old

terrace level in very acid sandy clay loam, 1100—1200 mm. ppt., 25° C." Hallé refers to it as a shrub or small tree, with green calyxes and white corollas.

The vernacular names, "tabacote", "arco", and "tabaco caspi", have been recorded for A. integrifolia in Venezuela, Colombia, and Peru, respectively.

Both Sweet (1830) and Loudon (1832) include this species among the plants cultivated in Great Britain in their day and assert that it was introduced from Trinidad in 1820. They call it the "arborescent aegiphila". Buek (1858) and others include A. arborescens β breviflora Schau. in the synonymy of typical A. integrifolia, but I feel that it belongs, rather, in the synonymy of A. bracteolosa Moldenke, unless, of course, we may have here again a case of sexual dimorphism.

The Lasser 1167, distributed as A. integrifolia and previously reported by me as A. sessiliflora Moldenke, actually is A. grandis Moldenke. I am indebted to my friend and colleague, Santiago López-Palacios, for this correction. The Maguire & Stahel 22782, cited below, is a mixture with Amasonia campestris (Aubl.) Moldenke. Bruijn 1015, distributed as typical A. integrifolia, actually represents var. guianensis (Moldenke) López-Palacios, while Troll 1704 is var. lopez-palacii Moldenke.

Additional citations: PANAMA: Darién: Stern, Chambers, Dwyer, & Ebinger 663 (W—2396631). VIRGIN ISLANDS: St. Thomas: Finlay s.n. [Antilles St. Thomas 1841] (P). TRINIDAD AND TOBAGO: Trinidad: Purseglove P.6483 [Herb. Trin. Bot. Gard. 18149] (W). COLOMBIA: Amazonas: Foldats 282A (W—2705445). Boyacá: Lawrence 548 (Ca—M293524, Ld). Chocó: Killip 35495 (W—1772204); Warner & Warner 61 (N, W—2770592). Córdoba: López-Palacios 3856 (Ac, N). Cundinamarca: López-Palacios 3909 bis (N, Ws). Meta: M. L. Grant 10163 (W—2107007); Little & Little 8227 (W—2140513). Putumayo: Schultes & Smith 2027 (E—1839059). Santander: Gentry & Renteria 19975 (N). Valle del Cauca: Cuatrecasas 17369 (W—2816327). VENEZUELA: Amazonas: Wurdack & Adderley 42905 (W—2320888). Bolívar: Gentry & Berry 14654 (N); López-Palacios 3015 (N); Oberwinkler & Oberwinkler 15377 (Mu); Ruiz-Terán, Carobot, & Morales 10691 (Ac); Ruiz-Terán & López-Palacios 10873 (Ld), 10908 (Mi), 11665 (Tu). Sucre: Ruiz-Terán & López-Palacios 10081 (Ld); Steymark & Rabe 96092 (W—2584222). SURINAM: Maguire & Stahel 22782 in part (N). FRENCH GUIANA: Aublet s.n. [F. G. Meyer photo 4067] (Gz—photo of type, W—photo of type); Hallé 1121 (N, P); Maguire & Fanshawe 23080 (W—1902649). ECUADOR: Napo: López-Palacios 4184 (Ld); Lugo S. 175 (W—2781668). Napo-Pastaza: Mexia 7173 (Ca—743335), 7187 (Ca—743325), 7289 (Ca—743352). PERU: Huánuco: Macurdy 1001 (F—1728083). Loreto: Croat 20529 (W—2786740).

San Martín: Chrostowski 70-353 (Ws); Klug 3468 (W—1457865); Schunke Vigo 6531 (W—2703976). BRAZIL: Amapá: Irwin, Egler, & Murça Pires 47161 (W—2400716). Amazônas: López-Palacios 3654 (Ld, N); Poeppig 1615 (W—photo). Mato Grosso: Hatschbach 34084 (Ld). Minas Gerais: Mexia 4500 (Au—120679). Roraima: Coradin & Cordeira 607 (N). BOLIVIA: La Paz: M. Bang 584 (Pd, W—photo). MOUNTED CLIPPINGS: Jacq., Stirp. Amer. 15. 1763 (W).

AEGIPHILA INTEGRIFOLIA var. GUIANENSIS (Moldenke) López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21. 1974.

Synonymy: Aegiphila guianensis Moldenke in Fedde, Repert. Spec. Nov. 13: 125—126. 1933. Aegiphila arborea Spruce ex Moldenke, Phytologia 1: 206, in syn. 1937. Aegiphila guianensis Aristeguieta ex Moldenke, Fifth Summ. 1: 379, in syn. 1971.

Bibliography: Moldenke in Fedde, Repert. Spec. Nov. 33: 125—126. 1933; Moldenke, Brittonia 1: 340—341. 1934; Moldenke, Phytologia 1: 206. 1937; Moldenke, Geogr. Distrib. Avicen. 18—20 & 24. 1939; Moldenke, Phytologia 1: 389. 1940; Moldenke, Prelim. Alph. List Inv. Names 1. 1940; Moldenke, Alph. List Inv. Names 1. 1942; Moldenke, Known Geogr. Distriv, Verbenac., [ed. 1], 30, 32, 35, & 85. 1942; Moldenke, Alph. List Cit. 1: 326. 1946; Moldenke, Phytologia 2: 395 (1947) and 2: 436. 1948; Moldenke, Alph. List Cit. 2: 337, 603, & 610 (1948), 3: 820, 905, & 956 (1949), and 4: 1006. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 58, 62, 65, 74, & 175. 1949; Moldenke, Phytologia 4: 389—390 & 432. 1953; Moldenke, Résumé 65, 69, 74, 86, 228, & 441. 1959; Moldenke, Phytologia 13: 326—327 (1966), 25: 318 (1973), and 27: 81 & 293. 1973: López-Palacios, Revist. Fac. Farm. Univ. Los Andes 9 (13): 26—27 (1973), 14: 21 (1974), and 15: 9. 1975; Moldenke, Phytologia 28: 434, 435, 437, 438, & 452 (1974), 31: 382 (1975), and 34: 255. 1976.

All the data recorded by me previously in this series of notes and elsewhere under A. guianensis should now be transferred to A. integrifolia var. guianensis.

López-Palacios and his associates describe this plant as an "Árbol [or] arbusto [or] arbolito erecto, de 3—15 m, inerme, ramificado, perennifolio, 1,5—7 m. Hojas opositidecusadas, membranosas [or] firmamente membranosas a membranoso-subcartaceas, verde obscuras por la haz, más claras por el envés. Hojas adultas pequeñas, grandes las de brotes jóvenes. Infructescencias en cimas dicótomo-corimboides. Corola blanca."

Other recent collectors describe it as a spreading shrub or small tree, 2—4 m. tall, the leaves papery, dull, pale- or medium-green above, paler green beneath, the young inflorescence greenish, the calyx green or pale-green, the corollas white or dirty-white, anthers brown, and the fruit at first green but maturing orange-yellow [Werner & White say "mature fruit green", but surely in error!].

Recent collectors have found the plant growing in dense tidal forests, open disturbed ground, and secondary forests or regrowth,

from sealevel to 850 m. altitude, flowering in March, June, July, and December, and fruiting in March, July, October, and December. Lee records the vernacular name, "tete viaja".

The Prance, Coêlho, Harley, Kubitzki, Maas, Sastre, & Smith 11680, cited below, was previously regarded by me as typical A. integrifolia (Jacq.) Jacq. The Breteler 4905 and Killip & Cuatrecasas 39091, also cited below, have much the aspect of typical A. integrifolia -- the under surface of the mature leaves is not observable on the specimens seen, but the densely velutinous immature leaves cause me to suspect that they probably represent the present variety. On the other hand, Aristeguieta 4215, is very different in aspect and bears hardly any resemblance at all to A. integrifolia. It is very probable that two taxa are here represented and the material needs to be re-studied.

López-Palacios (1975) comments that "Ae. guianensis y Ae. integrifolia están constituidas en Venezuela por poblaciones muy dudosas y de difícil interpretación, en especial el material de la parte de la costa y de los Edos. Mérida y Barinas....He considerado conveniente hacer una reducción de esta especie [A. guianensis] a variedad.....y entonces quedarían aquí los especímenes más indumentados o de envés tomentoso, incluido Blanchet 2121, es decir, aquellos ejemplares que consideraba Schauer 'lanuginoso-pubescente' (Prodr. 11: 649)."

The label accompanying E. L. Little 7769, cited below, originally was inscribed "7768", but this number was struck out and "7769" substituted by some unknown hand.

Material of A. integrifolia var. guianensis has been distributed in some herbaria as A. falcata Donn. Sm., a very different taxon of Central America!

Additional & emended citations: COLOMBIA: Arauca: López-Palacios 3950 (N). Caquetá: E. L. Little 7769 (W—2140364). Chocó: Killip & Cuatrecasas 39091 (N, W—1856920). Cundinamarca: López-Palacios 3909 (N, Ws). Meta: López-Palacios 3914 (Ld, N), 3918 (N, Tu). Nariño: López-Palacios 3950 (Ld). Valle del Cauca: Cuatrecasas 14846 (W—2815034); V. H. Lee 72 (Oa); López-Palacios & Idrobo 3848 (Ac, N). VENEZUELA: Barinas: López-Palacios 3116 (N). Bolívar: Ruiz-Terán & López-Palacios 11125 (Ld), 11656 (Ld). Mérida: Bernardi 6495 (W—2279384); López-Palacios 3159 (N). Táchira: Breteler 4905 (N, W—2583290a, W—2583291a). Trujillo: Ruiz-Terán & López-Palacios 7639 (Ld). Zulia: Bruijn 1015 (N). GUYANA: Schomburgk 404 in part (W—photo of type). BRAZIL: Amazônas: Prance, Coêlho, Harley, Kubitzi, Maas, Sastre, & Smith 11680 (W—2699642). MOUNTED CLIPPINGS: Moldenke in Fedde, Repert. Spec. Nov. 33: 125—126. 1933 (W).

AEGIPHILA INTEGRIFOLIA var. LOPEZ-PALACII Moldenke, Phytologis 36: 53. 1977.

Bibliography: Moldenke, Biol. Abstr. 64: 4787. 1977; Moldenke, Phytologia 36: 32 & 53. 1977.

Collectors describe this plant as a shrub, 2—4 m. tall, and have encountered it in "pajonales" and along rivers, at 1500 m. altitude, flowering in March, April, and July. The corollas are said to have been "white" on Lugo S. 896 & 991.

Citations: ECUADOR: Napo: Boeke 2209 (N); López-Palacios 4257 (Z—type); Lugo S. 896 (W—2781666), 991 (W—2781667). BOLIVIA: La Paz: Troll 1704 (Mu).

AEGIPHILA INTERMEDIA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 294. 1973.

The Eitens refer to this plant as an herb, 1 m. tall, the corolla "ivory-color", and the style white, and encountered it at the edge of "carrasco" (secondary scrub of cerradão) at 150 meters altitude.

Additional citations: BRAZIL: Maranhão: Eiten & Eiten 10811 (W—2757747).

AEGIPHILA LAETA H.B.K.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Fedde & Schust. in Just, Bot. Jahresber. 48 (1): 496. 1927; Moldenke, Phytologia 27: 294, 298, & 375. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102, 105, & 144. 1973; Moldenke, Phytologia 34: 255 & 256. 1976.

Recent collectors describe this species as a simple-branching subshrub, shrub, or alluvial forest tree, or even herbaceous, 1—5 m. tall, the branches decussate, the upper leaves entire, some of the lower ones crenate, the inflorescence greenish when immature, the cymes axillary or terminal, corymbose, and the fruit [erroneously referred to as "berries" by some collectors], yellow-orange or orange-red, red when mature, and have found it growing in sand and loam soil in bushy shaded ravines, from sea-level to 200 meters altitude, flowering in April, July, November, and December, fruiting in February, October, and November.

The corollas are described as "cream"-color by López-Palacios, while in Ebinger 243 they are said to have been "white" and on Nee 7289 they were "yellow".

Material of this species has been misidentified and distributed in some herbaria as A. panamensis Moldenke, while the Pittier 10533, cited below, was previously erroneously cited by me as A. martinicensis Jacq.

Additional citations: PANAMA: Canal Zone: M. Nee 7289 (W—2787121). San Blas: A. Gentry 6398 (W—2800090). Barro Colorado Island: Ebinger 243 (W—2728874). TABOGA ISLAND: G. W. Barclay 2498 (W—2779727). COLOMBIA: Antioquia: Pring 5 (E—905318). Arauca: López-Palacios 3936 (Ld, N, N), 3941 (Ac, N). VENEZUELA: Barinas: López-Palacios 3973 (Ld). Zulia: López-Palacios 1889 (Ld); Pittier 10533 (B, Cb, N, N—photo, W—1887211, Z—photo).

AEGIPHILA LAEVIS (Aubl.) Gmel.

Additional bibliography: Sweet, Hort. Brit., ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 294 (1973), 29: 32 (1974), and 36: 39. 1977.

Recent collectors describe this plant as a vine climbing to 1.5 m. on shrubs, the stems woody below, the calyx and [young] fruit green, and have found it growing by the sides of streams, in flower in June and in both flower and fruit in January. The corollas are said to have been "pale greenish-yellow" on Santos & al. 1793. Schunke Vigo reports that the leaves are used as an insecticide in Peru.

Both Sweet (1830) and Loudon (1832) list this species as cultivated in Great Britain, introduced from Guiana in 1824, and call is the "smooth aegiphila".

Material of A. laevis has been misidentified and distributed in some herbaria as A. falcata Donn. Sm. Maguire & Stahel 22782 is a mixture with Amasonia campestris (Aubl.) Moldenke.

Additional & emended citations: COLOMBIA: Valle del Cauca: Cuatrecasas 14302 (W—2772735), 15946 (W—2772825), 17567 (W—2816209). SURINAM: Maguire & Stahel 22782 in part (N). FRENCH GUIANA: Aublet s.n. (Gz—photo of type); Collector undetermined s.n. (Pd). BRAZIL: Bahia: Pinheiro 1728 (Ld), 1797 (N). Mato Grosso: Santos, Souza, & Ferreira R. 1793 (N).

AEGIPHILA LANCEOLATA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 294 (1973), 28: 437 & 438 (1974), and 36: 34. 1977.

Recent collectors describe this plant as a wwody vine or liana (or even as "herbaceous"), to 7 m. long, and have found it growing in gallery forests or primary forests or terra firma, flowering in February, and with yellow or orange fruit in February and July. The branches and petioles are characteristically long-hispid, thus easily distinguishing it from the very similar and closely related A. chrysantha Hayek, A. microcalycina Moldenke, and A. vitelliniflora Klotzsch. Campbell and his associates report the "calyx green, buds green, pistils green, filaments yellow, anthers brown". The corollas are said to have been "cream-color" when fresh on Hatschbach 26170 and "yellow" on Hatschbach & Guimarães 19047.

Material of A. lanceolata has been misidentified and distributed in some herbaria as A. chrysantha Hayek.

Additional citations: PERU: Loreto: Schunke Vigo, Mathias, & Taylor 5444 (F—1728082). BRAZIL: Amazônas: Campbell, Ongley, & Ramos P.21979 (Ld, N). Goiás: Hatschbach 34269 (Ld). Mato Grosso: Hatschbach 26170 (Ld). Paraná: Hatschbach & Guimarães 19047 (W—2705908).

AEGIPHILA LAXICUPULIS Moldenke

Synonymy: Aegiphila laxicupula Moldenke, Prelim. Alph. List

Inv. Names 2, in syn. 1940. Aegiphila laxicaulis Moldenke, Suppl. List Inv. Names [1], in syn. 1941. Aegiphila laxicupulis "Moldenke in Fedde", in herb. Aegiphila laxicupulis "Milenke", in herb.

Additional bibliography: Moldenke, Phytologia 25: 414 (1973) and 27: 84 & 166. 1973; Molina R., Ceiba 19: 95. 1975; Moldenke, Phytologia 36: 30. 1977.

Recent collectors describe this plant as a shrub, 5—15 feet tall, and have encountered it in shrubby thickets and along small streams in cafetal in seasonal evergreen forests, at 200 meters altitude, flowering in October. The corollas are said to have been "cream"-color on Breedlove 28551. Molina (1975) reports the species from Honduras.

Material of A. laxicupulis has been misidentified and distributed in some herbaria as A. panamensis Moldenke.

Additional citations: MEXICO: Chiapas: Breedlove 28551 (Ld, Mi). GUATEMALA: Jutiapa: Harmon & Dwyer 3335 (Ws). NICARAGUA: Chontales: Marshall & Neill 6539 (Z).

AEGIPHILA LAXIFLORA Benth.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 353. 1973.

Additional citations: TRINIDAD & TOBAGO: Trinidad: W. E. Broadway s.n. [Buenos Ayres, May 9, 1919] (E—862847).

AEGIPHILA LEWISIANA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 353 (1973), 28: 435 (1974), and 31: 382. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 10. 1975.

Ruiz-Terán & López-Palacios describe this plant as an "Arbusto erecto, inerme, ramificada, 2,5 m. Hojas opositidecusadas, firmemente membranosas, virtualmente glabras. Drupas inmaturas globoso-obovoides, amarillo verdosas, 8—10 mm. de diámetro, el ápice con cicatriz hundida" and found it growing at 50—180 m. altitude, fruiting in July.

López-Palacios (1975) comments that "Yo he distribuido mi ejemplar 3492 como Ae. lewisiana, basado más que todo en sus infrutescencias terminales y de pocos frutos. Hoy tengo duda de esa interpretación a causa de sus cálices completamente truncos y de sus frutos lisos cuando frescos y arrugados cuando secos, pero no escabrosos como los del tipo (Fendler 844, GH). Sin embargo, lo conservo aquí porque no sé hasta donde llegue la variación de la especie. Sabré agradecer los informes que a esta respecto se me comuniquen."

Additional citations: VENEZUELA: Bolívar: Ruiz-Terán & López-Palacios 11537 (Ld).

AEGIPHILA LHOTZKIANA Cham.

Additional synonymy: Aegiphilla lhotzhiana Cham. ex Moldenke, Phytologia 31: 292, in syn. 1975.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9.

1858; Moldenke, Phytologia 27: 353—354 (1973), 28: 438 (1974), and 31: 392. 1975.

Recent collectors describe this species as a shrub or treelet, 1.5—2.5 m. tall, thin, erect, unbranched until near the top, the trunk to 6 cm. in diameter, with corky bark, the fruit green in January, and have found it growing "in a dense scrub area of cerrado vegetation plus a few trees", in "capoeira", and "in degraded cerrado, young barbatimão trees and shoots 1—3 m. tall spaced 2—5 m. apart, the ground recently burned", at altitudes of 720—1000 m., flowering in October, in fruit in January. Prance & his associates refer to the plant as a "subshrub 5 cm. tall", but this is doubtless an error for 5 dm. or even 5 m. The describe the corollas as "pale-green". The corollas on Hatschbach 26120 & 37702 and on Hatschbach & Koczicki 33088 are said to have been "cream"-color when fresh, while on Mattos & Mattos 8418 they were "white, filaments green, anthers white". It has also been found in flower in January.

Additional citations: BRAZIL: Goiás: Hatschbach 37702 (Ld); Irwin, Onishi, Fonsêca, Souza, Reis dos Santos, & Ramos 25325 (Ws); Irwin & Soderstrom 7477 (Mi, N, W—2752377). Mato Grosso: Eiten & Eiten 9463 (W—2689080); Hatschbach 26120 (Ld); Hatschbach & Koczicki 33088 (Ld); Prance, Lleras, & Coêlho 18948 (Ld, N). São Paulo: Eiten & Eiten 2435 (Ln—188311, Mu), 7794 (W—2757759); Mattos & Mattos 8418 (W—2745209).

AEGIPHILA LONGIFOLIA Turcz.

This taxon is now known as A. mollis var. longifolia (Turcz.) López-Palacios, which see.

AEGIPHILA LONGIPETIOLATA Moldenke

Additional bibliography: Moldenke, Phytologia 25: 417. 1973; Soukup, Biota 11: 4. 1976.

AEGIPHILA LOPEZ-PALACII Moldenke, Phytologia 36: 52—53. 1977.

Bibliography: Moldenke, Biol. Abstr. 64: 4787. 1977; Moldenke, Phytologia 36: 32 & 52—53. 1977.

Citations: ECUADOR: Pichincha: López-Palacios 4237 (Z—type).

AEGIPHILA LOPEZ-PALACII var. PUBESCENS Moldenke, Phytologia 36: 53. 1977.

Bibliography: Moldenke, Biol. Abstr. 64: 4787. 1977; Moldenke, Phytologia 36: 32 & 53. 1977.

Citations: ECUADOR: Pichincha: López-Palacios 4201 (Z—type).

AEGIPHILA LUSCHNATHI Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 294. 1973; Hocking, Excerpt. Bot. A.23: 293. 1974; Moldenke, Phytologia 31: 293. 1975.

AEGIPHILA MACRANTHA Ducke

Additional bibliography: Moldenke, Phytologia 27: 354. 1973.

The Steyermark 88157 collection is represented in the fruit collection of the New York Botanical Garden herbarium. Austin describes the "old fruit" as brown and found the species fruiting in June.

Ruiz-Terán & López-Palacios describe the species as "Arbusto más o menos recostadizo, inerme, 5—6 m. Hojas opositidecusadas, coriáceas, verde intensas y más o menos lucientes por la haz, verde claras, algo lucientes, por el envés. Cimas axilares, pedunculadas. Brácteas foliáceas, verde claras. Flores grandes, de unos 3 cm. de largo en la antesis, inodoras en la hora de la recolección (2 p.m.). Cáliz fructífero de ± 3 cm. de diámetro" and encountered it at 200 meters altitude, flowering in July.

Additional citations: VENEZUELA: Bolívar: Ruiz-Terán & López-Palacios 11569 (Ld); J. A. Steyermark 88157 (N). BRAZIL: Pará: Austin 4182 (E—2035850).

AEGIPHILA MAGNIFICA Moldenke

Additional bibliography: Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 103, 114, & 144. 1973; Moldenke, Phytologia 27: 84, 87, & 166 (1973), 31: 456 (1975), and 36: 30. 1977.

AEGIPHILA MAGNIFICA var. PUBESCENS Moldenke

Additional bibliography: Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 103, 114, & 144. 1973; Moldenke, Phytologia 27: 84 & 166 (1973), 31: 456 (1975), and 36: 30. 1977.

The Croat 22141, distributed as A. magnifica var. pubescens in some herbaria, is perhaps better regarded as representing A. mollis H.B.K.

AEGIPHILA MARTINICENSIS Jacq.

Additional bibliography: Jacq., Select. Stirp. Amer. Hist., imp. 1, 26. 1763; Sweet, Hort. Brit., ed. 1, 1: 322 & 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Schau. in A. DC., Prodr. 11: 652—653 & 655. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Jacq., Select. Stirp. Amer. Hist., imp. 2, 26. 1971; Altschul, Drugs & Foods 245. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102, 103, 111—113, & 144. 1973; Moldenke, Phytologia 27: 295 (1973) and 28: 452. 1974; Hocking, Excerpt. Bot. A.23: 293. 1974; León & Alain, Fl. Cuba, imp. 2, 309 & 310. 1974; Little, Woodbury, & Wadsworth, Trees P. R. & Virg. Isls. 2 [U. S. Dept. Agr. Agric. Handb. 449:] xii, 854—856, 991, 994, 997, & 1021, fig. 678. 1974; Troncoso, Darwiniana 18: 390 & 408. 1974; Molina R., Ceiba 19: 95. 1975; Soukup, Biota 11: 4. 1976; J. F. Morton, Quart. Journ. Crude Drug Res. 15: 182—183. 1977.

Additional illustrations: Little, Woodbury, & Wadsworth, Trees P. R. & Virg. Isls. 2 [U. S. Dept. Agr. Agric. Handb. 449]: 855, fig. 678. 1974.

[to be continued]

BOOK REVIEWS

Alma L. Moldenke

"CRUCIBLES: THE STORY OF CHEMISTRY From Ancient Alchemy to Nuclear Fission" by Bernard Jaffe, Revised 4th Edition, ix & 368 pp., 29 b/w fig. & 3 tab. Dover Publications, Inc., New York, N. Y. 10014. 1976. $5.00 paperbound.

This is a replication that has been enlarged, revised and updated by the author since it was originally published by Simon and Schuster in 1930. It was a very good book then, it is an even better one now. By sharing glimpses into the homes, schools, and laboratories and at the confreres of Trevisan, Paracelsus, Becher, Priestley, Cavendish, Lavoisier, Dalton, Berzelius, Avogadro, Woehler, Mendeléeff, Arrhenius, the Curies, the Thomsons, Rutherford, the Moseleys, Bohr, Langmuir, Lawrence and the scientists who started harnessing nuclear energy by fission and by fusion readers gain an excellent survey and should be grateful to Jaffe for his effective telling of the story.

"BIOLOGY AND CULTURE IN MODERN PERSPECTIVE" - Readings from Scientific American edited by Joseph G. Jorgensen, iv & 441 pp., 373 b/w & color illus. W. H. Freeman & Company, Reading, England RG1 3AA & San Francisco, California 94104. 1973. $5.95 paperbound, $12.00 clothbound.

This is another well chosen collection of fine articles illustrated in excellent expected style. The printing paper is only minimally good. The first section is devoted to biological anthropology with human origins, genetics and evolution. The second part deals with human prehistory — tools, early cultural developments and the rise of civilization in the Old and New Worlds. The third part considers cultural anthropology in terms of kinships, polity, hunters, farmers, pastorals, urbanization, the "haves" and "have nots" of today. The book provides excellent supplementary reading for anthropology and allied courses, as well as good general reading.

"BIOLOGICAL IDENTIFICATION WITH COMPUTERS" edited by R. J. Parkhurst, xi & 333 pp., 37 b/w fig. & 33 b/w tab. Academic Press, Ltd., New York & London NW1 7DX. 1975. $28.50 or £ 11.00.

This Special Volume 7 of the Systematics Association is composed of the Proceedings of a meeting at King's College, Cambridge, in 1973 about the identification of biological specimens by computer.

It has 16 important papers, discussion, classified bibliography of computers and identification and computer programs, glossary and index. The advantages, limitations and prospects of several programs expressed in FORTRAN (usually IV) or ALGOL and for key-forming ones, on-line identifications, punched card keys, comparison of taxa, identification by comparison and/or by elimination, test selection and data capture.

Reading this study is like checking the many horses lined up for a race and wondering what one will clear into the lead.

"CONTROLLED ENVIRONMENTS FOR PLANT RESEARCH" by Robert Jack Downs, xi & 175 pp., 54 b/w fig. & 14 b/w tab. Columbia University Press, London & New York, N. Y. 10025. 1975. $12.00.

The intent (and achievement) of this author "is to describe the mechanical and biological systems encountered in modern controlled-environment facilities and to relate these systems to the problems of operation and plant growth....[including] some of the frequent design problems.....and the advantages of certain research techniques and cultural practices". After paying respects to Went's phytotron and other early efforts the text deals directly with constructional and operational details of today's and tomorrow's equipment "introducing the biologist to the mechanical devices and showing the engineer some of the plant requirements.....[helping both of] them to achieve better plant growth-chamber design and operation."

"NORTH AMERICAN MAMMALS — A Photographic Album for Artists and Designers" selected and edited by James Spero, 96 pp., 92 b/w photographs. Dover Publications, Inc., New York, N. Y. 10014. 1978. $4.00 paperbound.

Almost all of these excellent photographs of animals in their typical habitat came from the collection of the Audio-Visual Fish and Wildlife Service of the Department of the Interior. Artists, designers and many others are herewith provided with accurate, natural looking replicas of these 65 mammals. Children from 2 to 90, as well as artists and designers, should enjoy the very naturalness of these snapshots.

"THE LICHENS" edited by Vernon Ahmedjian & Mason E. Hall, xiv & 697 pp., 301 b/w fig. & 51 b/w tab., Academic Press, Inc., London & New York, N. Y. 10003. [1973] 1974. $35.00.

This companion piece to Ainsworth and Sussman's "The Fungi" from the same press is also an excellent work surely destined to become a classic. This book is planned for study beyond the in-

troductory college level because of its wealth of material, yet it reads interestingly, is fully documented, and is very effectively illustrated often by electron microscopy.

Lichens comprise (in part) the single largest group of Ascomycetes. The editors, respectively, author chapters on the isolation and resynthesis of the symbionts and on growth patterns. The text of 22 articles includes what they consider to be the most important topics: "structure and development, physiology of the intact thallus, environmental response and effects, secondary metabolic products, and symbiont interactions." The appendices consist of a taxonomic scheme, methods for isolating and culturing lichen symbionts and thalli, and methods for isolating and identifying lichen substances.

"TOPICS IN POPULATION GENETICS" by Bruce Wallace, xi & 481 pp., 126 b/w fig. & 113 b/w tab. W. W. Norton & Company, Inc., New York, N. Y. 10036. 1968. $14.00.

It is good that this book is still available for classes and students beyond introductory college genetics and now ready for population, evolutionary, ecological and/or mathematical genetics courses. The author intends it for supplementary reading so that not so much time in these advanced courses need "be spent merely acquainting students with elementary observations and the techniques by which these are made". The chapters in Part I deal "primarily with the Hardy-Weinberg equilibrium and how it can be used; those in Part II deal with hybrid vigor, genetic load coadaptation, evolution of dominance, stabilizing and disruptive selection, introgression, etc. and other aspects within populations on more complicated levels.

"INTERMONTANE FLORA — Vascular Plants of the Intermontane West, U.S.A. Volume 6 The Monocotyledons" by Arthur Cronquist, Arthur H. Holmgren, Noel H. Holmgren, James L. Reveal, & Patricia K. Holmgren, vi & 584 pp., 302 b/w full plate or part-page multiple-form line drawings. Columbia University Press, New York, N. Y. 10025. 1977. $54.00.

This work was published for the New York Botanical Garden where three of the authors are staff members. This Volume 6 is the next to appear after Volume 1 primarily to make the treatment of the Poaceae available to land-use managers as soon as possible. The excellent illustrations are provided by 9 different artists and artist-botanists, yet all fit in well with the text, keys and other illustrations and effectively display diagnostic characteristics. The text, with different families treated by different authors, gives accepted names, authorities, synonymy, effective descriptions, habitat, range, and blooming times. At the beginning there is Cronquist's "Artificial Key to the Families of

Monocotyledons" grouped by him in Class Liliopsida. This publication is an outstanding study. May the remaining volumes be as well prepared and appear soon!

"ORCHIDS FOR THE OUTDOOR GARDEN — A Descriptive List of the World's Orchids for the Use of Amateur Gardeners" by A. W. Darnell, xxiv & 467 pp., 22 b/w plates. Facsimile Edition for Dover Publications, New York, N. Y. 10014. 1976. $6.00 paperbound.

The executive secretary for the American Orchid Society, Gordon W. Dillon, provides the new preface for this unabridged republication of a work first published in England in 1930. For almost 1,000 kinds of orchids descriptive information is given relating to roots, stems, leaves, inflorescences, flowers, blooming times, natural habitats, geographic distributions and growing conditions. Common synonyms are given in the text, rarer ones in the index. Neither in the text nor in the 46-year younger preface is mention made of the special arrangement of orchid roots with microorganisms essential to their growth. Nevertheless, there is a vast amount of valuable information well presented in this book.

"OUR PRECARIOUS HABITAT" Revised Edition by Melvin A. Benarde, xiv & 448 pp., 104 b/w fig. & 31 b/w tab. W. W. Norton & Company, Inc., New York, N. Y. 10036. 1973. $3.95 paperbound, $8.25 clothbound.

The particular advantages of this presentation for the general reader and for non-biologists studying environmental health problems are (1) its "integrated approach to understanding man's effect on his environment", (2) its full and reasoned coverage of bacterial and chemical food poisonings, pesticides, zoonoses, air and water pollution including sewage, solid wastes, occupational hazards and accidents, radiation, noise, population pressures and (3) the politics of pollution control. The book will hold almost all readers' interest from cover to cover,

"INVITATION TO BIOLOGY" Second Edition by Helena Curtis, xxi & 646 pp., 14 full color plates, ca. 500 b/w & color fig., 29 b/w & color tab. Worth Publishers, Inc., New York, N. Y. 10016. 1977. $13.95.

The preface to the teacher begins "This second edition of 'Invitation to Biology' is in part a shorter version of 'Biology', second edition, and in part a wholly new book." Part I centers on the functional cell at the atomic and molecular levels; Part II on the diversity of individual organisms and on human physiology; Part III on ecology and evolution. Because of the format compar-

able to that of 'Biology', of the use of similar excellent illustrations and of pertinent content well explained, of the clearly defined glossary and the effectively annotated bibliography, this text is one of the very best for non-major courses. Too many of the review questions are dull, as, for instance, "Define"- appearing hundreds of times.

"STUDENT GUIDE TO ACCOMPANY 'INVITATION TO BIOLOGY' Second Edition" by Vivian Manns Null, vi & 265 pp., b/w illus. Worth Publishers, Inc., New York 10016. 1977. $4.25 paperbound.

Since this is not a laboratory/study manual and since the text has its own summaries and review questions at the end of chapters, its value is that which individual students attach to it. Its preface for the student is worth reading.

"INSTRUCTOR'S MANUAL TO ACCOMPANY 'INVITATION TO BIOLOGY Second Edition" by Vivian Manns Null, xiii & 103 pp. Worth Publishers, Inc., New York, N. Y. 10016. 1977. Free.

"This 'Instructor's Manual' contains answers to the questions that appear at the end of each chapter in the text,...a list of pertinent films.....[and] a list of major rental libraries in the United States."

"MOLECULAR GENETICS — An Introductory Narrative" by Gunther S. Stent, xvi & 650 pp., 282 b/w fig. & 4 color plates. W. H. Freeman & Co., San Francisco, California 94104. 1971. $14.00.

This excellent treatment that grew out of longtime teaching of this topic on the Berkeley campus requires a minimal prerequisite of two years of undergraduate science training including general college chemistry. In fact, students with a modern general biology course can start with Chapter 3 and those with biochemistry might start with Chapter 5. I hope that neither group will cheat itself out of the privilege of reading this author's fine presentation of classical Mendelian-Morganic genetics and gene-related biochemistry and cytology. Natural looking photographs, often in laboratory settings, add human touches to the accounts of these scientists' researches within their certain parts of this big field. The main topics of the 21 chapters are: gene-enzymes, mutation, transformation, DNA structure and replication, configuration, phage growth, recombination, genetic fine structure, lysogeny, transduction, DNA transactions and transcription, RNA translation, genetic RNA and code, and the important questions we cannot answer yet.

The first revision and new edition of this book is set for July 1978 at $18.00.

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NOTES ON HESPERMANNIA (COMPOSITAE)
HAWAIIAN PLANT STUDIES 80

Harold St. John
Bishop Museum, Box 6037, Honolulu, Hawaii, 96818, USA.

Hesperomannia has been mongraphed by Carlquist (1957), but it is still possilbe to make contributions to the knowledge of the genus.

Hesperomannia arbuscula Hbd., subsp. oahuensis (Hbd.) Carlq., Pacif. Sci. 11: 213, 1957.
H. arborescens Gray, var. Oahuensis Hbd., Fl. Haw. Is. 232, 1888.
H. oahuensis (Hbd.) Degener, Fl. Haw., fam. 344: 8/24/38.

Hillebrand based his variety upon two collections: "Oahu! Waianae range, Puakea (Wawra), Makaleka (Lydg.)."

In 1935 the writer noted that the cited Wawra collection, no. 2,222, was in the Berlin herbarium. The Lydgate collection, Makaleha, Oahu, ex herb. Hbd., is in the Bishop Museum. When Degener (1938) raised the var. oahuensis to a species, he cited the type locality as, "Oahu, Berge von Waianae." This was not a quotation from Hillebrand, and evidently Degener had not studied the specimens in the Hillebrand collection in the Berlin Museum. Clearly, the quoted phrase came from Wawra's Beiträge in Flora 31:76, 1873 (p. 39 in the reprint). Even though Degener did not precisely select the Wawra 2,222 specimen as a lectotype, it seems that he has done so effectively by quoting the locality in German, in the exact wording used in Wawra's Beiträge, for the same Wawra collection which was one of the two upon which Hillebrand based his var. oahuensis.

The differences between this plant of Oahu, and the species H. arbuscula of west Maui are in the habit, the length of the phyllaries, and of the pappus. These differences are slight, and appear to be of little significance. There seems no reason to change its taxonomic status as a subspecies, (or as a variety).

Hesperomannia arbuscula Hbd., var. Pearsallii var. nov.

Diagnosis Holotypi: Laminis ellipticis (vel ovatis) 14-21 cm longis 8-14 cm latis subintegribus vel minute serrulatis supra mox glabratis infra pallidis in initio tomentosis sed mox glabratis.

Diagnosis of Holotype: Blades elliptic (or ovate), 14-21 cm long, 8-14 cm wide, subentire or minutely serrulate, above early glabrate, below pale and at first tomentose but early glabrate.

Holotypus: Hawaiian Islands, Oahu Island, Waianae Mts., Puu Kaua-Kanehoa Peak, on side ridge below main ridge, above Kunia Camp, 2,950 ft alt., 5/19/60, G. A. Pearsall 500 (BISH).

Specimens Examined: Hawaiian Islands, Oahu Island, all from Waianae Mts., Kaneha Trail, w. of Schofield, Metrosideros-Acacia forest, with Pelea, Viola, Pipturus, 1,600 ft alt., Aug. 26, 1961, S. Carlquist 640 (BISH); Kunia Trail between Puu Kanehoa and Puu Hapapa, steep slope, Acacia koa forest, 1,200 ft alt., July 3, 1965, Carlquist 1,720 (BISH); and July 2, 1966, 1,910 (BISH); Kaluaa Gulch (Lihue), between Puu Kanehoa and Puu Hapapa, 23 July 1967, P. C. Hutchinson, C. S. Daniels & J. Obata 7,370 (BISH); back of Kunia Camp, 100 yds. below ridge between Puu Kaua & Kanehoa, 2,950 ft alt., 3/26/60, Pearsall (BISH); Kanehoa ridge trail, 1,500 ft alt., 26/3/60, B. C. Stone 3,293 (BISH); and 30 April 1960, 3,450 (BISH).

Discussion: The closest relative of the new variety is ssp. oahuensis (Hbd.) Carlq., which has the blades ovate (or elliptic), 9-19 cm long, 7-11 cm wide, below permanently soft tomentose. It occurs in the northern Waianae Mts., only on the slopes of Mt. Kaala.

Discussion: The new epithet is given in memory of Gordon A. Pearsall, of the U. S. Bureau of Entomology and Plant Quarantine, a former student of the writer's.

Literature Cited

Carlquist, Sherwin
1957. Systematic Anatomy of Hesperomannia. Pacif. Sci. 11: 207-215, figs. 1-5.

PROBLEMS IN THE PLACEMENT OF DIOCLEA PANICULATA KILLIP MS. (LEGUMINOSAE)

Richard H. Maxwell

Indiana University Southeast Herbarium, 4201 Grantline Road, PO Box 679, New Albany, Indiana 47150.
Herbarium and Field Studies in the Leguminosae. Supported in part by a Grant-in-Aid of Research.

Early in my studies of Dioclea and related genera, I came across E. P. Killip's manuscript of Dioclea paniculata at the U. S. National Herbarium (US). I have examined some of his other notes as well as his correspondence with H. Pittier in Venezuela. In my thesis (1969) I did a preliminary sorting of the "good" taxa from these notes, notations on herbarium sheets, partial manuscripts, unpublished type photos, etc. Dioclea paniculata is a "good" species. I consider the proper generic placement to be Dioclea H.B.K. rather than Cratylia Mart. ex Benth. or Galactia P.Br. Within Dioclea itself, I consider the best placement to be section Macrocarpon Amshoff rather than sections Pachylobium, Dioclea, or Platylobium. Second choice would be a section Platylobium placement. The purpose of this paper is to justify these placements based on an analysis of the diagnostic characters.

Dioclea paniculata Killip ex Maxwell, sp. nov. (Fig. 1 & 2)

Lianae scandentes alte, ligneae; folia pinnatim trifoliata, stipulae non prodientes, inflorescentiae erectae, tuberculatae, interdum ramis, fasciculatis-racemosis; flores ca 11 mm longi, subsessiles, calyx lobis obtusis, plus minusve aequalibus; petala glabra, vexillum obovatum, ca 8 mm longum, alae et carinae ca 6 mm longae, carinae oblongae, erostratae, supero margine integro; stamina 10, vexillaria leviter connata, glabra; ovarium breve stipitatum, ca 5 ovulis, villosum; stigma geniculatum, glabrum; stylus terminalis, capitatus, glaber; legumina elliptica, dehiscentia, 5.5-8.5 cm longa, ca 2.2 cm lata, ca 3.5 mm crassa, glabra; semina 2-4, ovalia, plana, laevia, brunnea, ca 13 mm longa, ca 10 mm lata, ca 3 mm crassa; hilo oblongo, ca 2.7 mm longo.

TYPE: COLOMBIA: Cundinamarca: Quebrada

Cabaña, Hacienda El Cucharo, btwn Tocaima and Pubenza: alt. 380-600 m; deep wooded canyon, May 8, 1944, E. P. Killip, A. Dugand, R. Jaramillo 38329 (holotype US (US Nat. Herb. No. 1855940), isotypes COL, US).

Vines, woody perennials, twining, high climbing; stems terete, old bark somewhat ridged, sparsely pubescent. Leaves pinnately trifoliolate, rigid, brittle, the rachis and petiole slightly ridged, the rachis 7-18 mm long, from 1/5 to 1/2 the petiolar length, apparently with dense, ferruginous pubescence when young, quickly glabrous; stipules linear or lanceolate, sometimes deeply bifurcate, sometimes trifurcate, with the lobes linear, the middle longest, frequently with secondary bracts surrounding the emerging inflorescence and leaf cluster, the bracts triangulate, ca 2 mm long, stipules and bracts glabrescent or glabrous, persistent. Leaflets with terminal lamina widely lanceolate, elliptic, ovate or occasionally obovate, 6.5-14 cm long, 2.5-8 cm wide, the laterals ovate, smaller, inequilateral, shining, raised reticulate above or dull, glabrous, sparse pubescence below or glabrescent with a few appressed hairs on the primary veins, the apices acute, obtuse, long acuminate or mucronate with the extension 10-15 mm long, rounded, the bases usually rounded, occasionally slightly cordate, with about 6 pairs of primary lateral veins; stipels setaceous, about 1 mm long, usually persistent. Inflorescences erect, terminal or axillary, the axillary peduncles emerging in the same pustule as the leaf, inflorescences single, double, occasionally branched, 3-18 cm long, each tubercle with 3-8 flower buds, the tubercles sessile globose or clavate, with the head occasionally elongate upcurved; primary bract at the base of tubercle linear-lanceolate, about 2 mm long, caducous, glabrous. Flowers blue-violet to deep purple, 10-12 mm long, subsessile; bractlets at the base of the pedicel remnant ovate, about 1.5 mm long, caducous, glabrous; bracteoles similar to the bractlets, semipersistent; the calyx campanulate, the lobes about equal, 1.5-2 mm long, the upper lobe usually entire, sometimes emarginate, the others obtuse or acute, the tube about 3 mm long, ferruginous pubescent outside, extending up the lobes inside. Standard with the lamina obovate, weakly auriculate or exauriculate, ecallose, striate, ca 8 mm long, 6.5 mm wide, the claw ca 2 mm long, glabrous; wings with the lamina oblanceolate or somewhat oblong, auriculate, striate, ca 6 mm long, 2.5 mm wide, glabrous, the claw ca 2.5 mm long; the keels with the lamina somewhat oblong to

obliquely oblong, ca 6.5 mm long, slightly wider than 2 mm, glabrous, the claw ca 2.5 mm long, the upper margin entire; stamens 10, the vexillary stamen attached to the staminal sheath, glabrous, the staminal sheath membraneous, glabrous, the anthers uniform; the pistil straight for ca 9 mm, then ascending ca 2 mm; the ovary ca 6 mm long, densely villous, with straight, rigid, white hairs ca 0.5 mm long, usually interspersed with dark brown hairs, the stipe ca 2 mm long, ca 5-ovulate; the style glabrous, ca 2 mm long, shortly exerted through the keels, the stigma terminal, capitate, glabrous. Legumes elliptic, dehiscent, sessile, flat, 5.5-8.8 cm long, 2.1-2.4 cm wide, 2.5-5 mm thick, young fruits with dark brown pubescence, finally glabrous, the upper suture slightly raised, with shallow parallel ribs about 1 mm to either side, the lower margin somewhat swollen. Seeds 2-4, oval-orbicular, flat, brownish, smooth, shining, ca 13 mm long, 10 mm wide, 3 mm thick, surrounded by papery, red, packing tissue; the hilum oblong to long-elliptic, 2.5-3 mm long.

Specimens examined: COLOMBIA: Without exact locality, Río Lobo, M. J. Goudot s.n., April 1844 (BM); "Nova Grenada," J. Goudot s.n. (K); Mutis 4284 (US). ANTIOQUIA: Uraba, orillas del Rio Mutatá, L. Uribe Uribe 2049 (COL, US). CUNDINAMARCA: Nariño, E. Perez Arbelaez 341 (US, as "Perez" on packet); Fusagasugá, Holton 828 (K); Quebrada Carmargo, N of Apulo, Killip, Dugan, Jaramillo 38215 (US); Quebrada Cabaña, btwn Tocaima and Pubenza, E. P. Killip, A. Dugand, R. Jaramillo 38329 (COL isotype, US holotype sheet 1 (US Nat. Herb. No. 1855940), isotype sheet 2); Tocaima, Triana s.n. (US, photo of collection in Herb. Nac. Col., US Nat. Herb. photos of type specimens; Distribution No. 2001); Valle del Magdalena, Fusagasuga, Triana s.n. (BM). SANTANDER: vic. Puerto Berrio, btwn Cacare and Magdalena Rivers, Haught 1855 (US). TOLIMA: La Plala (?), Lehmann 8474 (K); near Honda, Maxwell & Diaz 3 (COL, JEF, US). PANAMA: COLÓN: Santa Rita lumber road, ca 15 km E of Colón, R. L. Dressler 3797 (MO, Det. D. paniculata Killip ex Maxwell, 19 June, 1978, new record for Panama; specimen and label loose in newsprint).

We observed the species in Colombia as a high climbing liana beside rivers and streams. As the ends of the stems hang down from the canopy there seems to be apical meristem suppression. Lateral branches then grow until they are suppressed, and a zig-zag pattern results.

Collectors report flowering in December and Jan-

uary, April, May, and July at altitudes from 90 to 1700 m. The species is probably very common in the central lowland area, but also extends far up into the foothills and mountains in shady ravines and deep, wooded canyons.

Killip notes on his manuscript, "This appears to have much smaller flowers than in any other species of Dioclea, and the paniculiform inflorescence, well represented by the Mutis specimen, is unique in the genus so far as I know." The epithet caused him some concern as inflorescence branching is not consistent among the specimens he examined. Inflorescence branching is not as common in section Platylobium as in section Pachylobium. There are species and forms of species, such as D. macrocarpa, D. huberi and D. bicolor, with flowers this small. I don't believe there are unique characters in the genus Dioclea not found in closely related genera.

Within the specimens cited the following variations occur: branching or solitary inflorescences, leaflets appearing dull above rather than shining, and with some pubescence rather than glabrous; standards with folded auricles to either side of the apex of the claw or none, oblique wrinkles resembling lamellae in the target area above the claw or a clear area of loose tissue; very membraneous staminal sheaths without a distinct staminal collar, the vexillary filament fused weakly towards the middle of the sheath; the disc collar around the ovary stipe varying from indistinct to fleshy distinct to very hard, smooth, and tooth-like; and ovarian hairs which are all white.

Table 1 lists the characters which place Dioclea paniculata into the tribe Phaseoleae according to Bentham's (1865) conspectus and Hutchinson's (1964) interpretation of that conspectus. Table 2 lists characters of Lackey's (1977) diagnoses found in D. paniculata placing it in subtribe Diocleinae. According to Hutchinson's (1964) keys, it falls into the tribe Dioclea and into the genus Dioclea.

Lackey (1977) has added the genus Galactia to his subtribe Diocleinae. Macbride (1943) placed the genus Cratylia (pro parte) into Dioclea. Notes on Killip's manuscript indicate he considered a possible relation to Cratylia. The species is described in Dioclea primarily on the basis of seed characters, but also because the unpublished name, here validated, has been known for about 40 years. In Table 3, I compare D. paniculata with the genera

Table 1

Characters of Dioclea paniculata similar to Bentham's (1865) tribe Phaseoleae.

Climbing
Leaves pinnately 3-foliolate, stipellate, stipulate
Leaflets with entire margins
Flowers in axillary racemes, fasciculate from tubercles
Bracteate
Stamens with the vexillary more or less separate (pseudomonadelphous 9 + 1)

Table 2

Characters of Dioclea paniculata similar to Lackey's (1977) subtribe Diocleinae.

Leaflets 3, not gland-dotted
Inflorescences prominently nodose
Bracteoles present
Standard unappendaged
Stigma terminal, capitate
Style not bearded
Seeds smooth, without aril
New World

Cratylia and Galactia.

Dioclea paniculata is easily excluded from section Pachylobium since species of that section have alternate dimorphic anthers, fruits and seeds which are large and thick, and linear hila 1/2 to 4/5 encircling. In examining the other sections, I placed greatest weight on the seed characters.

Seeds in section Dioclea have a linear hilum nearly 1/2 the circumference of the seed, are somewhat oblong and hard, and are in the range of 7-15 x 4-7 x 2-5 mm. Seeds in section Platylobium have an oblong hilum, much less than 1/2 encircling, are somewhat orbicular, and may be soft (drying with a wrinkling of the testa), and are in the range of 14-25 x 12-23 x 2-5 mm.

Amshoff (1939a) named a new section of Dioclea,

Table 3

A summary of the diagnostic characters of Dioclea paniculata compared to the genera Cratylia and Galactia (sensu lato).

	D. paniculata	Cratylia	Galactia
Stipules non-produced	+	+	+
Upper calyx lobes connate, entire	±	±	+
Calyx lobes about equaling or shorter than the tube length	+	±	-
Petals glabrous	+	-	±
Keel petals erostrate	+	+	+
Ovary short-stipitate or sessile	+	-	+
Ovules about 5 (or less)	+	-	-
Style exerted	+	-(?)	+
Vexillary stamen fused	+	+	+
Legumes elliptic mostly	+	-	-
Seeds about 5 (or less)	+	-	-
Seeds in a 13 x 10 x 3 ratio	+	+	-
Hilum non-linear	+	+	+

In Table 3 a "+" indicates the character present; a "-" indicates the character lacking; a "±" indicates the character variable. Note Fig. 2 for similarity in seeds between D. paniculata and C. hypargyrea.

section Macrocarpon. She removed D. macrocarpa Huber and D. huberi Ducke from section Eudioclea (= section Dioclea), where Ducke (1922) had placed them, to her new section based on the following: stipules small,

not produced; keels subrostrate; anthers all fertile; legumes oblong, large, dehiscent, valves woody-coriaceous, convex; seeds few, large, slightly compressed, hilum short (fide Amshoff).

Amshoff (1939b) separated Bentham's section Platylobium from section Macrocarpon on the basis of anthers, section Platylobium having 5 fertile and 5 sterile alternating. The characters which separate these two sections may be tenuous. I have found collections with anther dimorphism somewhere between the 5 fertile-5 sterile condition. The second diagnostic character of 2 or 3 seeds, in the broad upper part of the pod for section Platylobium and evenly distributed in section Macrocarpon, is not always reliable. I've collected 4 and 5-seeded pods of D. bicolor Benth. (section Platylobium) in its southern range in Goias, Brazil, and the seeds in these pods were frequently evenly distributed.

Since Amshoff's work a number of new taxa have come to light. Although they are difficult to place (in some flowers or fruits are lacking), they now would seem to rest most comfortably in section Platylobium.

Since my classification of Dioclea rests primarily on fruits, I was reluctant to place D. paniculata until mature fruits were available for study. I was able to collect fruits in Colombia in 1968 after participating in one of Dr. H. S. Irwin's (NY) expeditions in the Brazilian Planalto. I gratefully acknowledge the assistance of Dr. Alvaro Fernandez-Perez in Bogota (COL) who introduced me to Santiago Diaz, a graduate sutdent at the Universidad Nacional. Sr. Diaz and I collected fruits of D. paniculata during a collecting trip of several days. I also acknowledge the continuing valuable advice of Dr. V. E. Rudd, expecially for the verification of E. P. Killip's handwriting.

Figure 1. Dioclea paniculata, Killip, Dugand, Jaramillo 38329 (US, holotype). A, calyx, outside outline--note other collections show an emarginate upper lobe; B, standard; C, wing; D, keel; E, flower aspect and bracteole; F, androecium; G, gynoecium.

Figure 2. A, habit, fruits D. paniculata, Maxwell & Diaz 3 (JEF); B, seeds, side and top views, D. paniculata, Maxwell & Diaz 3 (JEF); C, habit, fruits of Cratylia hypargyrea, Dusen 1975 (S); D, seeds, side

and top view, C. hypargyrea, Dusen 1975 (S).

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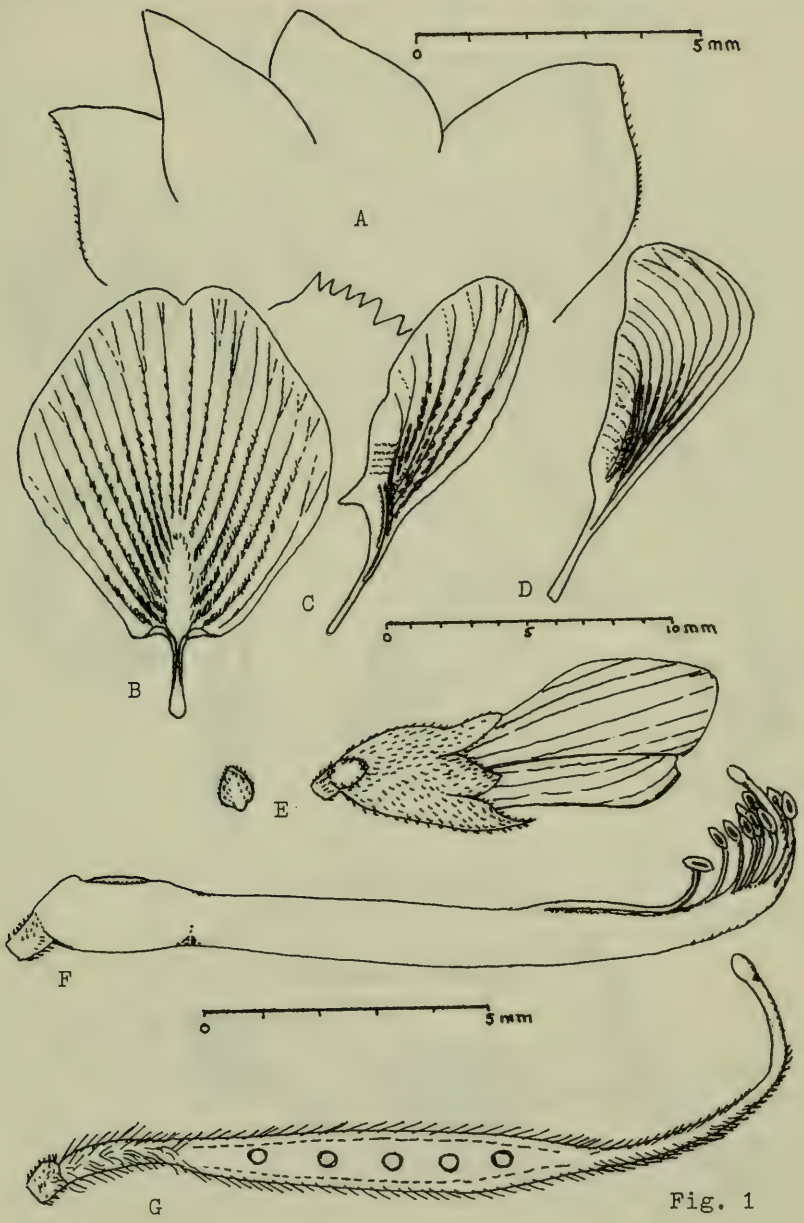

Fig. 1

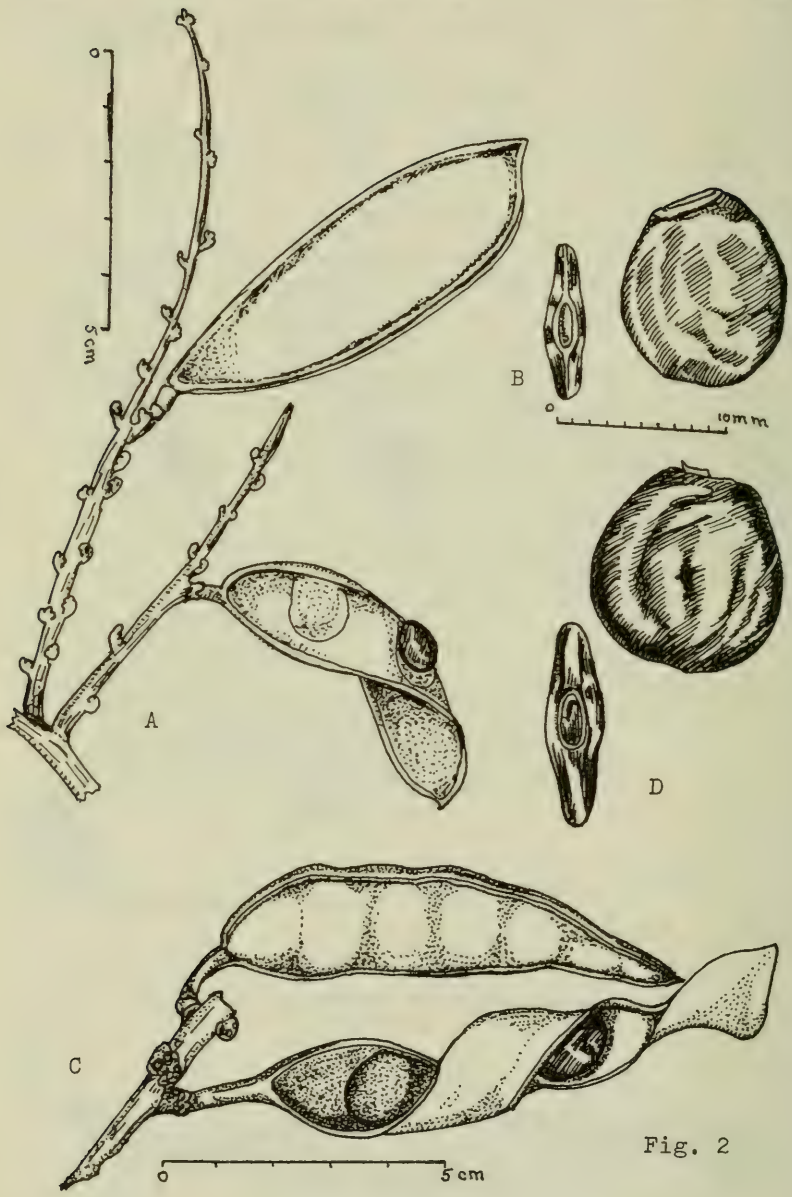

Fig. 2

EOLEUCODON, A NEW MOSS GENUS FROM POLYNESIA

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During preparation of the key to genera of Polynesian mosses for the Prodromus Florae Muscorum Polynesiae (Miller, Whittier and Whittier, 1978), the description of *Leucodon pacificus* Bescherelle caught our attention because a single long costa is anomalous in *Leucodon* as the genus is circumscribed today. Subsequently, while we worked in the British Museum (Natural History), it was possible to search out the type material for examination and comparison with potentially allied taxa. We found two specimens of *Leucodon pacificus*, one each from the Schimper and Bescherelle herbaria. The total agreement of developmental stages, size and condition indicated that the two specimens are part of a single gathering. The sole indication "Taïti" on the Schimper specimen can only be taken to mean that the specimen was transmitted from there--a common kind of annotation among herbaria of the period. Bescherelle's collection data are much more complete and fit the original citation from the description (1895): "Iles Marquises: Nukuhiva, sur les ecorces d'arbres dan la baie Taiohae,leg. Jardin." Although no date is given on the specimen (only a cryptic "18/3 -18/4"), Edélestan Jardin, a marine inspector, collected in French Polynesia during 1852-1855.

Bescherelle's original description summarizes accurately the salient features of the species. Further he observed that the plants approached "*Leucodon domingensis*," now known to be a synonym of *Pseudocryphaea flagellifera* from tropical America. The two taxa agree in having a somewhat dendroid habit, quadrate cells in the alar region and an elongate costa. They differ, however, in habit, areolation and costa structure. The structure of the base of the costa suggests the mid-basal areolation of some *Leucodon* species may represent the condition which prevailed in the costate ancestors of that genus. The combination of the primitive morphology and the discovery of the genus in the remote and long-isolated Marquesas Islands suggests ties with ancient Gondwana floras. We propose that this unique genus of mosses be designated "dawn *Leucodon*."

EOLEUCODON, genus novum

Plantae frondosae ramulosis pinnatis interdum attenuatis. Folia ovata, integerrima autem ad apicem denticulata, siccitate dense julaceo-imbricata madore erecto-patentia, ramulina inferiora caulinis simila superiora valde minora, margine e basi rotundata subauriculata ad medium revoluta, costa valida infra apicem erosum evanida levi, cellulis rhombiformibus ad costam oblique dispositis ad margines pluries seriatis quadratis. Perichaetia in ramo primario obsita, cylindrica, circa 5 mm longa foliis angustis intimis longe lanceolatis convolutus obsolete semicostatis integris vel tantum apice dentato

erosis, externis rotundato-squamosis et ovatis plus minus subito acuminatis ecostatis. Seta elongata, torta; capsula ignota. Species typicum: *Eoleucodon pacificus* (Bescherelle) comb. nov.

Basionym: *Leucodon pacificus* Bescherelle. 1895. Ann. Sci. Nat. Bot. Ser. 7, 20: 33.

Plants corticolous; leafy stems becoming frondiform from a soon-leafless and closely adnate rhizome, frondiform branches several per rhizome and occasionally producing secondary fronds from the older region of a frond axis; branching of the frond closely once pinnate with many longer branches becoming attenuated to nearly flagelliform. Primary leafy stem oval in cross-section with 3-5 layers of dark red-brown, incrassate, cortical cells surrounding a firmly parenchymatous, pellucid medulla with a weak central strand of 7-12 minute cells. Leaves concave, broadly ovate, with a single tapered, nearly percurrent midvein rising from a 3-5 rayed basal costal plate; margin revolute to midleaf or beyond, entire below and erose-dentate above; leaf tip acuminate or sometimes blunted by failure of the distal cell to form fully. Branch leaves smaller and proportionally narrower, especially so in the attenuated branch tips. Leaf cells smooth, irregularly rhomboid, somewhat collenchymatous, becoming quadrate and faintly collenchymatous at the base and extending obliquely up the margins. Perichaetia borne on the dorsal side of the primary leafy axis; inner perichaetial leaves more than twice the length of the vegetative leaves, forming a sheath around the seta, outer perichaetial leaves in several series, longer and more attenuated towards the middle of the perichaetium. Seta exceeding the tips of the perichaetial leaves by 1-3 mm or more, brownish, somewhat twisted, erect. Capsules not seen. (Figure 1)

Because of Bescherelle's comparison with *Pseudocryphaea*, we reviewed that genus in detail. Although we finally concluded that our Pacific species was not congeneric, we had assembled a widely scattered literature and examined many critical specimens. We found that the generic name has a somewhat confused history in that the name was proposed for *Pilotrichum flagelliferum* Bridel by Elizabeth Gertrude Britton in 1905, but in her discussion and characterization, she did not distinguish generic and specific characters, and so the genus was not validly established at that time (Art. 41, International Code of Botanical Nomenclature, 1972). The first properly designated generic diagnosis was published by Brotherus (1925) under "*Pseudocryphaea* Eliz. Britt. in Bull. Torr. Bot. Club 1905, p. 261."

Figure 1. *Eoleucodon pacificus*. A. Habit; B. Perichaetium; C. Attenuated branch; D. Perichaetium; E. Primary branch leaf; F. Secondary branch leaf; G, H. Attenuated branch leaves; I, J. Leaf tips; K. Median leaf cells and margin; L. Basal angle of leaf; M. Costal plate from secondary branch leaf; N. Cross-section of costal plate near base of primary branch leaf; O. Cross-section of primary branch. Scales: 10 mm - A; 5 mm - B, C; 1.0 mm - D, E, F, G, H; 0.10 mm - I, J, K, L, M, N, O. Drawn from the type.

Brotherus is cited in the Index Muscorum.

The species has carried several names, some published and some apparently found only in herbaria:

Pseudocryphaea flagellifera (Brid.) E. G. Britton. Bull. Torrey Bot. Club 32: 261. 1905.

Pilotrichum flagelliferum Brid. Bryo. Univ. 2: 259. 1827. Type: leg. Bertero s.n., Cuba (hb NY, isotype hb BM!)
Neckera domingensis C. Muell. Syn. Musc. 2: 95. 1850. Type: leg. Bertero ex hb Sprengel. (isotype hb BM!)
Leucodon domingensis (C. Muell.) Mitt. J. Linn. Soc. 12: 409. 1869.
Cryphaea? leptoclada Sull. Proc. Amer. Acad. 5: 283. 1861. Type: leg. Wright no. 68, on bushes in ravines, Cuba. (hb FH, isotypes BM!, G!)
Leucodon flagellare in hb (hb G!)
Pterigynandrum domingense in hb (hb G!)

Illustrations: Breen (1963) Plate 110, figs. 1-6; Brotherus (1925) fig. 502 A-E, p. 94; Florschutz (1964) fig. 97 a-d. p. 245.

Distribution: Peninsular Florida, Cuba, Hispanola, Puerto Rico, Antilles, Trinidad, Guadeloupe, Jamaica(?), Venezuela, Brazil, British Guiana, Surinam, Panama, Mexico, Costa Rica, Guatemala, Bolivia, Peru.

Among the synonyms listed by Britton (1905) was "?*Hypnum nudicaule*" Schwaegr. Spec. Musc. Suppl. 1(2): 223. 1816, and "*Pterigynandrum nudicaule*" (Schwaegr.) Brid. Bryol. Univ. 2: 182. 1827. This taxon is based upon a specimen leg. Thouin s.n., Domingo (hb G!) as noted by Florschutz (1964). The type collection of *Hypnum nudicaule* is well preserved and is of a robust, shiny plant with small lateral sporophytes on a branch, so it is clearly not *Pseudocryphaea*. The type was annotated "*Pilotrichella* cf. *flexilis* (Hedw.) Jaeg. (Type de *Hypnum nudicaule* Schwaegr.). P.A. Florschutz, XI-1954," a judgment which seems correct.

Acknowledgments

The kind assistance of Dr. A. Eddy and Dr. A. Harrington of the British Museum (Natural History) and of Prof. J. Miege and Dr. A. Stork of the Conservatoire et Jardin Botaniques, Geneva, made this study possible in several ways during our visits.

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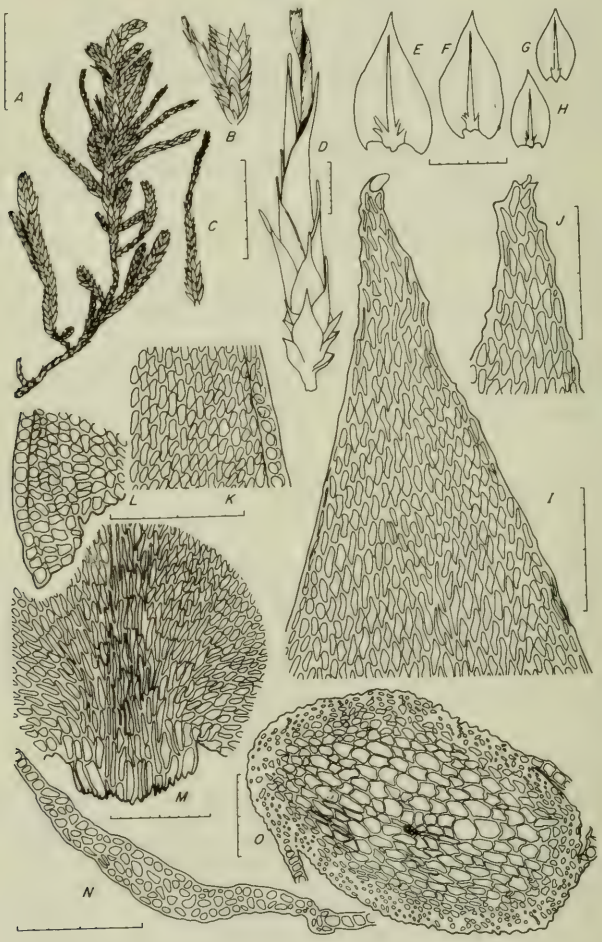

LESKEODON PONAPENSIS, A NEW MOSS FROM MICRONESIA

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Among the collections from the Miami University--Schooner *Collegiate Rebel* Expedition in 1960, we found a small *Distichophyllum*-like plant mixed among other bryophytes collected from tree bark in the rainforest of Ponape Island in the eastern Carolines. I have recently had the opportunity to compare the Ponape plant with material, usually type or isotype, and descriptions of each species reported from the tropical and western Pacific. These comparisons made at the British Museum (Natural History) indicate that this is an undescribed taxon which differs from *Leskeodon acuminatus* (Bosch et Lac.) Fleisch. in smaller size, shorter costa, larger cells and a weak border.

Leskeodon ponapensis, sp. nov.

Plantae gregariae ad arbores, nitidae, aureae usque ad 1 cm altas. *L. acuminatus* (Bosch et Lac.) Fleisch. persimilis, sed foliis minor, nervo foliis usque ad medium aut minor, margine infirmo, et cellulis laminae major rhombeis.

Type: Ponape: Mt. Kubursoh, 1000-1500 ft. alt, 17 June 1960, H. A. Miller 6429 (BM). Paratypes: Mt. Kubursoh, 1000-1500 ft alt, H.A. Miller 6448; Nanpili District, below Mt. Namulek, 500-700 ft alt, 20 June 1960, H. A. Miller 6710 and 6788 (G, MU).

Plants loosely gregarious and in rich admixture with other mosses and foliose hepatics on the trunks of trees in lowland rainforest. Individual plants are up to 1 cm tall, shiny, golden (when dry), and somewhat complanate on the red-brown, unbranched stem. Leaves crisped when dry, carinate below and at the tip when wet, obovate to spathulate; dorsal leaves ca 1.4 x 0.65 mm, lateral leaves ca 1.6 x 0.85 mm, costa ca 0.5 (0.35-0.75) mm long; margin entire, border weakly defined, 1-2 cells wide; upper leaf cells rhomboid, ca 130 x 20 µm, marginal cells 180 x 10 µm; leaf base 0.30-0.35 mm wide and often decurrent on the stem by 1-2 yellow-brown, pigmented cells; leaf apex rather abruptly cuspidate-acuminate, channeled and sometimes twisted. All specimens found were sterile.

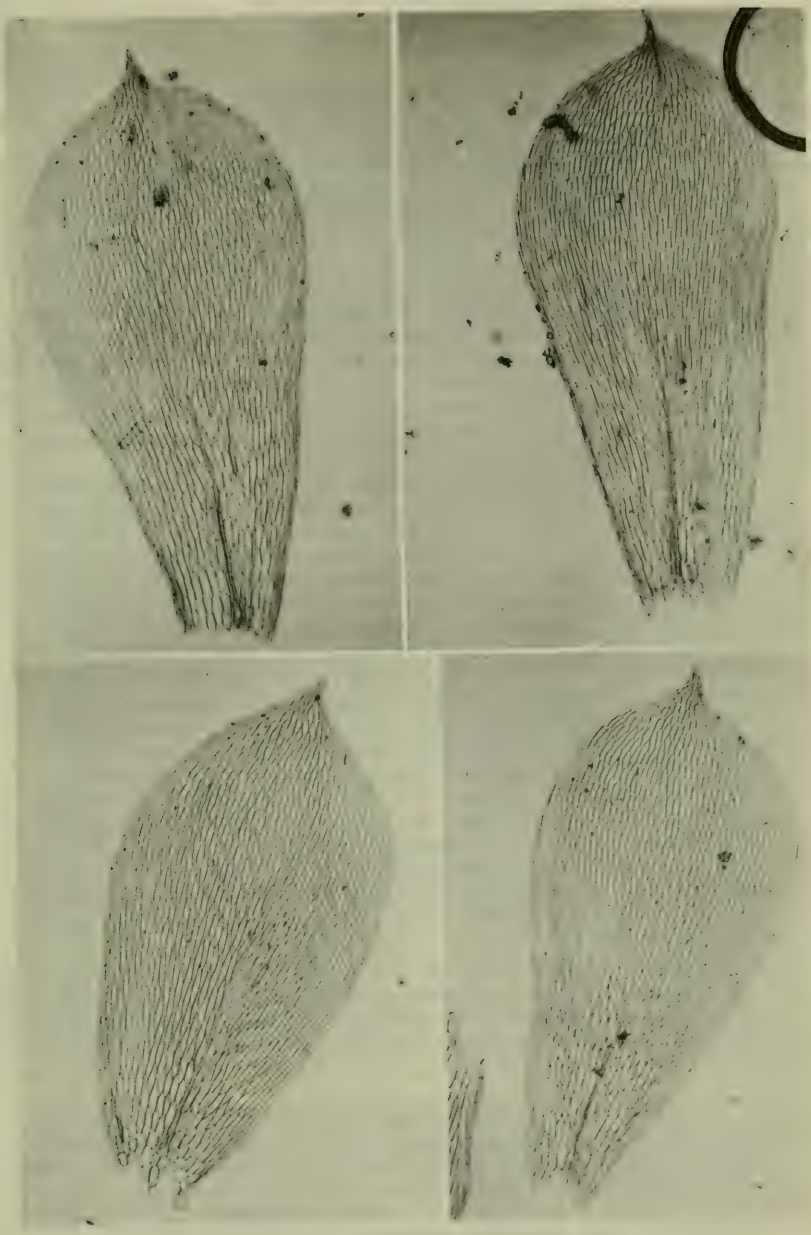
The genus *Leskeodon* is comprised of 22 species in the tropical Americas, the tropical western Pacific and southeast Asia. Only *L. acuminatus*, *L. pandurifolius*, *L. philippinensis*, *L. robbinsii*, and *L. rotundifolius* occur in the western Pacific--southeast Asian region. Of these, only *L. acuminatus* is known to have reached a remote island (New Caledonia) and so the discovery of *L. ponapensis* on tiny (only 15 km across) Ponape is somewhat unexpected.

This single record of a genus for an isolated island points up sharply a role for islands, especially those with orographic rainfall, as refugia for bryophytes through geologic time. Of course, few diaspores of a diverse flora on a large land mass will become established on an island. Thus, insular floras are strongly filtered and are usually populated by somewhat diverse taxa at the generic and family levels, and all taxa from the source land masses are not represented. When continental droughts occurred during ancient climatic changes, it is most probable that islands like Ponape or dynamic island archipelagos like Hawaii provided critical refugia during prolonged periods of inhospitable continental climates. With amelioration of continental climates, the genetic stock preserved on islands may have served to repopulate larger land masses. Since the origin of major bryophytic lines in the Devonian this process must have occurred several times through time.

Alternating geographically and geologically isolated floras as sketched above can explain the great systematic and geographic disjunctions observed today among bryophytes. Studies of insular bryofloras are yielding data from which to develop new understandings of biosystematics and evolution. The case of *Leskeodon ponapensis* seems so well marked that attention is drawn to it as an indicator of one means by which wide systematic diversity may have been achieved between some of the phylogenetically isolated extant groups within the bryophytes.

Field work was sponsored by the National Science Foundation Grant G-7115 to Miami University, Oxford, Ohio, and the Collegiate Rebel Foundation, Bartow, Florida.

Figure 1. *Leskeodon ponapensis*. Leaves, ca x 50.



NOTES ON NEW AND NOTEWORTHY PLANTS. CXV

Harold N. Moldenke

CLERODENDRUM PHILIPPINUM f. PLENIFLORUM (Schau.) Moldenke, comb. nov.

Clerodendron fragrans β pleniflora Schau. in A. DC., Prodr. 11: 666. 1847.

DURANTA BOEKEI Moldenke, sp. nov.

Frutex; ramulis pallide giseis tetragonis glabris, nodis brevissime aculeatis, aculeis ternatis gracillimis; foliis ternatis, laminis coriaceis atroviridibus ellipticis apicaliter rotundis vel obtusis, marginaliter argute parciserratis, basaliter acuminatis, supra glaberrimis nitidissimis, subtus glabratis vel obscure pulverulentis; inflorescentibus axillaribus racemosis ternatis adscendentibus 5—20 cm. longis multifloris.

Shrub, to about 2 m. tall; branchlets rather slender, very light-gray, corky, plainly tetragonal (with rounded edges), glabrous; nodes with 3 very small thorns about 2 mm. long; leaves ternate; petioles 2—10 mm. long, margined; leaf-blades coriaceous, very dark-green on both surfaces, very shiny above, obtuse or rounded apically, marginally with a few divergent triangular teeth, basally acuminate into the petiole, glabrous on both surfaces or obscurely pulverulent beneath, the venation deeply impressed above; inflorescence axillary, racemose, the racemes elongate, 5—20 cm. long, erect-ascending even in fruit, many-flowered, the rachis light-gray, plainly ridged longitudinally, subglabrate; bractlets inconspicuous, about 2 mm. long; calyx tubular, about 7 mm. long and 3 mm. wide, minutely puberulent externally, plainly 4-veined, the rim 4-apiculate; corolla hypocrateriform, violet, the tube about 1 cm. long, densely puberulent externally, the limb spreading, almost 1 cm. wide, the 2 lower lobes each with a dark-purple stripe; fruiting-calyx accrescent, incrassate, splitting wide open into 2—4 segments when the fruit is mature; fruit drupaceous, spherical, 1—1.5 cm. long and wide, yellow when mature.

The type of this species was collected by Jef D. Boeke (no. 644) — in whose honor it is named — along a roadside on the road from Cuenca to Angas, at 2820 meters altitude, Azuay, Ecuador, on December 28, 1976, and is deposited in the Britton Herbarium at the New York Botanical Garden.

LANTANA HORRIDA f. MICROPHYLLA Moldenke, f. nov.

Haec forma a forma typica speciei foliis parvissimis recedit.

This form differs from the typical form of the species in having its leaves during the fruiting stage very uniformly much smaller, only 1—2 cm. long and 1—1.5 cm. wide.

The type of the form was collected by Andrew R. Moldenke (no.

1495) 89 miles west of El Salto, Durango, Mexico, on June 6, 1967, and is deposited in the Herbarium Jutlandicum at the University of Aarhus.

PAEPALANTHUS BRACHYPUS f. BREVIPILOSUS Moldenke, f. nov.

Haec forma a forma typica speciei pilis cauli foliisque multo brevioribus sparsioribusque recedit.

This form differs from the typical form of the species in having the hairs on its stems, leaves, sheaths, and peduncles much shorter and much more sparse, irregularly disposed, often verging on mere puberulence.

The type of the form was collected by Gert Hatschbach (no. 40922) in wet sandy soil among rocky cliffs between Soupa and São João da Chapada, municipality of Diamantina, Minas Gerais, Brazil, on January 25, 1978, and is deposited in my personal herbarium. One of the plants on the holotype sheet has its inflorescence heads only in the bud stage, so it does not seem likely that the pubescence has worn off of the plant due to age.

VERBENA FILICAULIS var. AUSTRALIS (Moldenke) Moldenke, stat. nov.

Verbena australis Moldenke, Phytologia 2: 419—420. 1948.

VERBENA FILICAULIS var. PINNATISECTA (Schau.) Moldenke, stat. nov.

Verbena pinnatisecta Schau. in A. DC., Prodr. 11: 549. 1847.

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ADDITIONAL NOTES ON THE GENUS ACANTHOLIPPIA. V

Harold N. Moldenke

ACANTHOLIPPIA Griseb.

Additional & emended bibliography: Rojas Acosta, Cat. Hist. Nat. Corrient. 205. 1897; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 1, 714. 1969; Rouleau, Gruide Ind. Kew. 3. 1970; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 2, 714. 1974; Rogerson & Becker, Bull. Torrey Bot. Club 101: 383 (1974) and 102: 421. 1975; Goebel, Act. Bot. Venez. 10: 388 & 389, pl. 3, fig. 1—5. 1975; Hocking, Excerpt. Bot. A.26: 5. 1975; Moldenke, Phytologia 31: 298—300. 1975; Folmann-Schrag, Excerpt. Bot. A.26: 502. 1976; Hocking, Excerpt. Bot. A.28: 257. 1976; Moldenke, Phytologia 38: 251, 253, 259—261, 263, & 503. 1978.

ACANTHOLIPPIA DESERTICOLA (R. A. Phil.) Moldenke

Additional bibliography: Goebel, Act. Bot. Venez. 10: 388 & 389, pl. 3, fig. 5. 1975; Moldenke, Phytologia 31: 298. 1975; Hocking, Excerpt. Bot. A.26: 5 (1975) and A.28: 257. 1976; Moldenke, Phytologia 38: 260, 261, & 263. 1978.

Additional illustrations: Goebel, Act. Bot. Venez. 10: pl. 3,

fig. 5. 1975.

Werdermann found Acantholippia deserticola in flower in February. The Werdermann 184, however, also distributed as this species, actually is Aloysia reichii Moldenke.

Additional citations: CHILE: Antofagasta: Werdermann 1024 (Mu). Tarapacá: Zöllner 7798 (Ld). Province undetermined: Troll 3245 [Ocsaya] (Mu).

ACANTHOLIPPIA HASTULATA Griseb.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 5. 1975; Moldenke, Phytologia 31: 298—299. 1975.

Recent collectors have encountered this plant at 2650—3640 meters altitude.

Additional citations: ARGENTINA: Jujuy: Cabrera, Ancibor, Ré, Yello, & Torres 15283 (Mu); Cabrera & Fabris 13252 (Mu); Ellenberg 4249 (Ac), 4327 (Z).

ACANTHOLIPPIA RIOJANA (Hieron.) Hieron. & Moldenke

Additional bibliography: Goebel, Act. Bot. Venez. 10: 388 & 390, pl. 3, fig. 1—4. 1975; Moldenke, Phytologia 31: 299. 1975.

Additional illustrations: Goebel, Act. Bot. Venez. 10: pl. 3, fig. 1--4. 1975.

ACANTHOLIPPIA SERIPHIOIDES (A. Gray) Moldenke

Additional synonymy: Lippia foliodora Phil. ex Rojas Acosta, Cat. Hist. Nat. Corrient. 205. 1897.

Additional & emended bibliography: Rojas Acosta, Cat. Hist. Nat. Corrient. 205. 1897; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 1, 714 (1969) and imp. 2, 714. 1974; Moldenke, Phytologia 31: 299 (1975) and 38: 259 & 263. 1978.

Recent collectors have encountered this plant on moving dunes and abundant on "campo moreno muy seco". The corollas are described as having been "white" on Schajovskoy 53

Material of this species has been misidentified and distributed in some herbaria as Lippia sp. and as Verbena ligustrina Lag.

Additional citations: ARGENTINA: Buenos Aires: Cabrera & Fabris 14813 (Mu), 16452 (Mu); Fabris & Schwabe 4920 (Mu, Mu). Mendoza: Cuezzo & Balegno 1992 (Au—120680); Reales 2043 (Au—123267). Neuquén: Ammann 108 (Mu); Schajovskoy 53 (Mu). Río Negro: Schajovskoy 25/VII (Mu); Timmerman B.T.99 (Ld). Santa Cruz: Dusén s.n. [10.12. 1904] (Mu--4243); Roivainen 2294 (Mu).

ACANTHOLIPPIA TRIFIDA (C. Gay) Moldenke

Additional bibliography: Moldenke, Phytologia 31: 299—300. 1975; Hocking, Excerpt. Bot. A.28: 257. 1976.

ADDITIONAL NOTES ON THE GENUS PITRAEA. IV

Harold N. Moldenke

PITRAEA Turcz.

Additional & emended bibliography: Schau. in A. DC., Prodr. 11: 533, 556, & 557. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 367, 495, & 496. 1858; Darlington & Wylie, Chrom. Atlas., ed. 2, 324. 1956; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 1, 714 (1969) and imp. 2, 714. 1974; Moldenke, Phytologia 32: 227—232 (1975), 32: 507, 508, & 511 (1976), and 34: 272, 500, & 508. 1976; Hocking, Excerpt. Bot. A.28: 258. 1976; Rogerson & Becker, Bull. Torrey Bot. Club 103: 145. 1976; Soukup, Biota 11: 3, 8, & 21. 1976; Moldenke, Phytologia 36: 45 & 509. 1977.

Darlington & Wylie (1956) report the chromosome number for this genus as x = 11.

PITRAEA CUNEATO-OVATA (Cav.) Caro

Additional synonymy: Pitraea cuncato-ovata (Cav.) Caso ex Soukup, Biota 11: 8, sphalm. 1976. Castelia cuneato-ovata Rusby ex Moldenke, Phytologia 34: 272, in syn. 1976.

The corollas are said to have been "rose"-color when fresh on Varela 27.

Darlington & Wylie (1956) report the chromosome number for this species as 44 (quoting Covas & Schnack, 1946), while Bolkhovskikh and his associates (1969), quoting the same workers, report the number as 24.

The Figuerea, Legname, Schiavone, & Cuezzo 11648c, distributed as Pitraea cuneato-ovata, actually is Bouchea fluminensis (Vell.) Moldenke.

Additional citations: ARGENTINA: Catamarca: Varela 27 (Ut—269797B); Villafañe 1276 (Ld). Jujuy: Cabrera 13236 (Mu); Cabrera, Ancibor, Ré, Tello, & Torres 14980 (Mu). Mendoza: Negrete s.n. (Mu).

BOOK REVIEWS

George M. Hocking
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"A MONOGRAPH OF THE MEXICAN AND CENTRAL AMERICAN SPECIES OF TRIXIS (COMPOSITAE) by Christiane Anderson, Memoirs New York Botanical Garden, 22, No. 3:1-68; 1972.

The 18 spp. and five vars. (not including the typical vars.) recognized in this monograph include no novelties. The gen. is conceived to consist of a relatively homogeneous group of taxa mostly endemic to southern Mexico. The chief emphasis has been placed on the morphology and anatomy of the plants. An artificial diagnostic key to the spp. and vars. of this group is provided. Many collecting data are given. There are indexes of many scientific synonyms and of numbered collections (alphabetically by collector's name). Because of the lack of material at various herbaria, extensive collections were made in the areas of growth. It is still too early to decide whether Cleanthes D. Don is separate from Trixis or not; a decision cannot be made until all pertinent taxa have been reviewed. A detailed study of Trixis taxa of South American is needed before intrageneric relationships can be fully understood.

GMH

"BIOGRAPHICAL DICTIONARY OF THE BOTANISTS REPRESENTED IN THE HUNT INSTITUTE PORTRAIT COLLECTION" (Anonymous) 432 pp.; G.K. Hall & Co., 70 Lincoln St., Boston, Mass. 02111, 1973, $33.00.

The identity of botanists, horticulturists, and plantsmen represented in the portrait collection is shown together with brief biographical material.

GMH

"PERFUME AND FLAVOR CHEMICALS (AROMA CHEMICALS)" by Steffen Arctander, 2 vols, published by the author, Box 223-B, Olyphant, Penna. 18447, 1961, 1972, $66.00.

Vol. 1 appeared in 1961 (xiii + 736 pp.) and was devoted to natural products; vol. 2 deals with synthetics. Excellent information with an authentic ring!

GMH

"A STUDY OF BIRD SONG" by Edward A. Armstrong, Ed. 2., xvi + 343 pp., 25 photos, 45 other figs., 14 tabs., Dover Publications, Inc., 180 Varick St., New York 10014, 1973 (1963).

This interesting volume, originally published in 1963 and here revised by the author, contains much technical information on the singing of birds, a field in which modern technical inventions have contributed very materially. The revisions have been made in the form of two addenda, covering 19 pages. There are many references and four indexes: (1) bird names, both common and scientific; (2) names of other animals (subdivided into vertebrates and invertebrates), (3) authorities; and (4) a general index, covering everything not covered in the earlier indexes. This is a reference book which will repay anyone in its reading, since it gives one a realistic insight into the Wonderful World of Birds.

GMH

"THE NATURALISTS' DIRECTORY (INTERNATIONAL)" edited by Willard H. Baetzner, 42nd edition, 259 pp., PCL Publications Inc., PO Box 583, South Orange, NJ 07079. 1975. $7.95.

This useful directory was established in 1878, so that the average period separating editions would seem to be about two years, occasionally three years. As in previous editions, it is replete with the names and addresses of professional and amateur naturalists, museums, and publications in the United States (most emphasis) and also in the rest of the world. In the last quarter of the volume there is a useful directory of disciplines and specialities whereby one may determine the names and addresses of others interested in a particular area. This is followed by an index of individuals named throughout the volume. These indexes are published for the first time in this edition and will make the book of much greater utility without question. The listing is currently viable since the editor states that he has included only those who responded to a questionnaire. Sixty countries are represented. This is indeed a very welcome guide to the biological sciences.

GMH

"FLORIDA WILD FLOWERS: AN INTRODUCTION TO THE FLORIDA FLORA" by (Mrs.) Mary Francis Baker, Ed. 2, xv + 245 pp., 50 figs. Horticultural Books, Inc., PO Box 107, Stuart, Fla. 33494 1976 (1938), Price not stated.

This book originally published by Macmillan, has been reprinted so that once again it becomes available (in paper back format). (Original first edition: 1926). There is a general key, useful to beginners, and then come the detailed plant descriptions following the Engler order. The more important species are given chief emphasis and longer descriptions, the minor or rarer species follow in smaller type below. Botanical names are used but the authors are not indicated. However, the chief defect lies in the lack of updating of many botanical names so that a thorough revision of such is much needed. Some recent book reprints have issued tables showing the currently

valid name equated to the name used in the older text. Such should have been done in this case to render the book more current. However, the descriptions are generally good and the book should prove very useful to those interested in a casual way in plants. Examples of non-current names: Kuhnistera pinnata (p. 107) should be Petalostemon pinnatum; on the same page, Cracca has been replaced by Tephrosis as a generic name).

GMH

"THE SPECIES OF THE BEGONIACEAE" by Fred A. Barkley and Jack Golding, iv + 146 pp., 6 figs., Northeastern University, Boston, Mass. 1974. Gratis (?)

This contains an alphabetic listing of the species and varieties which have been published for family Begoniaceae, as far as determinable. The place of publication, date of issue of publication, geographic origin of the taxon, and the section of the genus to which it belongs are given whenever these data are available. An important feature is the inclusion of synonyms with of course the taxon to which these are now referred. About 2700 epithets are included in the listing. Besides Begonia, the two other genera of the family are included, viz., Hillebrandia and Symbegonia. This publication was prepared directly from a card file listing kept over a period of many years; it includes all of the entries in Index Kewensis (main work and 12 supplements). Many corrections have been made in the original edition (Barkley: Buxtonian 1, Suppl. 5: 1-120; 1972), together with several new spp. This listing includes only natural taxa and not cultivars (which are approximately the same in number as true species). In the Begoniaceae, varieties are much more commonly used than the subspecies categories. So without question, this is a useful listing.

GMH

"THE CHEMICAL FORMULARY" by H. Bennett (Editor-in-chief), volume 19, 418 pp., Chemical Publishing Co., Inc., 155 W 19th St., New York 10011, 1976, $15.00.

In this work, a number of experts have collaborated to furnish many formulas for preparations in wide usage in almost every field of human endeavor. As in previous volumes of the series, the first chapter with 34 pages is the same as in previous volumes, furnishing models and explanations for the use of the formulary. The format is also similar in having appended materials of service to the use of the work, with a listing of proprietary names indexed to the contents, and a list of manufacturers of the same. There are also reference lists of atomic weights, incompatible chemicals, and a brief digest of the Food and Drugs Act. However, the great value of the book lies in the main section of formulas, where a great deal of research is concentrated in development and testing programs carried out as prelude to publication. Some of the formulas are

for highly specialized applications such as the repellant for woodpeckers (p. 371) or the method of removal of skunk odor from pets who have had an unfortunate meeting with this odoriferous animal. There are bedpan and telephone disinfectants. An unusually large number of cosmetic formulas are given in this volume. This is no doubt a lucrative market, with little risk of saturation. This with previous volumes is an important resource of any lab or workshop engaged in the manufacture or repair of the various articles categorized. A practical suggestion by the reviewer pertains to the advisability of stating or defining the uses of some of the articles listed. Thus, the purposes and effects of a clay mask (p. 222) may well have been briefly stated. What is a "dye stripper"? The price of the volume has been increased from $11.00 to $15.00 - partially compensated for by the larger size of the book. However, in view of the greatly increasing cost of book publication and the intrinsic value of the work, it would seem that the price is not exorbitant.

GMH

"MANUAL OF FIELD BIOLOGY AND ECOLOGY" by A.H. Benton and W.E. Werner, Jr., vii 400 pp., Fifth edition, Burgess Publishing Co., Minneapolis, Minn. 55415, 1972.

In this practical spiral-bound manual, intended for field use, sections are devoted to field technics, taxonomy (plants and animals), terrestrial communities and succession, aquatic communities and succession, structure and function of ecosystems, population studies, behavior studies, projects for field study, and selected biological literature (use of the literature, references, audio-visual aids). There are numerous figures (unnumbered), tables, blank lesson forms (to be filled in) etc. Index. The price is only $6.75.

GMH

"NORTHEASTERN TREES IN WINTER" by A.F. Blakeslee and C.D. Jarvis, xxi + 264 pp., figs., Dover Publications, Inc., New York, NY 10014, 1972.

A facsimile of the text of Storrs (Connecticut) Agricultural Experiment Station Bulletin No. 69 (1911) published originally under the title "New England Trees in Winter." A table of nomenclatural changes has been added and the book is still a very useful one for the identification of trees in the resting condition.

GMH

"HOW TO FIND OUT IN PHARMACY" by Alice L. Brunn, sub-title: A Guide to Sources of Pharmaceutical Information, xi + 130 pp., 14 figs.; Pergamon Press, New York, Paris, etc., $2.95 paper.

In this "How to Find Out" series number, the author who has a degree in library science has clearly indicated the sources of literature in the field of pharmacy and its subdivisions (pharmacology, pharmacognosy, pharmaceutical chemistry, pharmaceutics, pharmaceutical administration, toxicology). In the first chapter, "Overview of the Field", she outlines the history of literature in pharmacy (from the early Chinese writings up to the present), the opportunities in pharmacy, and the educational requirements in the field. Chapter 2 deals with the serials in pharmacy (general field) and the indexing and abstracting organs available. The four following chapters take up each of the specialties and briefly surveys the literature which would be useful to the student. One weakness of the book is the consideration of literature in the English language only. The important foreign literature is used mostly by graduate students and faculty members, hence this little book is primarily of help to the undergraduate student. Appendix I lists the important library collections in pharmacy and medicine in the United States and Canada, while Appendix II does this for the British Isles (United Kingdom and Ireland). In the list of "current periodicals", an important journal was not listed, viz., the Journal of Pharmaceutical Sciences. Some titles listed are quite unimportant, such as The Mask (Kappa Psi Fraternity) and the Purdue Pharmacist. American Professional Pharmacist has changed its title to Pharmacy Times. Drug Topics and Drug Trade News should have been listed also. This small volume should be useful for class use in various pharmacy courses where the literature is consulted.

GMH

"THE WEALTH OF INDIA: A DICTIONARY OF INDIAN RAW MATERIALS AND INDUSTRIAL PRODUCTS" edited by Y.R. Chadha, Vol. X:Sp - W, LI + 591 pp. + XXV (total 667 pp.), 175 figs., 6 col. pls., Publications and Information Directorate, Council for Scientific and Industrial Research, New Delhi, India, 1976, $65.00.

This large volume with large page size (quarto) bears a wealth of information on the natural productions of India (plant, animal, mineral). It would seem that the word "dictionary" is misapplied here since we generally think of a dictionary as an alphabetic series of words with brief definitions. This work might better be called an (en)cyclopedia because of the elaborate treatment of each key word - going far beyond the mere definition. The text is replete with factual information and as a help to the interested person, a large number of references are included by which one is enabled to continue his study of the subject. A typical treatment for a plant species is as follows: Botanical name with author(s); references concerning the botany of the plant (includes illustrations); a description with information of the plant's distribution; vernacular names, the habitat and ecology of the plant; reproduction; culture; in the case of trees, the properties and nature of the wood; uses of all

kinds. Wherever literature exists on the topic, references are given. Also, importantly, nearly all of the plants are illustrated with a sketch or photograph. As in the previous volumes, plants are arranged not by common name - no matter how important - but by the botanical name. Thus, Tragacanth is discussed under Astragalus. The texts are well balanced, without excessive detail but at the same time adequately informative for the majority of inquiries. At the end of the volume is an index of common names (English, Indian languages, regional names, and trade names). A more complete index will be found in the next or eleventh volume of the work. It would appear that the object of "Wealth of India" is to acquaint the outside world of the great resources of India but also to inform Indians of the possible utilizations of their many species of plants and animals which are not as yet adequately known or made use of. The series belongs in every fair sized to large library.

GMH

"CHEROKEE WORDS WITH PICTURES" by Mary Ulmer Chiltoskey, 56 pp., many figs., The Herald Publishing Co., Sylva, NC, 1972.

This is primarily a dictionary of English-Cherokee, the latter being rendered in its own alphabet. There are three alphabetic sequences: words, phrases, and people (persons). Also included are essays on the Cherokee people, how this book and others came to be compiled; transliterations of poems, etc.; and a table of the Cherokee language. There is something like 900 words and phrases in the glossaries.

GMH

"PLANTS, FOOD AND PEOPLE" by Maarten J. Chrispeels and David Sadava, vii + 278 pp., 76 figs., 44 tabs., W.H. Freeman & Company, 660 Market St., San Francisco, CA 94104, $12.00 (cloth); $6.50 (paper).

The great problem of reducing the ravages of starvation in the world is brought out. Without great increases in food production, the number of people who annually starve to death or are in a pitiable malnourished state will increase as the population swells to greater and greater volume. Not only quantitatively but qualitatively food must meet standards for proper human growth and health. The authors show that only through plant production can these requirements be met. Meat from land animals is generally too inefficient a food source for humanity desperately in need of minimum amounts of food. Moreover, it is produced at the expense of large quantities of land plants. The flesh of aquatic (mostly marine) animals is however an important and growing resource for many areas, especially in maritime regions. Aquaculture (agriculture of the sea) and cultures of yeast and algae in factory scale operations will also bring their contributions to the collective dinner table. This story of the increasing role of plants in nutrition is most timely at this point in history.

GMH

"pH AND DISSOCIATION: A LEARNING PROGRAM FOR STUDENTS OF THE BIOLOGICAL AND MEDICAL SCIENCES" by Halvor N. Christensen, Second Edition, ix + 107 pp., W.B. Saunders Co., W. Washington Square, Philadelphia, PA, 1964, $2.25.

This follows the well known format of a learning program in which the student attempts to give the answer or solution to queries or problems, then turns to the answer which is adjacent to his own response. Prof. Christensen teaches biological chemistry at the University of Michigan.

GMH

"THE GOLDEN AGE OF HERBS AND HERBALISTS" By Rosetta E. Clarkson, xxii + 328 pp., 57 figs., Dover Publications, Inc., New York, 1972(1940), $3.00.

This is a republication of a book originally entitled "Green Enchantment: the Magic Spell of Gardens". Included is a new foreword (pp. vii, viii) by Gertrude B. Foster, editor of The Herb Grower Magazine. Otherwise the content is identical with the first edition.

GMH

"HERBS AND SAVORY SEEDS: CULINARIES, SIMPLES, SACHETS, DECORATIVES" by Rosetta E. Clarkson, xiv + 370 pp., 58 figs., 10 tabs., Dover Publications, Inc., 180 Varick St., New York 10014, 1972, $3.00.

In this reprinting of a text originally titled "Magic Gardens: A Modern Chornicle of Herbs and Savory Seeds" (1939, 1942), a new foreword (by Gertrude B. Foster) has been added. The authoress (1892-1950) presents much of the lore of medicinal and flavoring herbs told in interesting fashion.

GMH

"THE PROTEIN BOOK" by Don Cordy, X + 88 pp., 7 figs., 20 tabs., Naturegraph Publishers, Healdsburg, CA 95448, 1976, $2.95.

The author, a professional nutritionist, is a strong advocate of "raw foods" as opposed to those which have been denatured by various methods of heating. To this end, he has discussed many common food products, a few rather less common. The latter includes pumpkin seeds, soybeans, brewer's yeast, etc. Many foods have been given a double spread (two facing pages) and the information is documented. The various meats, milk products, eggs, and nuts are taken up. The book is quite informative but a few errors have crept in at places. Thus, yeast is referred to as a "higher plant", when it is of course one of the more primitive lower plants. In the story on sunflower seeds, the extensive use by the Russians is not mentioned. Surely, these people could tell us much about the advantages or otherwise of this product.

GMH

"INTERMOUNTAIN FLORA: VASCULAR PLANTS OF THE INTERMOUNTAIN WEST, U.S.A." by A. Cronquist, A.H. Holmgren, N.H. Holmgren, J.L. Reveal, Volume I, v 270 pp., 102 figs., (numbered) many line drawings (unnumbered), New York Botanical Garden and Hafner Publishing Co., Inc., New York, 1972. $17.50.

An Intermountain Flora was conceived many years ago by Dr. B. Maguire while a professor at Utah State University; it has now been carried through and will appear as a series of six volumes. In the first volume, there is published much general information on the area as a whole from various standpoints (pp. 1-175) along with a section (pp. 176-270) on the Pteridophyta and Gymnospermae. There is a separate index for each of these parts. The general and systematic order of appearance of the subsequent volumes will be 6 (monocots), 5, 4, 3, 2. The area covered by this flora includes all of Utah, most of Nevada, southeast Oregon, south Idaho, and small parts of Arizona, California, and Wyoming. This area is essentially the dryland region between the Sierra Nevada (on the west) and the Rocky Mountains (on the east) and lies between the moister country of the Pacific Northwest to the north and west and the warmer drylands to the south. In the area covered, the dominating groups are the sage brush (Artemisia tridentata Nutt. s.l.) and genera of Chenopodiaceae such as Atriplex). Following the introduction, (A.C.) there are chapters on the physiography of the region (W.D. Tidwell); evolution of floras (W.D. Tidwell, S.A. Rushforth, D. Simper); botanical explorations (J.L.R.); plant geography (N.H.); glossary (A.C.). Each chapter has a rather voluminous bibliography. The section on Pteridophytes (vascular cryptogams) was prepared by A.C. and that on the Gymonosperms by A.H. and N.H. The other five volumes will be written by the four authors named above as authors of Volume I. The systematic part of the text includes keys, descriptions of division, classes, orders, families, genera, spp., and of some infra-specific taxa. Synonyms, descriptions (including chromosome number), general geographic distribution data, vernacular names, and considerable other information are presented for each sp., with detailed drawings to match the descriptions. The flora is one that has been badly needed for the area and should serve importantly in the taxonomic study of plants here.

GMH

"WILD FLOWERS OF ALABAMA AND ADJOINING STATES" by (Mrs.) Blanche E. Dean (deceased; c. 1973), Amy Mason, and Joab L. Thomas, xxii + 230 pp., 9 figs., 1 map, 400 pls., University of Alabama Press, University, AL, 1973, $10.00.

Most of the approximately 400 plants described and illustrated in the volume are herbaceous, however there are included also a few shrubs and trees as well. This represents a rather small percentage of the ca. 3,000 plant species which occur in the state, however the plants selected are both common and showy,

hence they represent the most obvious members of the Alabama flora. The book should enable the interested lay person to go out into the fields and woods of the state and identify without much difficulty many of the plants which he sees about him. The learning process is aided by means of a glossary in the early part of the book, as well as by the diagrams illustrating flower parts and types, inflorescences, leaf arrangements, shapes, divisions, and margins. The brief but practical descriptions of the plants, fortified by the excellent kodachrome pictures, should be adequate for recognition of most common flowering plants. The descriptions are models of brevity, including plant type, approximate height, various morphological features, outstanding and different characters, habitat, and state distribution. One or two common names accompany the botanical name. The plants are grouped in families and the families are arranged according to the Engler system. There is a single index of scientific and vernacular names. The late Mrs. Dean was the author of at least two other books, viz., "Trees and Shrubs in the Heart of Dixie" (1961) and "Let's Learn the Ferns in Alabama". While this present book is not a definitive flora of the state, it does represent a stop gap of sorts to the shortage of books on Alabama's plants.

GMH

"COMPENDIUM OF SOYBEAN DISEASES" by Onkar D. Dhingra and others, v + 72 pp., 109 figs., 6 tabs., The American Phytopathological Society, 3340 Pilot Knob Road, St. Paul, MN 55121, 1977, $7.00.

This compilation of diseases of Glycine max (L.) Merrill is important to botanists and agriculturists because of the importance today of the soybean crop. The bean is grown on about 53 million acres in 30 states of the USA, which is now the chief producer in the world. Fungal infections, bacterial diseases, viral diseases, nematode diseases, and non-infectious diseases are treated systematically in turn. Diseases which specifically affect the seeds are described. There are a number of colored plates. A glossary and index make this useful book still more useful.

GMH

"OUR INSECT FRIENDS AND FOES" by William Atherton DuPuy, xiii + 284 pp., 48 figs., Dover Publications, Inc., New York, 1969 (1940), $2.00.

This republication of the second edition of title popular work on entomology (ed. 1 1925) should be popular with children and adults who wish to learn more about the insects and their relatives. While the text is worded in a rather simple and informal manner, it appears to be accurate and it does convey much information on the various groups of insects. Twenty-three chapters cover the field, with one chapter per insect or group of

insects, with the exception of the final chapter ("Insects in General"). At the end of each chapter is a series of questions based on the text, so that the book could be used as a class text.

GMH

"SUNDIALS AND ROSES OF YESTERDAY" by Alice Morse Earle, xxvii 451 pp., 219 figs., 19 photogravures; Charles E. Tuttle Co., Rutland, Vermont, 1972(1902), $3.30.

A reprint of the original editor. The book is devoted in the first section to sundials, in the second to the subject of roses - history, varieties, uses, etc. The very reasonable price is $3.30. This would make an excellent gift book.

GMH

"ORGANISCHE CHEMIE" by Gábor Fodor, Band 2, IV + pp. 829-1766, figs. 63-104 (colored)(in appendix), text figs. 224-252, tabs. 99-156, Literatur- und Registerband, VEB Deutscher Verlag der Wissenschaften, Taubenstr. 10, 108 Berlin, DDR. 83.-M, 1965, (Price included with that of Band 2).

Volume One of this excellent work on organic chemistry (see review in QJCDR 9(4):1490-1;1969) covered the hydrocarbons and their halogen and hydroxyl derivatives, along with organic compounds of S, N, B, etc. In Volume Two, the eminent author has treated in four large chapters the balance of known organic compounds: Chapter 5 dealing with oxo compounds includes the carbonyl derivatives, i.e., aldehydes and ketones, ex. acetaldehyde; Chapter 6 covers the carboxy acids and their organic derivatives; including the monocarboxy series (ex. propionic acid), the dicarboxy (ex. malonic acid), the tricarboxy (ex. tricarballylic acid), and the polycarboxy (ex. mellithic acid); also carbonic acid (H_2CO_3) and derivatives. In Chapter 7, the very important aromatic heterocycles and their important reduced derivatives are considered; ex. diphenyl sulfide. In the last and eighth chapter, the steroids are reviewed; these include the sterols, bile acids, some endocrines, etc. (aldosterone). All the compounds taken up are either 5- or 6-membered rings; theoretically, 3- and 4-membered rings such as ethylenimine (3-membered) and azetidine (4-membered) belong here; however, these were already considered under cyclic amines. An unusual feature of this work, the molecular models shown in colored figures in the first volume, appear also in the second volume (red oxygen, white hydrogen, brown carbon, blue nitrogen, green chlorine, orange sulfur atoms), coming at the end of the text. Other features of this valuable text are the tables of abbreviations, symbol explanations, and the detailed indices which come at the front of each important section of the book. The literature citations (2607 items) which appears in the "Literature and Index Volume" are indexed in the name index. There is also an unusual section of biographical data, with important data on outstanding organic

chemists of the world, and finally there comes the subject index, which includes rules, reagents, etc., named after individuals. The author is the internationally known Director of the Research Laboratories for Stereochemistry of the Hungarian Academy of Sciences in Budapest. The book comes in Hungarian and German editions. An English edition would no doubt be of much interest.

GMH

"AN ANNOTATED LIST OF SPEGAZZINI'S FUNGOUS TAXA" by Marie L. Farr, IV + 1662 pp., 2 volumes, J. Cramer, PO Box 48, D-3306, Lehre, W. Germany, 1973, DM. 125, -- per volume. (Both vols. $112. approx.).

The object of this work is to compile the mycological taxa (also two bacterial taxa) of Carlos Spegazzini (1858-1926) at the levels of genus, species, and subspecies; and also to indicate the reception with which these have been met by mycologists subsequently. This compilation is of particular value to mycologists since many of Spegazzini's papers appeared in relatively obscure publications (such as the Anales de la Sociedad Cientifica de Argentina). The objectives of the compilation were to (1) provide complete publication data for each taxon of Spegazzini's (2) show recombinations or other name changes and also any synonmys; (3) indicate where comments or opinions have been expressed as to the validity or invalidity of the name or classification; and (4) supply other references with descriptions, measurements, or illustrations of these taxa. A convenient listing is given at the end of the compilation (pp. 1639-60); this is an annotated listing of Spegazzini's publications on Fungi arranged in advancing chronological order from 1878 to 1929 (the last four items being published posthumously). There is also a list of Exsiccati issued by Spegazzini (1879, 1881). The taxa in this compilation are arranged by the alphabetic order of the generic names, starting with Acanthonitschkea Speg. and concluding with Zygodesmus; following are the two species of Bacillus (Bacteria) mentioned above. There is no census of the taxa included but the total must run into the thousands. An example will demonstrate the treatment and utility of this large compilation of new taxa and new combinations: Anthostoma urophorum (p. 75) was the epithet applied by Saccardo and Spegazzini published in an article by Saccardo in an Italian journal. Information is given on where it was found and the substrate on which growing. References are made to other places of publication, viz., Saccardo in "Fungi Italici" (1878) and his "Sylloge Fungorum" (1882). A new combination Xylosphaeria urophora by M.C. Cooke was made in 1889; the place of publication is cited, also a compilation ("Flora Ital. Cryptog.", 1906) including it. Another new combination for the same species was proposed by Boehnel in 1920, viz, Entosordaria urophora, represents the latest concept of the species. Of course, many of the taxa of Spegazzini are still good, for instance, Apiosporium australe, which he described in 1881. This

large compilation will surely be of much value to mycologists in the practice of their science.

GMH

"160 EDIBLE PLANTS COMMONLY FOUND IN THE EASTERN USA" by Joe Freitus, 96 pp. (S.P.), 160 figs., Stone Wall Press, 5 Byron St., Boston, Mass. 02108, 1975, $2.95.

All kinds of wild-growing plants that can be eaten in whole or in part, raw or cooked, are included in this booklet. Plants are arranged by the alphabetic order of their common names; there is no index. An index of the botanical names (which are given) would have been useful, since some of the common names are not too well known, also their alphabetization may raise problems. Thus, the last item, yellow wild licorice, is applied to Galium lanceolatum. This name was not found in Gerth van Wijk (one of the largest compilation of common plant names), which gave "wild liquorice" and "lance-leaved wild liquorice". Another question - should it be listed under "W" or "L"?

GMH

"HERB IDENTIFIER AND HANDBOOK" by Ingrid Gabriel, 256 pp., 117 figs., Sterling Publishing Co., Inc., 419 Park Ave. S., New York, 1975, $6.95.

In this volume, 100 spp. of medicinal and spice herbs are described and figured, with mostly colored plates. Each description faces the page with the illustration. The various plants are arranged alphabetically by their common English language names. The descriptions of the plant are accompanied by scientific and popular names, geographical area and type of soil, etc., where found growing, chief constituents, and medicinal and culinary (if any) uses. The book is of pocket size and should serve usefully for the person interested in collecting and using plants of this type.

GMH

"GARCKE ILLUSTRIERTE FLORA DEUTSCHLAND UND ANGRENZENDE GEBIETE" edited by Konrad von Weihe, 23rd completely revised and newly illustrated edition, 1627 pp. (XX + 1607 pp.), 3704 individual drawings in 460 figs., 5 pls., Verlag Paul Parey, Berlin and Hamburg, 1972, DM.124,--(c US $55.80). (Bound in Balacron).

Many hundreds of thousands of botanists, pharmacists, and nature lovers have learned about the variety of plants in Germany and adjacent areas through perusal of the 23 editions of Garcke. The first edition appearing in 1849 bore the title Flora of Northern and Central Germany, changed in the 13th edition (1878) to Flora of Germany and again in the 17th (1895) to the present title. Covered are the vascular cryptogams (Pteridophyta) and flowering plants (Spermatophyta) (sometimes flowering plants are interpreted

as meaning Angiospermae; however not here). The task of writing this flora was divided among seven persons, including the editor. Included in the flora are native wild plants, naturalized species, plants gone wild from cultivation, and plants which are frequently cultivated in field or forest; also some important temporarily established plants (adventives) are considered. The order of the larger divisions is based on that of Engler and Prantl's "Syllabus". At the beginning of the systematic part of the flora is a key down to families; there are also keys to genera, and even when the genus is a large one keys to the subgenera down to species. Most keys are natural but where necessity dictated, artificial. Special heed has been given to infraspecific categories. Chromosome numbers are given for the first time in this edition - basic numbers (x) for genera and diploid somatic numbers (2n) for species (etc.) wherever available. Another first is the recording of plant-sociological locations and other data on soil and climatic requirements. Floristic studies in Europe have allowed the recording of many new stations. Many new hybrids are now known, including those of the horticulturist. The cellular plant drugs of the two German pharmacopeias are cited, also many of the non-cellular, such as the oils. Part III, Appendix, following Part I, Introduction, and Part II, Special (or Systematic) part, consists of a glossary of technical expressions in German, usually with the Latin equivalents in parentheses (in italics), an index of the sources of figures, and an index of the names of systematic units from division (or phylum) down to genera and species, the latter of course under the generic name. Other reference lists precede the Introduction: abbreviations, and symbols, including those of geographical locations, and authors. The Introduction explains the mode of use and significance of data in the systematic part and also includes a bibliography. The book is well made and of such a size that it might serve either in laboratory (herbarium) or field.

GMH

"FADS AND FALLACIES IN THE NAME OF SCIENCE" by Martin Gardner, edition 2, x + 365 pp., Dover Publications, Inc., 180 Varick St., New York, 1957, $1.50.

This interesting book was originally titled "In the Name of Science" when it appeared in 1952. The present edition features the odd logic and "scientific" mumbo-jumbo of many different groups. Among these are the followers of Charles Fort, Velikovsky, Wilhelm Reich, Lysenko, Bellamy, Ron Hubbard, Symmes, and many others. A good deal of the book is devoted to medical quackery, in which the fakes from Elisha Perkins (1700's) to Dr. William F. Koch to Cayce are exposed. The Bermuda Triangle is not mentioned but there are chapters on Atlantis, Lemuria, flying saucers, and the Great Pyramid. Most of the changes in the new edition appear in the appendix with its notes on the various chapters.

GMH

"CHEMISTRY AND SOCIETY. III. PHYTOCHEMISTRY AND ZOOCHEMISTRY IN HISPANIC AMERICA" by F. Giral, Impact of Science on Society (serial) 16: 227-275, 2 tabs., 1966.

The number of organic compounds (i.e., carbon compounds) now known approximates 12 million (ca. 1962 per Amer. Chem. Soc.) with increasing discoveries of ca. 77,000 per year. 2,669 non-alkaloidal organic compounds had been discovered in plants by 1958 (per Karrer) and 1,580 known and 2,290 unidentified alkaloids have been noted. This gives a total of ca. 4,200 organic substances (aside from proteins) known (1957-9) in approx. 500,000 plant species. The knowledge of American plant phytochemistry began with the spice trade and with the discovery of such important drugs as cinchona, cocoa, tobacco, coumarin drugs, rubber, coca, etc. The story of activity of the Hispanic American scientists in the field is told.

GMH

"LOS HONGOS EN LA COCINA MEXICANA" by Gaston Guzman, iv + 63 pp., 13 figs., Sociedad Mexicana de Micologia, A.C., Ap. Postal 26-378, Mexico 4, D.F., Mexico, 1977.

Following an introduction with brief notes on the history of mushrooms in Mexico, general instructions on collection, their food values, etc, there are given about one hundred recipes of foods containing edible mushrooms. A useful contribution to the natural way of living!

GMH

"FINE STRUCTURE OF THE CORTEX IN THE LICHEN FAMILY PARMELIACEAE VIEWED WITH THE SCANNING-ELECTRON MICROSCOPE" by M.E. Hale, Jr., iii + 92 pp., 1 tab., 150 figs., Smithsonian Contr. to Bot. No. 10, Govt. Print. Off., Washington, D.C., 1973, $2.00.

The cortical surfaces of 123 spp. of Lichenes in 12 genera of Parmeliaceae were examined. Two general types of cortex were identified: one made up of exposed hyphae and one with the hyphae covered by a thin polysaccharide epicortex. There are two groups of the latter epicorticate spp., one with a tightly appressed continuous epicortex, the other with a more loosely associated paired epicortex. Type of epicortex is a constant character at gen. and sect. level and seems to be quite useful in the classification of spp.

GMH

"DRAWINGS AND PHARMACY IN al-ZAHRĀWI'S 10TH CENTURY SURGICAL TREATISE" by S. Hamarneh, paper 22: 81-94, 21 figs., Contr. from the Museum of Hist. Techn., 1961, $0.20.

One of the 30 treatises of al-Zahrāwi, also known as Abulcasis, is concerned with surgery, including the instruments and

procedures used. An effort is made here to reproduce from the original many of the drawings of surgical instruments and to extract information of special pharmaceutical-medical interest. The work dates from the late decades, possibly the last decade, of the 900's. The various translations and excerpts made in the past centuries have often greatly modified the original.

GMH

"INSIDE WOOD, MASTERPIECE OF NATURE" by William M. Harlow, viii + 120 pp., 111 figs., frontispiece, The American Forestry Association, 1319 18th St., NW, Washington, DC 20036, 1970, $6.50.

An early plant microscopist, Nehemiah Grew, said it truly (1682): "... one who walks about with the meanest stick holds a piece of Nature's Handicraft which far surpasses the most elaborate Woof or Needle-Work in the World." The structure and properties of wood are among the great marvels of the living world. This book tells about some of these wonders: The formation of tree rings; the gross and fine structure of wood; the variations found in some to the commoner woods; the mode of formation of the wood (xylem) and bark (phloem) of a tree; wood considered as a material substance; how wood is destroyed by decay fungi; and the multitude and variety of uses to which wood is put. An appendix proposes a simple method for the separation of wood fibers from solid wood, using a $KClO_3$-HNO_3 reagent; and a tabulation of the relative resistance of various heartwoods to fungal decay. References and the index follow. This book would be an excellent introduction to the subject of wood histology or wood economics, since it is written in simple language by one of the most authoritative voices in the field of dendrology and wood technology, Professor Emeritus Harlow of the New York State College of Forestry.

GMH

"GROWING WILD MUSHROOMS: A COMPLETE GUIDE TO CULTIVATING EDIBLE AND HALLUCINOGENIC MUSHROOMS" by Bob Harris, xii + 96 pp., 15 figs. (drawings), 24 photos, 17 col. pls., Winghow Press, 2940 Seventh St., Berkeley, CA 94710, 1976, $3.50.

In this paperback, there are chapters on sterile culture, media, starting cultures, incubation, and sources of materials, which should be very useful to anyone interested in growing mushrooms. The book is addressed to the non-botanists so the introductory chapter explains the chief features of mushrooms in a manner which should be adequate for the task involved. The book was written by a person who obviously had first hand acquaintance with the raising and care of mushrooms. A final chapter entitled "North American psilocybin mushrooms" describes and illustrates with photos several species of Psilocybe (including two unidentified and possibly unnamed) and one species of Panaeolus. Since Federal law prohibits possession of quantities of these two mushroom genera (because of their hallucinogenic properties),

the publisher has a disclaimer on page 4 stating that the book does not intend to encourage the cultivation of these fungi but only includes the information for educational purposes.

GMH

"WILD, EDIBLE AND POISONOUS PLANTS OF ALASKA" by Christine A. Heller, ii + 90 pp., 3 col. plates, many figs., Univ. Alaska, Coop. Ext. Serv. Publn. No. 28, 1974, $1.00.

This brochure was reprinted in 1974 but represents really the second (1966) edition. (It was first published as Ext. Bull. F-40; 1953). It is a most practical little volume, with brief descriptions followed by information on mode of preparation, poisonous components, etc. The text is classed into parts of plant eaten (leaves, fruits, roots, stems, entire plants); plants for emergency food use; and toxic plants.

GMH

"MANUAL OF THE GRASSES OF THE UNITED STATES" by A.S. Hitchcock, Second edition revised by Agnes Chase, 2 vols.: Vol. I: xii + 1-569, 820 figs., 1971 (1950), Vol. II: v + 570-1051, 380 figs., many maps (also in v. I), 1971 (1950), Dover Publications, Inc., New York, each volume $5.50.

This standard work on the Gramineae of the USA has been reprinted from the second edition prepared by the late Miss Chase, who with Hitchcock ranked as the most outstanding agrostologists in the country. Each species is described in detail, with for each one figures and a map showing distribution. Because of the small size of the flowers in the grasses, most drawings represent magnified views, although there is an adequacy of sketches to show the habit of the plant. About half of the second edition is made up of detailed synonyms and the index. 1398 numbered species represent the established grasses; there are also 120 species of ballast plants or waifs, plants not yet established or naturalized; a total of 1518 grass species. This book is an indispensable reference for American grasses and is also useful in studying those of other countries of the world.

GMH

"THE BOOJUM AND ITS HOME" by R.R. Humphrey, xviii + 1-216, 90 photos, 35 tabs., 5 maps, Univ. Arizona Press, Box 3395, Tucson, AZ 85722, 1974, $6.95 (paper).

In this age of record taking and making, the boojum tree, Idria columnaris Kellogg (Fouquieriaceae) (also called "cirio") might well be regarded as the strangest of all trees. Slender and tall like a pole (the tallest tree of the Sonora Desert, it grows as high as 77 feet), it is often contorted into the most varied figures. It may grow for many centuries (up to 700 or 800 years). From its weird appearance, it is easy to understand why some of the Indians of these areas have a superstitious fear

of the plant. The tree has found very few uses, which is fortunate, as the sp. might otherwise have been exterminated. In this book, there are chapters on various aspects of the plant (names, phylogeny, ancestry, phenology, growth characteristics, germination, enemies, etc.) and of its habitat (physical and vegetational characteristics of Baja California, distribution of plant, local habitat qualities, community relationship, associates, etc.). Interesting special data include list of insects collected on flowers, plant composition under varying conditions of growth, etc.

GMH

"VIOLETS OF THE UNITED STATES" by Doretta Klaber, 208 pp., 30 figs., 108 col. pls., A.S. Barnes & Co., South Brunswick, NJ and New York, NY, 1976, $30.00.

In this folio volume, there are described and figured 76 Viola species and 6 varieties together with a western form of V. odorata L. The volume was both written and illustrated by the author, who passed away soon after checking the final proofs so did not live to see her finished work. Mrs. Klaber worked closely with a specialist on Viola, Dr. Norman Russell; among other things, he identified all the species which were sketched or painted by the author. The American violets are described after being placed in nine groups as follows (with number of species and varieties in parentheses): I: stemless blue uncut (leaf) (17): II: stemless blue cut-leaved (8, 1): III: stemmed blue uncut (14); IV: stemmed blue cut-leaved (3); V: stemless white uncut (7, 2); VI: stemmed white uncut (8, 1); VII: stemless yellow uncut (1); VIII: stemmed yellow uncut (14, 2); IX: stemmed yellow cut-leaved (3). There is considerable information on the ecology and cultivation possibilities of various species. The descriptions of the various taxa are accurate but not technical and are apparently designed for the general reader and garden enthusiast. Following the major part of the text with its descriptions and splendid water-color paintings and pen sketches, there are an appendix, bibliography and indexes. The appendix furnishes practical information on nurseries where wild violets are offered for sale; a tabulation of geographic distribution, of the various species; and a listing of location types for the various taxa - in the sun, shade, moist places. Mrs. Klaber (1887-1974) devoted her time to the study, illustrating and writing of books on various plant groups. One book concerns gentians, another primroses, and another rock garden plants. In pursuing these interests, she of course ranked herself among the conservationists - those who study and preserve the products of nature.

GMH

"BIOLOGY TEACHERS' HANDBOOK" by Evelyn Klinckmann, 2nd edition, xvii + 692 pp., figs. and tabs., John Wiley & Sons, Inc., New York, 1970, $9.95.

This volume is made up of contributions by 27 specialists at high schools, universities, colleges, and related scholarly organizations all over the USA from Florida to Washington State and from California to New Jersey. It was introduced as a manual for teaching teachers (especially those in high schools) how best to instruct in the biological sciences (1st ed. 1963). The main theme of the work is that any science should be taught not as a dogma but as an enquiry, a search for the truth. A series of chapters "Invitations to Enquiry" serve as models of teaching units. It is intended to make students think by participating in the experiment or demonstration. The volume was produced by the Biological Sciences Curriculum Study (BSCS) (headquarters at the University of Colorado, Boulder, Colo.), which since 1958 has been endeavoring to improve biology education at the secondary and tertiary school levels. The book is based on an earlier paper back entitled "Teacher's Commentary" (1960). A large component of the book is chemistry, physics, and mathematics (with stress on statistics) (chapters 11 to 19). One weakness of the volume is the lack of an index; at the same time, the table of contents is lacking in detail and therefore the contents of the book are not adequately available. The second edition has been updated and extensively restructured. The six appendices are among the most useful features: (1) Republished research papers in biology (books reproducing outstanding research papers of the past, such as "Readings in plant science" compiled by I. Knobloch), (2) Selected bibliography for teachers (of biology), (3) Laboratory facilites for BSCS biology (with plans of laboratory, lists of equipment, etc.), (4) Techniques and materials for the biology lab, with sources of the same; (5) Sources of films (arranged by state), (6) career opportunities in the biological sciences (pamphlets and books).

GMH

"SYMPOSIUM ON SAFFLOWER, CONDUCTED BY THE AMERICAN OIL CHEMISTS SOCIETY AT THE 39TH FALL MEETING PROGRAM, CINCINNATI, OHIO, Oct. 10-13, 1966, Kneeland, J.A. (Chairman), J. Amer. Oil. Chem. Soc. 43: 403-17; 1966.

Five papers are included: status of safflower, composition of S. seed; S. oil utilization in surface coatings, S. meal; and the role of S. oil in edible oil applications. In the second of these (T.H. Applewhite), the composition of the hull, kernel, and oil is given. In common commercial types, the following composition is typical: hull 40%; fatty oil 37%; meal 23%. The fatty acid composition is quite constant at 78% linoleic acid, 11% oleic, 3% stearic, and 6% palmitic.

GMH

"READINGS IN BIOLOGICAL SCIENCE, by Irving William Knobloch, Third Edition, x + 499 pp., Appleton-Century-Crofts, Meredith Corp., New York, 1973.

Selections have been made from the classical literature of biology and of its subdivisions: structure and functions of animals and plants; nutrition, health, and disease; ecology, conservation, and economic biology; exobiology (biology in interplanetary space); heredity; origins of life; evolution; population and birth control; and the philosophy of science. As the old platitude states "There is something here for everyone." The dates are also widely variable: some from before the time of Christ (Hippocrates, Aristotle, Theoph rastus), others very recent. This edition and the second one are strikingly different from the original since the editor has excised entire articles and inserted in their place more recent ones. The text is therefore timely and currently important and should enthuse the reader with many of the present trends and thinking in the area of biology. The table of contents in front is not supplemented by an index, which would have been useful. Many citations were without a date; all should be dated. A table of abbreviations would have served a good purpose, as many, especially in the field of biochemistry (ex. PGA), might not be intelligible to the reader. All of the readings are fully textual: it might have been good to introduce some with figures, tables, diagrams, or charts, since these do enliven the perusal of an article or book. Lists of suggested readings drawn up under certain topic headings might have been useful for the interested student. There are a few references in footnotes but not really enough for the person who wishes to pursue a subject which has greatly interested him. Biographical notes on the authors would have been appreciated, either in the form of a footmote or in a section appended to the text. However, the selections provided are excellent ones and will hopefully serve their purpose of stirring up the attention and keen interest of the otherwise sluggish schoolboy.

GMH

"PROCEEDINGS, INTERNATIONAL SYMPOSIUM COMMEMORATING THE 30TH ANNIVERSARY OF KOREAN LIBERATION, AUG. 11-20, 1975", xv + 862 pp., many figs., maps, and tabs., 3 col. pls., National Academy of Sciences, Seoul, Republic of Korea, 1975, Gratis.

Following the introductions, the papers are collected under two main headings: humanities and social sciences (history and culture of east Asia); and natural sciences (featuring sciences and technology for the future society). The latter is broken down into sections on science education, biology and geology, energy and resources, organ transplantation and immunology, and minor elements in soils. The second of these sections has articles on chromosome aberration and genetic counseling; study of cellular control mechanisms by the transfer of cell organelles, fluorometric study of chemical carcinogenesis, resistance of wheat to stem rust; evolution of the Okchon Orogenic Belt (geological features) inferred from the structural viewpoint; ophiolites and their importance to global tectonics; and the role of

paleomagnetism in the recent earth science revolution. All but one of these articles are by Koreans or Chinese (to judge by the names, such as Kim, Chai, Park) R.G. Coleman who wrote the article on ophiolites, is from the U.S. Geological Survey. (Ophiolites are igneous rock products such as serpentine). In the paper on chromosome aberration by Yung Sun Kang (of Seoul National University) the problem is first pointed out: whereas in Japan the life span over the past 25 years has been extended to ca 70 years and there has been a drastic drop in infectious disease, at the same time the rate of genetic disease has increased from 300 to 400/100,000 population during 1941-65. This may partly be due to more efficient monitoring systems in use. Five types of genetic disease are recognized: mutant genes (such as hemophilia); chromosome aberration (ex. Down's syndrome); cogenital malformation (ex. hare lip); constitutional disease (ex. diabetes); and limited distribution type (ex. sickle cell anemia). Except for some references, the text of the volume is in English.

GMH

"ALGOLOGICAL BIBLIOGRAPHY OF THE U.S.S.R. FROM THE BEGINNING UP TO 1960" by S. Koeltz (Editor), Gaidukov, N. et al., Vol. 3: viii + 1-126; iv + iv + 1-139; 171-255; 95-115; 1-170; 1-343; 5-22, (total 918 pp.), Collectanea Bibliographica, Otto Koeltz, Antiquariat, Koenigstein/Taunus, West Germany, 1967 (1901-1966), DM. 290.

In this compilation, seven bibliographic articles have been reprinted from Russian Journals concerning the Algae of Russia. Although with the exception of summaries the texts of the articles are Russian in every case, yet many of the references are in English and other western languages so that the primary value of the bibliography will not be lost for the specialist in Algae, plant geography, etc. The articles are marked with marginal tabs to make for ready availability. The titles in the table of contents are in German, French, Latin, and English and show the journal citations as follows: 1) Gaidukov, N.: Literature sources for the algal flora of Russia, (up to 1900) 1901: Scripta Bot. Horti Imp. Petrop. v. 17. (arranged in the alphabetic order of authors) (French summary, pp. 136-9), 2) (1900-1925) Elenkin, A.A. and Ohl, L., Bibliography of algological works in the USSR which appeared from 1900 to 1925 inclusive, 1929. Acta Horti Petropol. 42 (#1). (French summary pp. 136-9). 3) Elenkin, A.A. and Ohl., L., Bibliography of algological works published from 1926 to 1930 incl. in the USSR. 1934. Acta Instituti Botanici Academiae Scientiarum URSS. Series 2, v. 2. (German summary p. 255). 4) Elenkin and Ohl, Bibliography of the algological works published in the USSR from 1931 to 1935 inclusive. 1950. Trudy Botanicheskogo Intituta im. V.L. Komarova, Akademii Nauk SSSR. (Works of the Botanical Institute in the name of V. L. Komarov, Academy of Science, USSR). Series 2, vol. 5. 5) Elenkin, A.A., Gollerbach, M.M., Karasavina, L.C., and others, Soviet algological

bibliography for the years 1926 to 1940 with supplement for the preceding years. 1966. Societas Botanica URSS, Bibliotheca Academiae Scientiarum URSS, Academia Scientiarum URSS (Botanical Society of the USSR, Library of the Academy of Sciences of the USSR) (Brief summary, p. 4.). 6) Krasavina, L.C., Soviet algological bibliography for the years 1941 to 1960. 1968. Institutum Botanicum nomine V.L. Komarovii. Bibliotheca Academiae Scientiarum URSS, Academia Scientiarum URSS (Brief Summary, p.2). 7) Elenkin, A.A. and Ohl, L. Additions to N. Gaidukov's Literature resources for the algal flora of Russia. 1950. Trudy botanicheskogo Instituta im. V.L. Komarova, Akademii Nauk SSSR) Ser. 2. Vol. 6. (No summaries). The subject matters covered in these listing of the literature are not confined to taxonomy and floristics: there are in addition data on the biology, physiology, biochemistry, etc., of Algae. Articles are included by foreign scientists on Russian Algae and also articles by Russian algologists on the algae of other countries. This compilation is bound sturdily in a hard plastic cover and is well printed. The book should be very useful and handy to all students of the marine and fresh water algae of Europe and Asia.

GMH

"RENAL TRANSPORT AND DIURETICS, INTERNATIONAL SYMPOSIUM FELDAFING, JUNE 21-23, 1968", Chairmen: K. Karmer, H. Schwiegk, with 235 figures and 62 tables, XV, 487 pages (incl. 229 in German), 8 vo. Springer-Verlag, Berlin - Heidelberg - New York, 1969, Cloth DM 68.

In this work, a series of 46 articles is presented, articles sometimes in the English language, sometimes the German. However, rather oddly, all summaries are in English and not in German. In some cases, both German and English versions of the article are given. Each paper bears a double heading, one English, the other German, and the Table of Contents in front bears titles of papers in both English and German, but there is no indication as to which language composes the body of the text. It would have been a convenience for the one - language man to know the language used, since he would not be interested in the alternate language used. Quite regularly, each paper includes a summary and bibliography and in many instances comments or questions from the audience. Other features include a terminal subject index in English only, an alphabetical list of speakers in front adjacent to the table of contents, and a clearly printed text bound in a sound cover. 48% of the text of the papers is in German, showing an almost equal distribution of text between the two languages. The research reported covers both the physiology and the clinical trial in nephrology, the science of the kidney. The 67 authors represent an international participation, with 51 Germans, 10 Americans (USA), 3 Swiss, 2 English and one Belgian included. Some well known individuals are represented, including for instance Drs. K.H. Beyer and H.A. Krebs. The three main divisions of the text include (1) Renal metabolism (including handling of carbohydrates,

fatty acids, amino acids, ammonia, oxygen, and carbon dioxide); (2) renal transport processes (including for water, Na, K, CO_2, and bicarbonate); (3) clinical application of diuretics (including some comparatively new products, such as amiloride). Constructive Suggestion: Inclusion of a table of both English and German abbreviations, so many of which are used (ex. RR, GFR, RBF, MSD, AM, etc.).

GMH

"VOCABULARIUM NOCENTIUM FLORAE: DICTIONARY OF PLANT PESTS, PLANT DISEASES, AND WEEDS" by Richard Kwizda, Ed. 4, 128 pp., quarto, Card covers, Springer-Verlag Wien., 1963, U.S. $9.95.

In this volume, tables are used to present in parallel columns the terms used in ten various languages for higher plants (weeds), fungi, bacteria, and animals (mostly insects and related) considered "noxious". The column of Latin names represents the scientific binomial or trinomial name of the organism, where the columns in other languages give the common or vernacular names in use in English, German, French, Italian, Dutch, Russian, Swedish, Danish and Spanish languages. One omission which seems important is Portuguese, in view of the large poupulation of Brazil. Names are arranged in the alphabetic order of the German names in the main listing, but this is followed by indexes in each of the other nine languages. It is hoped that this compilation will do a small part in developing and maintaining peace and public tranquility in the various parts of Europe by promoting understanding, restricted though it may. There are several alphabetic sequences under the following classifications: (1) field and vegetable crops, (2) fruit culture, (3) oeniculture (wine grape culture), (4) field weeds, (5) forest, (6) storage, (7) wood parasites. Some of these are subdivided into two divisions - animal enemies and diseases. Thus there are in all 10 separate alphabetically arranged groups. The following organisms could not be found but might well have received a mention: house fly, horse fly, livestock fly, stable fly, horn fly, fire ant, spotted spider mite, plum curculio. Each term is numbered: Nos. 10, 344, and 426 all refer to the same organism, viz., the turnip moth or cutworm, Agrostis segetum. It would seem as a saving of space, cross references could have been used in such cases. Without question, this dictionary should be available at large comprehensive libraries, agricultural schools and offices, pesticide manufacturers, and wherever it is necessary to identify agricultural pest terms in the various languages in use.

GMH

"McGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS" edited by Daniel N. Lapedes, xv + 1635 pp. + 26 (appendix), 2800 figs., McGraw-Hill Book Co., 1221 Avenue of the Americas, New York 10020, 1974, $39.50.

This 1676-page volume is truly a great dictionary and of particular importance now with the upspring of interest in science

and technology in this country. Like the American Heritage Dictionary, the margins of the pages of this work are embellished with numerous illustrations - sketches, diagrams, photographs. They are most effectively used in an area where graphic devices greatly simplify discussions. The coverage is very wide, covering as it does so many diverse fields - biological, physical, mathematical, medical, psychological, engineering. The dust cover bears a listing of just 100 fields of science which are covered. Included for instance are archeology, architecture, petrology, pharmacology, solid-state physics, statistics. The definitions are clear and well-balanced, with modern usages and meanings, and kept to the minimum in length. Synonyms, abbreviations, and acronyms are included wherever needed. More than 100,000 definitions are included, reflective of the great surge forward of science in all areas. (This is said to be more than twice the number of definitions in other technical dictionaries). Definitions relate to theories, laws, rules, reactions, processes, methods, descriptions, and proper equivalents. Many cross references are used. Beyond the regular alphabetic sequence, an appendix of 26 pages presents in condensed form a great many data, such as the SI system units, abbreviations, symbols, bacterial taxonomies, etc., constituting a kind of handbook of data. The alphabetization of terms in the dictionary part proper is very strict, as it should be, that is spaces, hyphens, etc. are ignored, and words follow on a letter-by-letter basis. Thus, for instance: banking pin, bank-inset reef, bank reef, bank-run gravel, bank slope, banksman... The prefixes of chemical titles are disregarded in alphabetization. Thus, alpha-, D-, 3-, meta-, etc., are disregarded and the following word used such as the "g" in 7-D-glucoside. The coverage runs from "a" (abbr. for ampere) to Zythiaceae (a fungal family). The introductory part is remarkable for its simplicity, with a one-page preface, a listing of the editorial staff, consulting and contributing editors, a page on "How to use the dictionary", field abbreviations and "scope of fields". In a work of such breadth one would expect not to find all the terms of highly specialized type peculiar to any technical field. Hence, a listing of omitted terms might well be rejected as not sufficiently important for retention in the dictionary. On the chance that this is so, the following were not found but may just possibly have been included: teosinte, ensilage (however ensiling is included), mariculture, Chironix (a toxic animal), betalain, epithet, oenology (science of wines), ortets (applied in plant ecology), ramets, sigmoidicity, non-hyperbolicity, barachois (ecology), analplerotic pathway (biochemistry), oak openings, golden seal (drug plant), tribe, section (systematic biology terms), perigonium (a zoological definition is given, but not a botanical), perigone (perianth, floral envelope), nothomorph, nothogamy, registrate, cooperativity, alkanol (as a generic term, chemistry). The dictionary has only a few abbreviations and this might be considered one of the chief defects in the work. However, many compilations of abbreviations and acronyms are now available and these would be regularly available to most

individuals. It would be very useful to include in the Appendix a tabulation of hierarchies of plants and animals, showing the divisions of the Kingdoms from Phylum or division down to family, subfamily, tribe, genus, subgenus, section, species, variety, form, etc. The dictionary is printed on smooth thin but strong paper - sturdier than bible or rice paper - and solidly bound in boards. It should take a good deal of rough handling and should stand up in regular library use. It would seem likely that all large libraries - public, university, company - would install this dictionary alongside of Webster's Unabridged and other important reference works. It certainly deserves such a place.

GMH

"FLORA OF TAIWAN" by Hui-Lin Li, S. Liu, T.C. Huang, T. Koyama, and C.E. DeVol (Editors), Volume I., XXI + 562 pp., 207 pls., 1 group portr., 3 maps, Pteridophyta and Gymnospermae, Epoch Publishing Company, PO Box 642, Taipei, Taiwan, ROC., 1975, $20.00.

This work to be published eventually in six volumes is going to fill a gap in the geographical coverage of the plants of our globe. No comprehensive flora of mainland China has been published, at least in our era, and this bids fair to be a good beginning to the "opening up" of "the wonderful world" of China. The introductory part of the text tells a good deal (for a flora) about the geology, soils, topography, and climate of the Island, as well as about the vegetational types and general distributions. A general key is presented for the fern families and later in the volume for gymnosperm families. The families follow in taxonomic sequence; within each family the genera and the species in turn follow an alphabetical sequence. There are a number of keys to genera and species. Excellent drawings illustrate (as a rule) at least one member of each genus. The descriptions of genera and species are generally quite adequate for definition of the taxon. The volume is complete in and of itself with a thorough terminal index. There are no references to the literature and no glossary of terms. There is a number of novelties in the volume: two new species and 13 new combinations. These include: Hymenophyllum taiwanense DeVol sp. nov. (much like H. perfusum Copel.) and Grammitis latifolia DeVol sp. nov. The following new combinations are included: Diplopterygium chinensis (Rosenst.) DeVol (Gleichenia c.); Cephalomanes laciniatum (Roxb.) DeVol (Trichomanes l.); Diploblechnum fraseri (A. Cunn.) DeVol (Lomaria f.); Lindsaea securifolia Presl var. kusukusensis (Hayata) Shieh (L.k.); Egenolfia laxireticulata (Iwats.) Kuo (Bolbitis l.); Arachniodes rhomboides (Wall.) Ching var. yakusimensis (H. Ito) Shieh (Rumohra amabilis (Blume) Ching; Christella acuminata var. kuliangensis (Ching) Kuo (Cyclosorus a. var. k.); C. arida (Don) Holtt, (Aspidium aridum); C. ensifera (Tagawa) Holtt. (Dryopteris e.); C. subarida (Tatew. et Tagawa) Holtt. (Cyclosorus subaridus); Pronephrium triphyllum var. parishii (Beddome) Kuo (Meniscium p.); Sphaerostephanos kotoensis

(Hayata) Holtt. (Dryopteris K.); S. taiwanensis (C. Chr.) Holtt. (Dryopteris t.). All of these changes are in the Pteridophyta. The book is well bound and printed; no printer's errors were noticed. The price seems reasonable enough. It will be hoped that many libraries, certainly those of the colleges and universities, will avail themselves of this excellent treatment of the vascular plants of Taiwan, formerly known as Formosa. The five other volumes are coming out in rather quick succession.

GMH

"ATLAS OF UNITED STATES TREES" by E.L. Little, Jr., Volume 3, Minor western hardwoods, vi + 1-13, 290 large maps, U.S.D.A. Forest Service Misc. Publ. No. 1314, (total pages: 242), 1976.

The introductory section deals with procedures of map making, tree names, notes on ranges, rare and endangered hardwood spp., and references. The maps which follow are in two series; the first are several base maps, showing the geographic areas considered as oriented in North America. Then follow the species maps, plotting the natural ranges of 220 tree spp. native to the western conterminous states of the USA. The tree species are arranged in strict alphabetic sequence. All of the 11 far western contiguous states are shown in these maps (Washington, Oregon, Idaho, Montana, California, Nevada, Arizona, Utah, Wyoming, Colorado, and New Mexico) as well as trans-Pecos Texas. However, in some instances the range is shown to include the tier of midwestern states to include North and South Dakota, Nebraska, Kansas, Oklahoma, and Texas. When the tree occurs beyond these areas, a map of North America is used. (In the case of one sp., Esenbeckia berlandieri Baill., the natural range is all in Mexico, the tree being extinct in extreme southern Texas, where formerly found, and it is found in this area only as cultivated plants). The ranges are very clearly shown by using a solid brown color against the black outlines of the map. Although most of the species are primarily western in distribution, in some cases (as for Salix discolor Muhl. (sphalm.: Muehl.), the distribution is primarily eastern and northern North America with only a sporadic spread in the western USA. Out of the 24 spp. with local distribution (i.e., restricted to one or two states) 9 are classed as endangered (ex. Quercus graciliformis C. H. Muller, found in s. w. Texas in small area and in adjacent Mexico) and 5 as threatened spp. (ex. Ceanothus Aroboreus Greene, occurring only in a few islands off California's coast). This useful volume is reasonably priced at $9.10.

GMH

"A CONTRIBUTION TO THE FLORA OF ASIR, SOUTHWESTERN ARABIA" by James P. Mandaville, Jr., (Ed. H. Field and W.T. Gillis), iv + 13 pp., Field Research Publications, Coconut Grove, Miami, FL 33133, 1973.

This included principally an annotated list of non-vascular and vascular plants collected in Saudi Arabia in the fall of 1969. 143 species are represented, of which five seem to be new and unnamed; there are also eight ferns. Also included are a history of botanical studies in the area, and notes on the meteorology, topography, and plant communities. There are a guide to geographical areas and a bibliography.

GMH

"EASY FIELD GUIDE TO COMMON TREES OF ARIZONA" by Dick and Sharon Nelson, 36 pp., 72 figs., Tecolote Press, Inc., PO Box 217, Glenwood, New Mexico 88039, 1976, $1.00.

"EASY FIELD GUIDE TO COMMON DESERT CACTUS OF ARIZONA" by Sharon and Dick Nelson, ii + 32 pp., many figs., Tecolote Press, Inc., PO Box 217, Glenwood, NM, 1973, $1.00.

These popular little tracts will be useful to the layman for identifying the commoner trees and Cactaceae of Arizona (etc.). There are 47 tree species and 27 cactus species, with brief descriptions and figures of each. The word "cactus" ("cacti") is generally used to include both members of Cactaceae and cactus-like members of Liliaceae, Euphorbiaceae, Fouqueriaceae, etc., but here has been restricted to the Cactaceae.

GMH

"PENICILLINS AND CEPHALOSPORINS; EFFECTS OF HORMONAL STEROIDS ON CELLULAR PROCESSES" edited by D. Perlman, Vol. 1 of "Topics in Pharmaceutical Sciences", ix + 136 pp., 6 portraits, many figs., and tabs., Interscience Publishers, div. of John Wiley and Sons, New York, 1968, $7.95.

In this volume are reproduced the papers presented at Symposia held at the April 1967 meeting of the American Pharmaceutical Association Academy of Pharmaceutical Sciences, Las Vegas, Nevada. Twelve authors are represented, mostly from the USA. The six papers are equally divided between the two topics of the title. Various papers discuss the relationship of the chemistry of the two groups of antibiotics to their biological activity; advances towards the total synthesis of Beta-lactam antibiotics (Beta-lactam is a 4-membered ring representing an important part of the nuclear structure of the penicillins and cephalosporins); the enzymic processes by which the cell wall of microorganisms is formed and how penicillin acts to interfere with this process; steroid hormone synthesis in the testis; the effects of corticosteroids on fibroblast (connective tissue cells) functions; effect of steroids on lysosomes (small bodies involved in processes of intracellular digestion) and artificial lipid structures (using lecithin-cholesterol mixtures). The book is offset printed with the ends of the lines unjustified. The legibility and clarity of the text are excellent however; many references; no index.

GMH

"NORTH AMERICAN TREES (EXCLUSIVE OF MEXICO AND TROPICAL UNITED STATES)" by Richard J. Preston, Jr., Ed. 3, xxx + 399 pp., 310 maps, 161 pls., Iowa State Univ. Press, Ames, Iowa, 1976, $7.50.

This manual includes an explanatory Introduction (including discussions about the forest regions of North America and tree characters) and keys to genera. This is followed by the "Handbook" or the descriptive text; also included are keys to species. The descriptive text and figures are on opposite pages for each species (sometimes for 2 or 3 species). The text includes both botanical and silivical characters. Following the text are the glossary and index. This handbook or manual should be a useful field book, both during the vegetative reproducing and the dormant periods of the life cycle. Winter twigs are shown for each illustrated species. Hence this text can serve as an all-year guide to the trees of the continental USA and Canada.

GMH

"SECOND DICTIONARY OF ACRONYMS AND ABBREVIATIONS" by Eric Pugh, 410 pp., The Shoe String Press, Inc., 995 Sherman Ave., Hamden, Conn., 1974, $16.50.

The original Pugh dictionary of acronyms and abbreviations was published in 1968, followed by a second edition in 1970. The second volume is a compilation of additional items with a few corrections and expansion of meaning. The third dictionary came out in 1977 as a supplement to the first two volumes. There is no overlapping, cumulation, or duplication in the three volumes. All three volumes have the same plan of alphabetic listing of abbreviations with the meaning or meanings in a second column; at the end of the book is a list of subjects with the abbreviations pertinent to each. A search of all three volumes shows the following to be absent: AID (artificial insemination by donor); ARAMCO (Arabian American Oil Company); AFC (automatic frequency control)(radio); ALM (American Leprosy Missions); ACT (air control tower); CFR (Code of Federal Regulations); CBC (complete blood count); CDP (chlorodiazepoxide) CRT (color tube)(TV); DME (distance measure of equipment); GPA (grade point average); HD (Hansen's disease; Hodgkin's disease); HFCS (high fructose cane sugar); HOG (phencyclidine; "Peace Pill"); INRA (Institut National de la Recherche Agronomique (France) - National Institue Of Agronomic Research); ISO (International Standards Organization); IVP (intraventricular pressure); INH (isonicotinic hydrazide - isoniazid); LNG (liquified natural gas); MH (maleic hydrazide); MCT (medium chain triglycerides); NE (nor-epinephrine); OPEC (Organizatio of Petroleum Exporting Countries); OR (operating Room); PR (per recto - digital examination); PS (postscript); PPS (additional postscript); PMC (pollen mother cells) (cytotaxonomy); Pty. (Proprietary); PZA (pyrazinamide, a tuberculostatic agent); PMSG (pregnant mare serum gonadotropin); SM (streptomycin); SAP

(sine Acido Prussico; without prussic acid) (applied to synthetic Bitter Almond Oil); TAN (tactical air navigation); TEAB (tetra ethyl ammonium bromide); VO (volatile oil); 6-MP (6-mercapto-purine). These three volumes will be of much service in this Age of Abbreviations and Acronyms!!!

GMH

"THE VANISHING LICHENS: THEIR HISTORY, BIOLOGY, AND IMPORTANCE" by David H.S. Richardson, 231 pp., 30 tabs., 27 figs., 41 pls., Hafner Press, 866 Third Avenue, New York 10022, 1975, $12.00.

While this book is to all appearances primarily of interest to the layman, it should be attractive reading for all classes and levels, since it tells to an adequate degree the fascinating story of the practical use of these most commonly overlooked of all plants. It will strike many readers with considerable surprise that the encrustations on rock or tree trunk which quite obviously are worthless for man at any rate, are in actuality of importance as foods for man and beast, medicines, perfume components, dyes, and otherwise. Another surprising fact is the relative sensitivity of these plants. Instead of being as one might well suppose comparatively rugged and indestructible, lichens furnish an important clue to atmospheric pollution since so steadily affected by contaminants transmitted through the air. The last chapter and the longest chapter in the book is entitled "Pollution, habitat destruction and conservation". The title of the book becomes clear from perusal of this chapter: lichens are disappearing in many areas on account of the prevailing smoke, smog, fumes, gases, and other pollutants. Also interestingly covered in this book is the history of our knowledge and study of these symbiotic combinations of fungus and alga. Their wide extent of growth makes these organisms of special interest to the plant geographer. Almost the only plants found in vast stretches of the polar regions, at least during the winter season, reindeer and caribou would not survive in their regions of living were it not for these humble organisms.

GMH

"GÉOGRAPHIE FLORISTIQUE DU QUÉBEC-LABRADOR: DISTRIBUTION DES PRINCIPALES ESPÈCES VASCULAIRES" by Camille Rousseau, xiii + 799 pp., 1021 maps, 2 tabs., Les Presses de l'Université Laval, Québec, (available in US from International Scholarly Book Services Inc., PO Box 555, Forest Grove, OR 97116). 1974, $30.00.

This work, representing volume 7 of "Travaux et Documents du Centre d'Etudes Nordiques", is concerned with an enormous area of land (1825 million square km) extending from the subarctic to the more temperate latitudes (deciduous forest zone); nevertheless the area is relatively poor in numbers of species. Of the 1850 taxa of vascular plants in the flora (species and varieties,

the latter perhaps mostly corresponding to subspecies), 1016 were investigated in the work. For each of these entities, the distribution area is presented in the form of dotted maps, which is the product of exhaustive herbarium studies and an evaluation of the literature. The textual matter discusses habitat, distribution in the field, and general distribution; earlier published maps are cited. In the final chapter (before "Conclusions") the indigenous species have been arranged into seven geographic-habitat areas ("elements"), thus: circumpolar; amphi-Atlantic; Cordillerian (E. North America); great deciduous forest of eastern North America; Atlantic coastal plain; St. Lawrence estuary; and the prairie area of Nominique (County Labelle, Quebec). Widely set ecological groups are formed in this way in which the position of the distribution boundaries in definite climatic zones plays the chief role. A comprehensive discussion is given of the various theories on special instances of distribution in the field, for instance, the disjunct appearance of western American species around the Gulf of St. Lawrence. However, no important new viewpoints are introduced. The value of this work lies principally in the collection and summarization of comprehensive floristic materials, so that the book belongs without doubt to the standard works for North America. It contains a very large bibliography The text is reproduced from typewritten copy by offset printing but is very well done indeed. The book is strongly bound.

GMH

"ROEMPP: CHEMIE LEXIKON" ed. 6, continued and expanded by Dr. Erhard Uehlein, Vol. III: v + 3809-5554, tabs, and figs. (s.n.), Franckh'sche Verlagshandlung, Stuttgart, BRD (West Germany), 1966.

The third volume covers words, phrases, and abbreviations beginning with the letters M to R. As with the previous volumes (see reviews: Quart, J. Crude Drug Res. 8: 1281-2; 1968; Phytologia 34: 105-7; 1967), this one bears a rich treasure of information on chemistry and its branches. Following the key word (Stichwort) (in black face type) there is a paragraph of succinct information (short to long), and finally in smaller type information on literature references, manufacturer and price (if pertinent), and the English equivalent word or words. An important feature is the biographic information; thus, for instance, there is a 17-line entry for Linus Pauling, the American chemist. One especially interesting biographical entry is that of the original creator of the work: Hermann Roempp (1901-64) who from the time of the first edition (1947) until his death was the sole author of the Lexicon; it will surprise some to learn that he was also the author of many other technical books. Although it will not answer all questions, it will give information on a surprisingly large number. The following terms could not be found: rubazonic acid; physcion(e); pnictides; prostaglandins (!!!); polyethylene glycol; methysticin; nigericin; Pasteur pipet; resinols (as a

class of compounds found in resins); R_m; Makrogola (ointment base); M. (= mol); NBD-Cl (7-chloro-4-nitrobenzeno-2-oxa-1,3-diazole). Under "Papain" (column 4650), the enzyme of fig is "ficin" (not "fican"), and the enzyme "asclepain" is obtained from Asclepias speciosa not as stated. In the same column, Papanicolaou (1883-1962) is better known for the famous "Pap" test, in which his stain solution is used to detect malignancies and premalignancies of various mucous surfaces of the body. Under Paraffin'ol (col. 4671), the correct spelling is Albolene. The names of outstadning firms are given; for instance, S.B. Penick and Comp., Dept. CMC (an error in the address; it should be Lyndhurst, New Jersey; having moved there from New York City). Chemical apparatus has become so diverse and complicated that a dictionary or lexicon of apparatus would be welcome as a means of locating desired types; more entries in Roempp would be welcome. As a matter of constructive criticism, it seems to this reviewer that more structural formulas for organic compounds would be useful in the Lexicon. This great reference work should be better known to American scientists.

GMH

"STATISTISCHE METHODEN: EIN SOFORTHELFER. (STATISTICAL METHODS: AN IMMEDIATE HELPER)" by Lother Sachs, xi + 103 pp., 5 figs. 25 tabs., 1 folding plate, Springer-Verlag Berlin, Heidelberg, New York, 1970, DM. 8.80; US $2.50 (4.00), (Limp cloth bound).

This little book in flexible binding contains the most important simple methods of statistics. (A more elaborate treatment by the same author is his "Statistische Auswertungsmethoden", ed. 2; Springer; 1969). In the book under review successive chapters take up the following topics: (1) Bases and goals of statistical methods; (2) Average values and variability (for unclassified observations (numbers)); (3) Frequency distribution and summations frequency distributions; (4) Normal distribution; (5) Confidence range; (6) Statistical tests: 97) How many observations (measurements or numbers) are needed? (8) Correlation and regression; (9) Annex: Rapid procedure for comparing many averages. Although some people use statistics like a drunk uses a lamp post - more for support than illumination - yet statistics are essential to the proper utilization of all scientific results - that is for the presentation and summarization of results of measurements or counts and to test for validity. The following table at the end has many uses: to show values for n of n^2, $\sqrt{n}$, etc., for numbers 1-150, then by tens to 200, then 250, 300, 500, and 1000. This is a very useful little book.

GMH

"FLORA OF HASSAN DISTRICT, KARATAKA, INDIA" by Cecil J. Saldanha and Dan H. Nicolson, viii + 1-915, 132 figs., 2 maps, 20 col. pls., Smithsonian Institution, Washington, DC, 1976.

With descriptions of ca 1700 spp. of vascular plants, this is thought to represent some 75% of the total species of the State of Karnataka and possibly 10% of the tracheophyte species of India. The District is quite small roughly 130 by 110 km. in size, lying some 50 miles west of Bangalore. The 19-page Introduction gives the usual information on history of the area, topography, climate, history of botanical exploration, etc. A key to families follows, then the systematic portion which includes a number of novelties. Thus, there are six new names, viz., Rubus fockei Gandhi (R. fulvus Focke), Euphorbia laciniata Ramam. (E. fibmriata Heyne), Ligustrum gamblei Ramam. (L.roxburghii C. B. Clarke), Justicia andersonii Ramam. (J. montana (Nees)Wall.), J. neesii Ramam. (J. micrantha Wall.), and Habenaria roxburghii Nicolson (Orchis plantaginea Roxb.). There are 22 new combinations, including Meiogyne ramarowii (Dunn) Gandhi (Unona r.), Phoebe cathia (D. Don) Gandhi (Cinnamomum c.), Solena amplexicaulis (Lam.) Gandhi (Bryonia a.), Diospyros nigrescens (Dalzell) Saldanha (Maba n.), Syzygium laetum (Ham.) Gandhi (Eugenia l.), S. occidentale (Bourd.) Gandhi (Eugenia o.), Loeseneriella bourdillonii (Gamble) Ramam. (Hippocrates b.), Cassine paniculata (Wight et Arn.) Ramam. (Elaeodendron p.), Maytenus rothiana (Walp.) Ramam. (Catha r.), Buchanania axillaris (Desr.) Ramam. (Mangifera a.), Nothopegia racemosa (Dalz.) Ramam. (Glycycarpus r.), Naringi crenulata (Roxb.) Nicolson (Limonia c.), Aglaia lawii (Wight) Saldanha (Nimmoia l.), Pimpinella wallichiana (Miq.) Gandhi (Heloscia-dium w.), Mackenziea caudata (T. Anderson) Ramam. (Strobilanthes c.), Fimbristylis eragrostis (Nees) Hance var. nigrobrunnea (Thwaites) Hooper (F. n.), Kyllinga brevifolia Rottboell var. stellulata (Valck, Sur.) Hooper (Cyperus brevifolius (var s.) Pycreus diaphanus var. gracilescens (Kueken.) S. Hooper (Cyperus latespicatus var. g.), Zingiber neesanum (Graham) Ramam. (Alpinia n.), and Gastrochilus flabelliformis (Blat. et McCann) Saldanha. In this work, very little was done with the Pteridophyta (only 11 pages in the treatment at the end of the volume), however, with the following new taxa: Christella meeboldii (Rosenst.) Holttum comb. nov. (Dryopteris m.), Pseudocyclosorus ochthodes (Kunze) Holttum comb. nov. (Aspidium o.), and Trigonospora ciliata var. angustiloba Holttum var. nov. In the structuring of this flora, the scheme proposed by A. Cronquist ("Evolution and Classification of flowering plants"; 1968) has generally been followed. Authors of individual family treatments include besides the two editors, K.N. Gandhi, T.P. Ramamoorthy, R.E. Holttum, S. Hooper, W.D. Stevens, B.C. Stone, and perhaps others. (A listing in front of all authors would have been commendable). Several botanist-artists also contibuted their talents. This flora is indeed a model for others to follow.

GMH

"LEXIKON ZUR ARZNEIMITTELGESCHICHTE. Band II: PHARMAKOLOGISCHE ARZNEIMITTELGRUPPEN: SACHWORTERBUCH ZU IHRER GESCHICHTE" by Wolfgang Schneider, 90 pp.; Govi-Verlag GmbH, Pharm. Verlag, Frankfurt a/M., 1968, price not given by publisher.

The introduction of this linen-bound volume is followed by the alphabetically arranged series of pharmacological/therapeutic class names, starting with the abortifacients (Latin: Abortiva) and finishing with the Vulneraries (Latin: Vulneraria). The terminal Register, instead of giving references to pages as conventionally done, cites the equivalent words when used as chapter headings, or simply refers to "kapitel" (chapter) where the class has been described under that name. Thus, for instance, "Adurentia" is referred to "Casutica", while under "Caustica" the word Kapitel shows that the caustic drugs are discussed under this heading. There are about 200 "Chapters". The terms are those which have been used in the literature over the past two centuries (approx.) from roughly 1740 to the present time. In the case where a therapeutic term (such as Abführmittel (laxative) covers several categories, these are listed in the Register. (Abführmittel is followed by four other categories: cathartics, cholagogs, panchymagogs, and purgatives, and following these by 10 other categories where laxatives at least formerly represent a part of the total therapeutic "management", such as antirheumatics).

In the individual chapter, defintions are given with examples and references to the same. The examples cited are all either crude drugs or chemicals, with an occasional synthetic compound. Thus, under febrifuges (antipyretics), with six subclassifications showing mode of action, nitrous ether and antipyrine are cited as examples of those which act by dilation of blood vessels in the skin. The tranquilizers (ataractics) of current popularity are taken up under Sedatives, which includes definitions of writers of about 1750, 1830, 1910, and 1950. Naturally some of the terms are never now seen. Thus, as an instance, the Deapyetica (19th Century) are defined as agents favoring suppuration; the current terms are suppurants, pustulants, leucotaxic agents, etc. Terms which were not noted in index: Delirifacients, disinfectants, cardiac depressants; cholinergica and anticholinergica; adrenerigica and nasal decongestants.

GMH

"A PHYSICIAN'S POSY" by Dr. Dorothy Shepherd, Ed. 2, 256 pp., Health Science Press, Rustington, Sussex, England, 1969, 30 s.

The first edition of this book came out in 1952. It is made up of a series of essays on 22 medicinal crude drugs from Arnica to Yarrow (A-Y), followed by a bibliography and several indexes. The original intention of the author, who is a Homeopathic physician, was to present 26 drugs, one for each letter of the alphabet and in the same order. (Yarrow was added in ed. 2.) The entry name used varies - in some cases it is the Latin title (ex. Nux Moschata), in others the botanical origin (ex. Arnica montana), in others the English name (ex. yarrow), and in still others the generic name (ex. Gelsemium). The information is the usual things about origins, properties, and uses. with considerable embroidery of folk lore, popular ideas, traditions, legend, and anecdote. Much of the information about medicinal usage arises from the authoress' personal practice over many years. The

impression left from perusal of this book is that much of the medical benefits from herbal medicine are substantial and genuine even when these cannot be demonstrated by the usual scientific means. Of course one can always revert back to the old hackneyed idea that a large psychological (or psychosomatic) element is present in the effective use of some of these herbs. If the authoress is looking for drugs beginning with the four missing letters, here are some suggested topics: J for Juniper, W for Wormwood or Water cress, X for Xanthoxylum (or Prickly Ash Bark or Berries) and Z for Zedoary or Zingiber(L. ginger).

GMH

"AN ANNOTATED BIBLIOGRAPHY OF SOYBEAN DISEASES, 1882-1974" by J. B. Sinclair and O.D. Dhingra, viii + 280 pp., International Agricultural Publications, INTSOY Ser. No. 7, College of Agriculture, Univ. Illinois at Urbana-Champaign, 1975, Gratis, (Formerly $12.00).

More than 2275 citations to the literature are presented, together with a commentary or abstract - sometimes a few words, sometimes a long paragraph. The arrangement is by alphabetic order of the senior author's name. Usually the abstract is based on the author's own. The index gives a competent coverage of the contents being divided into five chief sections: fungi; bacteria; nematodes; viruses; and miscellaneous agents, each with its own alphabetic sequence. The guide will be of interest to persons seriously interested in Glycine max, mycologists, bacteriologists, nematologists, virologists, and of course agriculturalists.

GMH

"THE FILAMENTOUS FUNGI, VOL. II: BIOSYNTHESIS AND METABOLISM" by J. E. Smith and D. R. Berry (Editors), XIV + 520 pp., 132 figs., 45 tabs., John Wiley and Sons, (Halsted Press), 605 Third Avenue, New York 10016, 1976, $47.50.

Twenty two authors contributed to the 17 chapters of this book dealing with the life processes and chemical by-products of fungal organisms. (These authors are mostly English, Scottish, and Canadian). A first chapter tells how the growth of fungi is altered by changes in the various parameters - including temperature, oxygen supply, CO_2, H^+ ion concentration, etc. The next chapter details the transport and translocation of water and solutes in the filaments, including the various methods of study by which these processes are explored. Chapter 3 is devoted to glycolysis (or glucolysis) which is broadly defined to include the conversion of sugars into smaller molecules - an extremely important segment of metabolism which proceeds either aerobically (tricarboxy acid cycle, TCA) or anaerobically (a much less efficient process). The following chapter is concerned with the origin and chemical activity of mitochondria, cell inclusions, abundantly present in the bacterial cell and important to cellular differentiation. Chapter 5 discusses anaplerotic pathways (a replenishment process involving

enzyme systems which supply fresh amounts of an intermediate which has been depleted by growth process). Chapter No. 6 deals with the very important fatty acids, particularly as to their synthesis in the fungi - both saturated and unsaturated, straight chain and branched, cyclic and hydroxy fatty acids. Next is a chapter which concerns nitrogen metabolism, the single most important metabolic component of the organism. The utilization, transport, catabolism, and biosynthesis of the several amino acids is reviewed. In chapter 8, the closely related and supremely important nucleic acids are treated in detail and the important cell reproductive RNA-DNA processes given proper attention. Chapter 9 reviews the reserve carbohydrates in fungi, treating of polyols, glycogen, starch, and other polysaccharides. In the Chapter 10, the lipid-protein make-up of the various fungal cell membranes is taken up - plasma, nuclear, metachondrial, and vesicular. The rigid cell wall which surrounds and protects the protoplasm body of the fungal cell is described and discussed in Chapter 11. It will come as a surprise to some to learn in Chapter 12 that hormones and hormonal systems are present in the filamentous fungi. With Chapter 13, many data are reproduced on the biosynthesis of terpenes and steroids - important because some of these are related to some important medicinals (ex. vitamin D from ergosterol). Chapter 14 is devoted to the carotenoids, tetraterpenoid pigments which are synthesized only in plants, where they are widely distributed. Polyketide biosynthesis is very strongly developed in the Fungi (especially the Fungi Imperfecti) and this is reviewed in depth in Chapter 15. Patulin and other antimicrobials are among the products of this synthesis. Chapter 16 is concerned with secondary metabolites derived through the shikimate-chorismate pathway (shikimic acid was so named because it was first discovered in "shikimi", Japanese word for Illicium anisatum, important as an intermediary in the biosynthesis of the three aromatic amino acids). Chorismic acid is another intermediate in this same pathway and is the precursor of several carboxy acids (including salicylic acid), the ubiquinones, vitamin K, etc. This process is pretty well restricted to plants including the fungi and is of practical importance since they proceed to such compounds as the ergot alkaloid, psilocybin (of much current interest as an hallucinogen), the betalains, coumarins, and many other interesting compounds. The last chapter in the book expounds on secondary metabolites developed from the non-aromatic amino acids, such as alanine. Various alkaloids (ex. muscarine), the penicillins, cephalosporins, and scores of other interesting and often complicated compounds are biosynthesized in the fungi in this group of intermediate compounds.

GMH

"BACTERIAL METABOLISM" by (Miss) Marjory Stephenson†, Ed. 3, xiv, 398 pp., many figs. & tabs., MIT Press, Mass. Institute of Technology, Cambridge, Mass, 1966, (paperback Series No. 50), $2.95.

The present volume is a reprint, apparently unchanged, of the edition of 1949 (manuscript completed 1947; the author died in

1948), but in spite of its being effectively 19 years old, yet it represents a valuable reference volume on the subject with 62 pp. of references, many rich tables, a detailed index, and a condensed and well written text. Miss Stephenson of Cambridge was herself a productive research worker, who among other achievements developed the "washed cells" technic for obtaining bacterial enzymes. Some chapter headings will give a better idea of the book: Fermentation; the metabolism of nucleic acid and its derivatives; enzyme variation and adaptation.

GMH

"AN ANNOTATED CATALOGUE OF THE VASCULAR PLANTS OF WEST PAKISTAN AND KASHMIR" by R.R. Stewart, xviii + 1-1028, 1 map, 1 portr., Gordon College, Rawalpindi, Pakistan, 1972.

This thick volume represents one section of "Flora of West Pakistan" edited by R. Nasir and S.I Ali (see review elsewhere). The author now long since retired (he is 87 years old) has made a most valuable contribution in this detailed listing of the plants of Pakistan. For many years he served as Principal of Gordon College in Pakistan at the same time carrying on at every possible moment his studies of the plants of the area, using his vacations and leaves of absence either in the Punjab or Kashmir or in London or New York to collect, compare specimens, and search for information in libraries. If his time were to be taken into account, the value of this volume would be very great indeed. (The reviewer counts himself privileged to have known Dr. Stewart). The Introduction is absorbingly interesting, telling as it does of the area and botanical studies there, the needs of further studying of this enormous extent of land, and the types of plant which occur here. (Besides printers' errors, one error detected is the name Juniperus Polycarpa, which should have appeared as a synonym after the accepted name, J. excelsa (see p. 27). Quite a few taxa are mentioned as unpublished (ined.). 20 new combinations were noted including: Bothriochloa bladhii (Retz.) S.T. Blake var. punctata (Roxb.) (Andropogon p.); Digitaria adscendens subsp. chrysoblephara (Fig. et de Not.) (D. c.); D. ciliaris var. criniformis (Hen.) and var. chrysoblephara (Fig. et de Not.) (D. c.); Epipactis helleborine var. thomsonii (Hk. f.)(E. latifolia var. t.); Carex curta var. maxima (Kuek.)(C. canescens var. m.); Polygonum rottboelliodes var. tibetica (Hk. f.)(P. tubulosum var. t.); Stellaria cheriae var. polyantha (Edgew. et Hk. f.); Capparis spinosa var. mucronifolia (Boiss.) Hedge et Lam. comb. nov. (C. m.); Prunus rechingeri (Browicz) (Cerasus r.); Sibbaldia cuneata var. micrantha (Hk. f.)(Potentilla sibbaldi var. m.); Syzygium cumini var. caryophyllifolia (Du.)(Eugenia jambolana Lam. var.c.); Bupleurum longicaule var. hazarica (Nasir) Nasir comb. nov.; Ligusticum stewartii (Hiroe) Nasir comb. nov. (Selinum s.); Platytaenia lasiocarpa (Boiss.) Rech. f. et Riedl. (Peucedanum l.); S. stewartianum (Nasir) Nasir comb. nov. (Bunium s.); Centaurium pulchellum var. caspica (Griseb.)(Erythraea r.); Lepidagathis incurva var. ustulata (Nees)(L. u.); Inula cernua (Dalz.) (Vicoa c.); I.

clarkei (Hk. f.)(I. obtusifolia Kern, var. c.); Tanacetum eriobasis (Rech. f.)(Chrysanthemum e.). The following new specieas (unpublished) are mentioned: Aegopodium burttii E. Nasir; Cortia schmidii E. Nasir; Ormopterum tuberosum E. Nasir; there is also one other, Platytaenia lasiocarpa subsp. radiata Rech, f. et Riedl. subsp. nov. and a new hybrid, Veronica leucothrix Penn. hybrid. nov. In addition are found eight other changes as follows: new names: Carex borii Nelmes forma lutea; Ziziphus mauritiana Lam. var. fruticosa (Haines)(Z. jujuba Lam. var. f.); Z. Maur. var. spontanea (Edgew.)(Z. j. var. s.); Nepeta royleana (N. salviaefolia Royle ex Bth.); and Jurinea himalaica (J. Macrocephala Hk. f.); and forma foliosa (Royle)(A. f.); and Onobrychis laxiflora Baker var. shugnanica (B. Fedtsch.) Ali stat, nov. (O. s.). There are a number of other features of value and interest: a list of authors with abbreviations; a list of collectors in West Pakistan (and the corresponding area of India) and Kashmir; and the large index. The "Flora of West Pakistan" now in process of publication will no doubt add and change many taxa but this enormous compilation of the plants of West Pakistan (originally India) will remain as a basic work for the area.

GMH

"THE THOMPSON BEGONIA GUIDE" by Mildred L. Thompson, (second edition), Volume 1: XVIII + 18 + 54 + 150 + 36 + 20 + 10 + 12 pp. (total 318 pp.) 98 figs., Edward J. Thompson (Publisher) Southampton, New York, 1976.

This series of large loose-leaf volumes (letter size) contains a great deal of information on the important ornamental genus of Begonia, leading member of the family Begoniaceae. The first volume (like the other volumes) is divided into its various topics by yellow cards, making it easy to find the various sections of the work. Volume I has eight subdivisions. Titles and letter designations are used for each. The first, Classification System (CS), starts out with an historical account of the genus. Rather surprisingly the American begonias were discovered by the Spanish conquistadores. We rarely think of these rather violent men as being interested in acquiring more than gold or silver. However, Hernandez, who accompanied the soldiers, described the genus in his work "Nova Plantarum" before 1577. Unfortunately his entire work was never published, only excerpts, and much of the manuscript has been lost to us. The section continues with a system of horticultural classification, with division into eight groups (cane-like, shrub-like, etc.) Subdivision A, Alphabetic Listing, is next, with 54 pages devoted to species, hybrids, and cultivars. Synonyms are also included so that the coverage is quite complete, with numerous cross-references. This listing begins with Begonia 'A. D. Davis' (a cultivar), which is briefly described) and ends with B. 'Zugbow', another cultivar. There are also references to entries in a separate classification following and to a listing of the putative parents. (Addenda and corrections follow). Classification Listing (C) represents the main entry place of all

entities, species, hybrids, and cultivars, listed alphabetically in their respective horticultural groups. For each entry there are listed: country of origin, date of first published description, the name, and reference symbols, which last key into listings of authors, reference books, and serials given in the Introduction. The next subdivision, Parentages of Hybrids, P-1 to P-34, records the hybrid or cultivar name, then the parents, pistillate first, staminate last. Much of the information in this section came from the hybridizers. (An addenda and correction section follows). The Glossary of Descriptive Botanical Terms (G) is the next subdivision and this cotains in alphabetic order, hundreds of technical terms used in describing the various parts of the begonia plant. Illustrations help to make the terms more understandable. The Appendix (Ap) includes a listing of "unclassified" begonias, arranged alphabetically; these entries represent begonia entities which are not fully described in the literature; as much information as is available about them is given. Also given here is a list of the registry numbers of entities (cultivars) as recognized by the American Begonia Society. The final subdivision in volume I is the Bibliography (Bi), which lists books and journal articles (by author), journals devoted partly or wholly to Begonia, current catalogs, and discontinued catalogs. This work on the begonias, all three volumes, represents truly a "labor of love" by the writers, who deserve much praise for a compilation which took infinite pains, great perseverance, the utmost patience, and a great deal of that most precious commodity - time. The contents of the three volumes represent largely the personal experience of the authors together with the records of experience of other growers with whom the authors have been in contact. Thus even though the published literature is drawn on, the work is mostly original.

GMH

"THE THOMPSON BEGONIA GUIDE" by Mildred L. and Edward J. Thompson, (second edition), Volume II: ix + 132 + 52 + 73 + 18 + 14 (total 298 pp.), 159 figs., Edward J. Thompson (Publisher), Southampton, New York, 1976.

In this loose-leaf volume, there are five chief sections: (1) Historical Excerpts (H): this the largest section includes excerpts from the ancient to more modern literature from various botanical and horticultural publications. The original copy is reproduced from English, Latin, German, and French texts, with translations into English. These excerpts date from 1651 to 1894. Section (2) is concerned with Bloom Information (B), with tabular alphabetic listing of Begonia species bearing information on the color of flowers, time of flowering (anthesis), and amount of flowering (i.e., whether profuse, moderate, or sparse). There is one alphabetic list for species and a separate alphabetic listing for cultivars. Close up photos of the flowers are also shown for many of these entities, demonstrating the floral characters of the various groups. The third section deals with the Details of Begonia Culture (DC) in various parts of the USA and of the world.

Included here are articles by various practical growers telling of their experiences and practices, with illustrations. Appended is a section with brief biographies of the various contributors. Section four bears Cultural Listings (L), with lists of Begonias appropriate for beginners, for advanced growers and for collectors; also listed under each are the various horticultural types with the species or cultivars recommended in each category. Further lists are given of miniature and dwarf types, begonias suited for hanging containers, and so forth. The fifth and last subdivision takes up Propagation (PR), in which details are given for propagating from stem cutting, leaf cuttings, and seeds. This section again is profuse with illustrations to facilitate understanding of the text.

GMH

"THE THOMPSON BEGONIA GUIDE" by Mildred J. and Edward J. Thompson, (second edition), Volume III: xviii + 286 + 76 + 4 + 18 (total 402 pp.,), 743 figs. Edward J. Thompson (Publisher), Southampton, New York, 1977.

More than 1800 species and cultivars of Begonia are being grown today. The authors have presented in this and the two preceding looseleaf volumes information on all of them. The first part of the third volume consists of an article on the species B. foliosa HMK, which is the favorite begonia of the two authors. The first sub-division of the text is titled "Culture of Begonia" (CB) and takes up in great detail by groups the minutiae of cultivation of the many Begonia forms. The main divisions of the text in these books is by use of green cards; the sub-groups within each are separated with yellow cards. In the case of BC, a division is made first into general culture and then culture by groups. Under general, many factors and practices are considered: the environment, potting, grooming, watering, plant nutrition, and the diseases and pests known to attack members of the group. Culture by group considers the special characteristics of and treatments needed for members of cane-like, shrub-like, thick-stemmed, and other types of the genus. Other sub-sections deal with hanging containers; contained atmospheres (growing in terrariums); naturalistic growing (growing on such natural habitats as rocks, driftwood, etc.); growing environments (in windows, under fluorescent light, in outdoor gardens, in the greenhouse); hybridizing (by B.N. Kusler). The next major section is a Pictorial Review (R) with a multitude of excellent black-and-white mostly original photographs showing many representatives (with 420 entities) of each horticultural type. The Appendixes (Ap) follow: Appendix A gives information on the American Begonia Society (*1932); Appendix B lists 23 concerns or persons (with addresses) which sell begonias. The last section in this volume and in the whole work is a Bibliography (Bi) representing a completely revised revision of the one appearing at the end of volume I. About 370 books and periodical articles, serials, and old and current catalogues are included. It is manifest that the authors are in love with this beautiful group of flowering plants.

GMH

"THE LIPASES OF THE HIGHER PLANTS" by Elsa Ullmann, (Universität München, Germany) Die Lipasen der höheren Pflanzen, Pharmazie 14(2): 57-67, 1959.

A review of the part played by lipases in metabolic processes of the cell, in seeds (with the effect of light on lipolysis in germinating seeds); occurrence in higher plants; preparations and their stabilization; properties (pH effects, substrate specificity, optic or stereochemic specificity, and applications), 139 references.

GMH

"MARCEL PROUST AND ILLNESS" by Fritz Usinger, Mediz. Monätsspiegel 1964, No. 6: 123-9 (1964). (Also 2 plates).

This outstanding French novelist was said physically sick (asthma) and mentally deranged (homosexuality). This article discussed the effects of his illness on his work. His father was a physician and an outstanding medical scholar of the times.

GMH

"COMMITTEE ON PRACTICING PHARMACY IN DISPENSARIES (Commission de l 'exercice de la pharmacie d'officine)", various authors, Reports, 18th General Assembly International Pharm. Federation, Brussels, 6-15 Sept. 1958. 182 pp., contents in 3 languages (English, French, German).

Dispensing pharmacy in the world of today (J. Lesur); Reflections on the protection of the pharmacist as a compounder of medicines (S. Björn). The protection of the quality of the medicine supplied from the dispensing pharmacy. (M. Hardy). The repercussions on the control by social security over pharmacies and the consequences deriving from it (Hans Meyer). Notes on answers to the report of the Internat. Assn. of "Mutuality" (Health insurance) (H. Spillmann). International code of ethics for pharmacists (Frank Arnal).

GMH

"FLORA OF TAIWAN, VOLUME FOUR" by various botanists, xii + 1-994, 373 pls., Epoch Publishing Co., Ltd., Taipei, Taiwan, Republic of China, 1978, US $35.

This definitive flora of Taiwan (Formosa) was written under the editorial direction of five botanists headed by Dr. Hui-Lin Li (University of Pennsylvania). The various families were assigned to 18 co-authors, each having the care of from one to several families. Thus Hui-Lin Li, Chairman of the Editorial Committee, was responsible for 18 families, among them such large groups as the Compositae, Scrophulariaceae, Apocynaceae, and Ericaceae. All of the co-authors are Chinese with the exception of two. As in the previous three volumes the text shows a marked degree of accuracy, as far as could be determined. Not a single factual, grammatical, or typographical error was noted in sample readings. This six

volume work is intended to cover all known native vascular plants and some of the introduced and cultivated ones found on Taiwan. At least one figure has been exhibited for each genus. 26 families are included in this volume, the last of those in the Dicotyledoneae, the preceding two volumes having also been devoted to this group. Volume Five will deal with the Monocotyledoneae while the sixth and last volume will contain the general index, bibliography, and a check list together with the addenda and errata uncovered in the preceding volumes. A flora is intended to present keys to and descriptions of the established plants of an area. Only occasionally are new forms described or other changes made. In the present volume, there are a few such: a new variety; Tripterospermum taiwanense var. alutaceofolium Liu et Kuo; a new status is given Chimaphila taiwaniana Masamune: it is reduced to the status of a variety: C. japonica var. taiwaniana (Masamune) Hsieh. Four new combinations are proposed in Cheilotheca, Parachampionella, Ixeris, and Youngia. This pioneering flora is a first step in the writing of floras for the Asiatic mainland of China and it is a most admirable first step.

GMH

"FRENCH-ENGLISH SCIENCE DICTIONARY FOR STUDENTS IN AGRICULTURAL, BIOLOGICAL, AND PHYSICAL SCIENCES..." by Louis De Vries, Ed. 3, ix + 655 pp., McGraw-Hill Book Company, Inc., New York, 1968, $10.50.

This dictionary is one of several in the McGraw-Hill Library of International Dictionaries, which includes works in German, Chinese, Portuguese, Spanish, and other languages, besides French. The 3rd edition was prepared by using the text of the second edition then adding as a supplement some 5,000 new terms in the form of an appendix (pp. 535-635). Another addition was made in the form of a grammatical guide for translators (at the end of the section of abbreviations.) This guide is useful not only to translators but also to students of the French language. As would be expected with any dictionary, several terms could not be found defined, including the following: rhum(e) des foins (hay fever), fichier (file, dossier ?), champignon des bruyères (field agaric), pelot de neige (snowball tree (Viburnum opulus)), viorne (Virburnum), patience crépue (Rumex crispus, dock), huile miellée, chromatographie sur couche mince (thin layer chromatography), capteur, chaude-pisse (gonorrhea), varec (or varek) (kelp, ash of algae), paliure, gelule (gelatin capsule), physalie (Portuguese man-of-war), courge bouteille (lagenaria species), courge pépon (pumpkin), courgette (vegetable marrow), antiverruque (anti-wart), ressence, plastidome, onirisme, athérure. Some abbreviations that could not be found were: UT (unité de tuberculin), RU (Royaume Uni, the United Kingdom), CS (Caoutchouc synthetique), CCM (thin layer chromatography). A few additional definitions: cache (guard for screening parts of photo negative), remontant (tonic), potiron (squash), tri (selection). The Dictionary contains no proper nouns, such as geographic names, however, there is a limit to what such a reference book can contain. Such a specialized dictionary as this

can hardly be expected to include many general terms and this work does not supplant a dictionary of French of the ordinary type. This special dictionary includes the vocabularies of biology, botany, zoology, embryology, cytology, physiology, morphology, genetics, and many other disciplines. It is a job very well done indeed!

GMH

"OPIUM POPPY (OPIINYI MAK)" by P. M. Zhukovskii and N. A. Bazilevskaya, Reprint of Chapter XV of "La Turquie Agricole--Krashkaw", pp. 476-507, (published in Moscow, 1933), (Transl. from the Russian), 40 pp., 11 figs. 3 tabs., Agricultural Research Service, U.S. Dept. of Agriculture, Available from the U.S. Dept. of Commerce, NTIS, Springfield, VA, 1975 Price?.

This is a very informative exposé of the methods of production of opium poppy and opium, with a great deal of data on the distinction of the different varieties of Papaver sommiferum as grown in Turkey. The origin of the opium poppy and its cultivation and the history of opium use are given detailed treatment.

GMH

CORRECTIONS FOR PHYTOLOGIA 29 (5): 425; 1975

1) America's Systematics Collections. Publisher should have been given: Smithsonian Institution, Washington, DC

2) p. 429.
"Annual Review of Ecology and Systematics". Publisher was omitted: Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California

Acknowledgement

This and the six previous publications of book reviews (Phytologia 27(3): 180-208; 1973. - 29(5): 395-445; 1975. - 30(6): 488-504; 1975. - 31(1): 30-61: 1975. - 34(1): 95-144; 1976. - 37(2): 98-176; 1977) were supported by a Faculty Grant-in-Aid (No. 73-57) of Misc. Grants Fund 2775-17-5240 (Auburn University, Auburn, AL), for which the reviewer is grateful.

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Price of this number $2.00; per volume $9.75 in advance or $10.50 after close of the volume; 75 cents extra to all foreign countries; 512 pages constitute a full volume; claims for numbers lost in the mails must be made immediately after receipt of the next following number.

TYPIFICATION AND IDENTITY OF ANDROPOGON SACCHAROIDES SWARTZ VAR. POLYTRICHUS GRISEBACH

Kelly W. Allred
Tracy Herbarium, Department of Range Science, Texas A&M University, College Station, Texas, 77843.

In 1879 Grisebach described Andropogon saccharoides Swartz var. polytrichus. His brief description states only, "leaves softly pilose throughout, convolute; nodes appressed sericeus," and no specimens are cited. This entity has apparently been mentioned only twice in the botanical literature; once in the original description and a second time by Hackel (1889) when he listed the name as a questionable synonym of A. saccharoides var. berteronianus Steudel. Hackel evidently did not have access to any specimens of this variety as he was uncertain of its placement. No further references to this variety can be found.

In the course of a taxonomic investigation of the Bothriochloa (Andropogon) saccharoides complex, I had occasion to examine material of this variety from Grisebach's herbarium at Göttingen (GOET). The single sheet bears five plants, only one of which possesses an inflorescence.

The fertile specimen is neither an Andropogon nor a Bothriochloa. Its morphological features agree perfectly with specimens and the description of Sorhastrum nutans (L.) A. Gray subsp. pellitum (Hackel) Burkart.

A brief description of the specimen follows: Plant perennial, ca. 55 cm tall; nodes sparsely short-hirsute; sheathes subglabrous, continued upward at the collar into short sheath-auricles; leaf blades 8-11 cm long, 2 mm wide, convolute, sericeus-pilose on both surfaces, markedly pilose in the throat; panicle 7.5 cm long; spikelets in pairs of one sessile and one pedicelled, the pedicelled one actually lacking and represented by the pedicel only; sessile spikelets 5.2-5.6 mm long, scattered-pilose with tawny hairs on the back, only 6 spikelets remaining; awns 9-12 mm long, pedicels 2.5-4.3 mm long, terete, long ciliate.

The label reads:

FLORA ARGENTINA
470 Andropogon saccharoides Sw. var. polytrichus Gr.
[this in Grisebach's handwriting]
Bei las Ramadas (Höhle)
unweit San Miguel;
Sierra Arbola de Cordoba

14-III-1876 Leg. G. Hieronymus

The International Code of Botanical Nomenclature makes it clear that holotypes, syntypes, and lectotypes are all specimens that have been cited in the protologue (see Article 7 and Guide for the Determination of Types). Guédès (1978) argues that "indicating a type is mentioning in a published outlet that one specimen definitely singled out as such is deposited in some definite place." Indications of intent by an author of a name, such as annotations on herbarium sheets, are useful in choosing a type, but do not satisfy the requirements for formal typification. Since Grisebach cited no specimens (directly or indirectly) in his description, technically there can be no holotype, syntypes, isotypes, or lectotype for the name Andropogon saccharoides var polytrichus Grisebach. Therefore, a neotype must be choosen.

The specimen in question is selected as a neotype for these reasons: 1) The specimen was seen by Grisebach and he identified it as his var. polytrichus; 2) The specimen is from Grisebach's herbarium; and 3) All data from the specimen (both morphological features and label information) agree with the protologue.

The formal typification is as follows:

Andropogon saccharoides Swartz var. polytrichus Grisebach
Abh. Konigl. Ges. Wiss. Göttingen 24: 309. 1879.
Neotype: G. Hieronymus 470. 14 March 1876. (GOET).

Literature Cited

Grisebach, A. 1879. Symbolae ad floram Argentinam. Abh. Konigl. Ges. Wiss. Gottingen 24: 1-345.

Guédès, M. 1978. Did Linnaeus ever indicate a type? Taxon 27: 128-129.

Hackel, E. 1889. Andropogoneae. In DeCandolle and DeCandolle. Monographiae phaneroganarum prodromi. Paris.

STUDIES IN NEOTROPICAL SENECIONEAE, COMPOSITAE
I. REINSTATEMENT OF GENUS LASIOCEPHALUS

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In the process of reassessment of the generic status of the Andean species of Senecioneae, the evaluation of the Schlechtendal genus Lasiocephalus is of major importance. Since Bentham, most of Lasiocephalus species, along with a few hundred other members of neotropical Senecioneae, have been treated as belonging to the large and heterogeneous genus Senecio. I have followed this wide concept in previous years while gathering material and information for a review of the northern Andean species. Many of the latter were known to depart from the natural concept of Senecio L. It was on this basis that genera like Paragynoxys Cuatr. (1955), Paracalia Cuatr. (1960) and Pseudogynoxys Cabrera (1950), among others, were established.

It is not my purpose to review the situation of the Senecioneae now. At this time I am particularly concerned about the large number of Andean species which fall into the sections Microchaete Benth., Triana Cuatr., Streptothamni Greenm., Aetheolaena Benth. and Culcitium auct. var., including Lasiocephalus, and the urgency to clarify their generic status. The first step in that direction already has been taken with the revival of the generic name Pentacalia Cassini by Robinson & Cuatrecasas (1978) on the occasion of a revision of the Central American species of that genus; see the comments made in that paper.

The genus Lasiocephalus was established by Willdenow, but published by Schlechtendal (1818), based on two species: L. ovatus and L. lingulatus, both from the high Andes of Ecuador. S.F. Blake (1937) reviewed Schlechtendal's work and transferred the two species to Culcitium, in accordance with the artificial concept prevailing at that time. When I merged the artificial concept of Culcitium into Senecio (Cuatrecasas 1950, p. 47, 48, 51; 1951, p. 38, 73), both species of Lasiocephalus were transferred to Senecio. On the other hand, B. Nordenstam (1978), in an important recent paper on the taxonomy of the Senecioneae, has reestablished the genus Aetheolaena Cassini, typified by Cacalia involucrata HBK. Most of the 18 additional species included in his treatment were extracted from Senecio sensu amplissimo; they are among themselves very closely related, suffrutescent climbers with discoid capitula forming a very natural group. But a few other species included are "ascending halfshrubs" which had been initially described as Culcitium or Lasiocephalus (C. ascendens Benth., C. puracensis Cuatr., L. lingulatus Schlecht.). Considering the range of variability of most of the characters, such as the structure of the calycle, number of phyllaries in the involucre, size of the capitula, number of flowers in each, shape of the leaves and apical appendage of the stylar branches,

it would have been difficult to exclude from the new genus the above mentioned species of Lasiocephalus, formerly in Culcitium. These species not representing climbers are more or less flexuous subshrubs with tortuous, fruticose, often reptant ligneous bases; their leaves have more narrow-elliptic or oblong, subcoriaceous blades with revolute margins, the petioles tending to become broader or laminar and amplectant. The corollas may have an obvious campanulate limb or may be narrower, or broadly tubular, the variation being observed occasionally in a single head. Variation in size of the apical appendages of the stylar branches have been observed in specimens of L. lingulatus, puracensis, gargantanus, adscendens, and ovatus. In well preserved specimens the apical tuft of trichomes is usually well developed and very conspicuous, but sometimes it appears to be more or less reduced. Nevertheless, this feature has been found to be present in most cases for each species, indicating its generic significance. Because of the controversial case of Lasiocephalus ovatus, several specimens from widely dispersed localities have been closely examined. This examination indicates that L. ovatus should not be excluded from the concept of Aetheolaena sensu Nordenstam. Willdenow and Schlechtendal were both right in considering congeneric their two species of Lasiocephalus. Lasiocephalus ovatus conforms well with the characters selected and listed in the Nordenstam diagnosis of Aetheolaena. The species belongs to this relationship and it falls particularly close to the Culcitioid species. Its anthers are obtuse, ecaudate at the base, the endothecial cells have radial thickenings; the style branches are apically convex with a central coma of trichomes longer than the marginal crown of hairs. In some cases this character is less obvious, but in general it is consistent (e.g., Aplund 7412). The leaves in L. ovatus have a long petiole; this is membranaceous, laminar, appressed to the stem. These leaves are fundamentally like those in, e.g., L. lingulatus or L. puracensis. Lasiocephalus ovatus may be considered as derived from the lingulate type as a morphological adaptation to a higher altitude, the leaves increasing in number, becoming crowded, the blades becoming smaller and thicker, the petioles longer, flatter, appressed and imbricate; the heads become larger and the whole plant more densely woolly. This evolutionary adaptive variation in habit morphology takes place similarly in a convergent or parallel way in other genera that apparently migrated from a lower altitude to the superparamos.

An important parallel morphological change experienced by Andean genera of the Senecionae under the influence of the highest altitudes is the increase in number and length of the calycular bracts. These become more numerous and similar to the phyllaries in shape, they are imbricate, and their positions, progressively closer to the involucre, simulate a multi-seriate, imbricate involucre. This particular kind of calyculus develops along with an increase in the size of the heads; this disposition, when developed at maximum, is the characteristic of Culcitium H. & B. But the fact is that in all "Culcitia" the true involucre remains of the Senecio type: one row of subbiseriate, subuniform, closely parallel, linear or narrow-

elliptic phyllaries. The calcycle bracts are external and variable in number. They vary greatly with the species, and their presence cannot be used alone to characterize a genus. "Culcitioid" calyculate heads are found at high altitudes in members of several genera: Senecio, Lasiocephalus, Pentacalia, and in parallel ways in different sections of some of these. The plasticity in shape of some species in the ecologic zones of transition can be observed within the range of a single species, particularly, e.g., with the polymorphic L. otophorus.

An idea of the variability of some macrocharacters in Lasiocephalus is shown by the variation in size of the heads as seen in the number of the phyllaries and the number of flowers per capitulum. Among the typical Aetheolaena group of species, the number of phyllaries is 12-21, being most frequently between 16 and 21. The number of flowers goes from 30 to 100 (-140). In the Lasiocephalus culcitioid group, the involucres vary from 20 to 35 phyllaries, the number of flowers going from 105 to 406.

The genus can be divided into two subgenera: (1) Lasiocephalus with the species with flexuose ascending stems and somewhat larger heads; and (2) the Aetheolaena with the suffrutescent larger climbers with usually smaller heads.

Since L. ovatus is the type species of Lasiocephalus, this name takes priority over Aetheolaena Cassini. The following nomenclatural and taxonomic transfers will be necessary.

LASIOCEPHALUS Schlechtendal, ampliatum Cuatr.

Schlechtendal, Ges. Naturf. Fr. Berlin Mag. 8: 308. 1818. Type species L. ovatus Schlechtendal.
Aetheolaena Cass. Dict. Sci. Nat. 48: 453 (1827). Nordenstam emend. Opera Bot. 44: 53. 1978.
Senecio sect. Aetheolaena (Cass.) Hoffm., Pflanzenf. IV-5: 301. 1894.
Senecio sect. Reflexum Cuatr. in part, included type, Fieldiana Bot. 27(1): 51, 1950; 27(2): 73, 1951.

LASIOCEPHALUS CALDASENSIS (Cuatr.) Cuatr., comb. nov.
Senecio caldasensis Cuatr. Notas Fl. Colom. VI: 28. 1944.
Aetheolaena caldasensis (Cuatr.) Nord. Opera Bot. 44: 54. 1978.

LASIOCEPHALUS CAMPANULATUS (Sch. Bip. ex Klatt) Cuatr., comb. nov.
Senecio campanulatus Sch. Bip. ex Klatt, Leopoldina 24: 126. 1888.
Aetheolaena campanulata (Sch. Bip. ex Klatt) Nord. Opera Bot. 44: 54. 1978.

LASIOCEPHALUS CUENCANUS (Hieron.) Cuatr., comb. nov.
Senecio cuencanus Hieron. Bot. Jahrb. 19: 65. 1894.
Aetheolaena cuencana (Hieron.) Nord. Opera Bot. 44: 54. 1978.

LASIOCEPHALUS DECIPIENS (Benoist) Cuatr., comb. nov.

Senecio decipiens Benoist, Bull. Soc. Bot. France 83: 807. 1936.

LASIOCEPHALUS DORYPHYLLUS (Cuatr.) Cuatr., comb. nov.
Senecio doryphyllus Cuatr. Proceed. Biol. Soc. Washington 74: 18. 1961.
Aetheolaena doryphylla (Cuatr.) Nord. Opera Bot. 44: 54. 1978.

LASIOCEPHALUS GARGANTANUS (Cuatr.) Cuatr., comb. nov.
Culcitium gargantanum Cuatr. Rev. Acad. Colomb. Cienc. 5: 29, fig. 16. 1942.
Senecio gargantanus (Cuatr.) Cuatr. Fieldiana Bot. 27(1): 44. 1950.

LASIOCEPHALUS HETEROPHYLLUS (Turcz.) Cuatr., comb. nov.
Gynoxys heterophylla Turcz. Bull. Soc. Nat. Mosc. 24(2): 85. 1851.
Senecio pindilicensis Hieron. Bot. Jahrb. 19: 65. 1894.

LASIOCEPHALUS INVOLUCRATUS (HBK) Cuatr., comb. nov.
Cacalia involucrata HBK, Nov. Gen. Sp. 4: 130. 1818 ed. folio.
Senecio involucratus (HBK) DC. Prodr. 6: 422. 1838.
Aetheolaena involucrata (HBK) Nord. Opera Bot. 44: 54. 1978.

LASIOCEPHALUS LINGULATUS Schlechtendal, Ges. Naturf. Fr. Berlin Mag. 8: 309. 1818. Type: Humboldt, in Herb. Willdenow, Cat. No. 16435, metric label 4247/B, "Lasiocephalus lingulatus (W)" (holotype).
Cacalia arenaria HBK, Nov. Gen. Sp. 4: 129. 1818, ed. folio.
Culcitium ledifolium HBK, Nov. Gen. Sp. 4: 133. 1818, ed. folio.
Senecio sabulosus DC. Prodr. 6: 422. 1837.
Culcitium adscendens Benth. Pl. Hartw. 205. 1845.
Culcitium lingulatum (Schlecht.) Blake, Journ. Wash. Acad. Sci. 27: 390. 1937.
Senecio neoadscendens Cuatr. Fieldiana 27(1): 45. 1950.
Senecio lingulatus (Schlecht.) Cuatr. Fieldiana Bot. 27(1): 44. 1950.
Aetheolaena lingulata (Schlecht.) Nord. Opera Bot. 44: 54. 1978.

LASIOCEPHALUS LOESENERI (Hieron.) Cuatr. comb. nov.
Senecio loeseneri Hieron. Bot. Jahrb. 36: 510. 1905.
Aetheolaena loeseneri (Hieron.) Nord. Opera Bot. 44: 54. 1978.

LASIOCEPHALUS LONGIPENICILLATUS (Sch. Bip. ex Sandw.) Cuatr., comb. nov.
Senecio longipenicillatus Sch. Bip. ex Sandw. Kew Bull., 1941: 226. 1942.
Senecio nevadensis Wedd. Chl. And. 1: 97. 1856, non Boiss. & Reut. 1852.
Senecio pittieri Cuatr. Field. Bot. 27(1): 34. 1950.
Aetheolaena longipenicillata (Sch. Bip. ex Wedd.) Nord. Opera Bot. 44: 54. 1978.

LASIOCEPHALUS MOCHENSIS (Hieron.) Cuatr., comb. nov.
Senecio mochensis Hieron. Bot. Jahrb. 29: 68. 1900.
Aetheolaena mochensis (Hieron.) Nord. Opera Bot. 44: 54. 1978.

LASIOCEPHALUS OTOPHORUS (Wedd.) Cuatr., comb. nov.
Senecio otophorus Wedd. Chl. And. 1: 98. 1856.
Aetheolaena otophora (Wedd.) Nord. Opera Bot. 44: 56. 1978.

LASIOCEPHALUS OVATUS Schlechtendal, Ges. Naturf. Fr. Berlin Mag. 8: 309. 1818.
Gnaphalium uniflorum Lamark, Encycl. 2: 752. 1788, not. G. uniflorum Miller 1768.
Culcitium reflexum HBK. Nov. Gen. Sp. 4: 134, Tab. 362. 1818, ed. folio.
Culcitium uniflorum (Lam.) Hieron. Bot. Jahr. Engl. 19: 63. 1894.
Culcitium ovatum (Schlecht.) Blake, Journ. Wash. Acad. Sci. 27(0): 389. 1937.
Senecio reflexus (HBK) Cuatr. later homonym, not Senecio reflexus HBK, Fieldiana 27(1): 44. 1950.
Senecio superandinus Cuatr. Fieldiana 27(2): 38. 1951.
Type: Humboldt, monte Pichincha, Ecuador. Herbarium Willdenow Cat. No. 16434, metric label 4246/B, "Lasiocephalus ovatus (W)" (holotype). Humboldt & Bonpland "no. 2280 Culcitium reflexum mihi" in HBK herbarium, holotype of Culcitium reflexum (P), Photo. F.M. 37832. Bonpland 2280, Antisana, isotype (P).

LASIOCEPHALUS PATENS (HBK) Cuatr., comb. nov.
Cacalia patens HBK. Nov. Gen. Sp. Pl. 4: 129. 1818, ed. folio.
Senecio patens (HBK) DC. Prodr. 6: 423. 1838.
Senecio bullatus Benth. Pl. Hartw. 208. 1845.
Gynoxys prenanthifolia Turcz. Bull. Soc. Nat. Mosc. 24(2): 86. 1851.
Gynoxys auriculata Turcz. Bull. Soc. Nat. Mosc. 24(2): 86. 1851.
Aetheolaena patens (HBK) Nord. Opera Bot. 44: 56. 1978.

LASIOCEPHALUS PICHINCHENSIS (Cuatr.) Cuatr., comb. nov.
Culcitium pichinchense Cuatr. An. Univ. Madrid 4(2): 215, reprint p. 2, fig. 4. 1935. Type: Isern 308; MA, holotype; F, isotype.
Senecio pichinchensis (Cuatr.) Cuatr. Fieldiana Bot. 27(1): 44. 1950. Later homonym.
Senecio quitensis Cuatr. Fieldiana Bot. 27(2): 38. 1951.

LASIOCEPHALUS PURACENSIS (Cuatr.) Cuatr., comb. nov.
Culcitium puracense Cuatr. Not. Fl. Colomb. VI: 31. 1944.
Senecio puracensis (Cuatr.) Cuatr. Fieldiana Bot. 27(1): 44. 1950.
Aetheolaena puracensis (Cuatr.) Nord. Opera Bot. 44: 56. 1978.

LASIOCEPHALUS ROSANUS (Cuatr.) Cuatr., comb. nov.

Senecio rosanus Cuatr. Brittonia 8: 43. 1954.
Aetheolaena rosana (Cuatr.) Nord. Opera Bot. 44: 56. 1978.

LASIOCEPHALUS SENECIOIDES (HBK) Cuatr., comb. nov.
Cacalia senecioides HBK, Nov. Gen. Sp. Pl. 4: 129. 1818, ed. folio.
Senecio assuayensis DC. Prodr. 6: 422. 1838.
Aetheolaena senecioides (HBK) Nord. Opera Bot. 44: 56. 1978.

LASIOCEPHALUS SUBINVOLUCRATUS (Cuatr.) Cuatr., comb. nov.
Senecio subinvolucratus Cuatr. Feddes Repert. 55: 149. 1953.
Aetheolaena subinvolucrata (Cuatr.) Nord. Opera Bot. 44: 56. 1978.

LASIOCEPHALUS YACUANQUENSIS (Cuatr.) Cuatr., comb. nov.
Senecio yacuanquensis Cuatr. Not. Fl. Colomb. VI: 30, Fig. 23. 1944.
Culcitium karstenii Sch. Bip ex Benoist Bull. Soc. Bot. Fr. 95: 305. 1949. Nomen nudum.
Aetheolaena yacuanquensis (Cuatr.) Nord. Opera Bot. 44: 56. 1978.

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Nordenstam, Bertil, 1978. Taxonomic studies in the Tribe Senecioneae (Compositae). Opera Botanica 44: 1-83.
Robinson, H. and Cuatrecasas, J., 1978. A review of the Central American species of Pentacalia (Asteraceae: Senecioneae). Phytologia 40: 37-50.
Schlechtendal, D.F.L. von, 1818. Lasiocephalus eine neue Pflanzen-Gattung. Ges. Naturf. Fr. Berlin Magazin 8: 308-309.

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CORRECTIONS AND CHANGES IN RECENT PALM ARTICLES PUBLISHED IN PHYTOLOGIA

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I wish to make certain changes in "Preliminary Taxonomic Studies in the Palm Genus Orbignya Mart." (Phytologia 36, no. 2: 89-115. 1977); and "Preliminary Taxonomic Studies in the Palm Genus Maximiliana Mart." (Phytologia 38, no. 3: 161-172. 1978).

Orbignya article

P. 90. 3rd paragraph starting with "A total of 30 species ..." Change to 29 species. Second sentence. "Of this number, 18 (including six synonyms) ..." Change to 17 (including six synonyms).
Pp. 92-94. Key to species. Middle of page, starting with 1. Middle pinnae not clustered ...Replace the entire section of key with following:

1. Middle pinnae not clustered, more or less evenly spaced

    9. Male flowers completely encircling each rachilla of male spadix

        10. Plants acaulescent, fruits either 3.5-4.5 cm long or 11-14 cm long

            11. Male flowers 10-13 mm long, stamens 16-24 per flower, female flowers 3-4.5 cm long, fruits 11-14 cm long . . . . . O. cuatrecasana

            11. Male flowers 5-10 mm long, stamens 11-16 per flower, female flowers 1.5-2.5 cm long, fruits 3.5-4.5 cm long . . . . . O. polysticha

        10. Plants arborescent, 6-10 m tall, fruits 6-9 cm long

            12. Middle pinnae 4-5 cm wide, male flowers 10-12 mm long, stamens 20 per flower. .O. guacuyale

            12. Middle pinnae 5-7 cm wide, male flowers 13-15 mm long, stamens 24 per flower . . .O. cohune

    9. Male flowers on one side of each rachilla of male spadix

13. Middle pinnae 2.5-4 cm wide and 40-90 cm long

14. Stamens 9-18 per flower, male flowers 11-14 mm long

15. Stamens 9-13 per flower, male rachillae 5-6 cm long, female flowers 1.5-2 cm long and 1 cm in diam . . . . . O. sabulosa

15. Stamens 15-18 per flower, male rachillae 6-12 cm long, female flowers 3 cm long and 2 cm in diam . . . . . O. urbaniana

14. Stamens 18-24 per flower, male flowers 9-10 mm long

16. Plants acaulescent, stamens 22 per flower . . . . . O. pixuna

16. Plants arborescent, stamens 18-20 or 24 per flower

17. Stamens 18-20 per flower, trees 6-8 m tall . . . . . O. teixeiriana

17. Stamens 24 per flower, trees 15-20 m tall . . . . . O. phalerata

13. Middle pinnae 4-9 cm wide and 90-150 cm long

18. Plants mostly acaulescent, stamens 6-12 per flower, fruits 3.5-6 cm long

19. Petals of male flowers broader below and gradually narrowed above, stamens 6-8 per flower, fruits 6 cm long . . . . . Parascheelea anchistropetala

19. Petals of male flowers usually narrowed below and abruptly broadened above, stamens 12 per flower, fruits 3.5-4.5 cm long . . . . . O. sagotii

18. Plants arborescent, stamens 24 per flower, fruits 9-12 cm long . . . . . O. barbosiana

Maximiliana article

P. 163. Delete key to Maximiliana. It serves no purpose since the delineation of M. macropetala as a clear-cut species is

questionable.

P. 164. Correct name should be M. maripa instead of M. martiana because Palma maripa (1806) is the earliest valid epithet. Therefore, the synonymy for M. martiana in pp. 164-165 should be changed as follows:

M. maripa (Correa de Serra) Drude, Mart. Fl. Bras. 3: 452, t. 104. 1881. Palma maripa Correa de Serra, Ann. Mus. Hist. Nat. Paris 8: 75. 1806; Attalea maripa (Correa de Serra) Mart., Palmet. Orbign. 123. 1844; t. 167, fig. 3. 1845; Englerophoenix maripa (Correa de Serra) Kuntze, Rev. Gen. Pl. 2: 728. 1891.
Type: French Guiana (no specimens cited)
M. martiana Karsten, Linnaea 28: 273. 1857.
Type: published as a new name to replace M. regia Mart., 1826, a homonyn for M. regia Mart. in Schrank, 1819.
M. regia Mart. Hist. Nat. Palm. 2: 132, t. 91-93. 1826; Wallace, t. 47, 1853; Dahlgren, pl. 326-327. 1959; Engleophoenix regia (Mart.) Kuntze, Rev. Gen. Pl. 2: 728. 1891; Attalea regia (Mart.) Wessels Boer, Indig. Palms Suriname 150. 1965.
Lectotype: Brazil, prov. Marañon and Pará (Martius s.n.-M). d.f. Dahlgren, Pl. 327. 1959.

The remaining names (and their synonyms), except M. maripa, remain unchanged and in the same order: M. elegans, M. caribaea, M. longirostrata, M. macrogyne and M. stenocarpa.

NOTES ON NEW AND NOTEWORTHY PLANTS. CXVI

Harold N. Moldenke

SYNGONANTHUS GOYAZENSIS var. HATSCHBACHII Moldenke, var. nov.

Haec varietas a forma typica speciei recedit foliis usque ad 22 cm. longis 1 cm. latis utrinque dense longipilosis marginaliter ciliatis, vaginis dense patenteque villosulis.

This variety differs from the typical form of the species in having its leaves to 22 cm. long, 1 cm. wide, densely long-pilose on both surfaces, and densely ciliate along the margins, and the sheaths densely spreading-villosulous.

The type of the variety was collected by Gert Hatschbach (no. 40064) — in whose honor it is named — at Rod. Jatai-Caiaponia, in the municipality of Jatai, Goiás, Brazil, in brejo (sedge meadow), on July 24, 1977, and is deposited in my personal herbarium.

CLERODENDRUM VISCOSUM f. RUBRUM Moldenke, f. nov.

Haec varietas a forma typica speciei corollis rubris recedit.

This form differs from the typical form of the variety in having its corollas magenta to red or blood-red in color.

The type of the form was collected by Maser (no. 8) one-half mile west of Hitaura, Nepal, at an altitude of 450 meters, where it is the "dominant understory of Sal forest", on February 11, 1967, and is deposited in the United States National Herbarium at Washington.

This taxon is probably also the one represented by Shah 2041 in the Blatter Herbarium, which is said to have had blood-red corollas, and probably is also the plant depicted by Lindley in Edwards, Bot. Reg. 30: pl. 19 (1844), said to have been grown from seed received from Sri Lanka in or before 1843.

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ADDITIONAL NOTES ON THE GENUS AEGIPHILA. XXV

Harold N. Moldenke

AEGIPHILA Jacq.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 9—11, 21, 23—180, 631—633, 645—649, 651, & 652. 1977; Moldenke, Phytologia 40: 205—235. 1978; R. F. Sm., Act. Bot. Venez. 13: 193, 204, & 262. 1978.

López-Palacios (1977) gives a excellent and important review of this genus as it occurs in Venezuela, with a key to the accepted taxa.

AEGIPHILA ALBA Moldenke

Additional bibliography: Moldenke, Phytologia 40: 207--208. 1978.

In a personal communication to me López-Palacios records the following vernacular names for this species: "lulu", "masamorro", "mazamorro", "palo San Pablo", "salvaluca de montaña", and "totumillo blanco".

AEGIPHILA ANOMALA Pittier

Additional bibliography: López-Palacios, Fl. Venez. Verb. 25 & 645. 1977; Moldenke, Phytologia 40: 208—209. 1978.

AEGIPHILA ARCTA Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 24, 37—39, & 645, fig. 1. 1977; Moldenke, Phytologia 40: 209. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. 40: [38], fig. 1. 1977.

López-Palacios (1977) cites only Steyermark, Bunting, & Wessels-Boer 100334 from Yaracuy, Venezuela.

AEGIPHILA BOGOTENSIS (Spreng.) Moldenke

Additional synonymy: Aegiphila tomentosa López-Palacios, Fl. Venez. Verb. 42, 43, & 646, in textu. 1977 [not A. tomentosa Cham., 1832, not Cham. & Schlecht., 1934].

Additional bibliography: López-Palacios, Fl. Venez. Verb. 23, 25, 27, 29, 30, 39—42, 645, 646, & 649, fig. 2. 1977; Moldenke, Phytologia 40: 208—210. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [40], fig. 2. 1977.

Cuatrecasas has encountered this species at 2200—3100 meters altitude, flowering in February and fruiting in April. The corollas are said to have been "light-yellow" on Cuatrecasas 23639.

López-Palacios (1977) comments that "En los ejemplares venezolanos es digno de notarse que Aristeguieta 2568 tiene flores blancas de cerca de 3 cm. en antesis, y unas ramas con hojas opuestas y otras con hojas triverticiladas; que Ruiz-Terán 3010 es glabrescente; y que Little 14144 es de hojas triverticiladas." He cites the following from Venezuela: Lara: Steyermark 55265. Mérida: Garcia-Barriga 13294; Little 15144, Ruiz-Terán 3010. Táchira: Aristeguieta 2568; Bautista 83; López-Palacios 1081; Madriz 76. In a personal communication to me he lists the following vernacular names for the species in its typical form: "queso fresco" and "yuco blanco".

Additional citations: COLOMBIA: Caldas: Cuatrecasas 23354 (W—2817209). Cauca: Cuatrecasas 23639 (W—2817656). Valle del Cauca: Cuatrecasas 20812 (W—2817215), 22536 (W—2817210, W—2817211).

AEGIPHILA BOGOTENSIS var. AEQUINOCTIALIS Moldenke

Emended synonymy: Aegiphila meridensis López-Palacios, Pittieria 5: [34]—[37], fig. 8. 1973.

Additional bibliography: López-Palacios, Pittieria 5: [34]—[37], fig. 8. 1973; López-Palacios, Fl. Venez. Verb. 29, 43—47, 645, & 646, fig. 3 & 3a. 1977; Moldenke, Phytologia 40: 209—210. 1978.

Illustrations: López-Palacios, Pittieria 5: [37], fig. 8. 1973; López-Palacios, Fl. Venez. Verb. [44] & [45], fig. 3 & 3a. 1977.

López-Palacios (1977) notes that "Excepcionalmente, tanto en el material venezolano como en el ecuatoriano (Camp 5195) se encuentran algunas cimas 3-floras." He cites from Venezuela: Mérida: Bautista 3564; López-Figueiras & Rodríguez 8894; Ruiz-Terán, López-Figueiras, & López-Palacios 8245; López-Palacios 3013.

AEGIPHILA BOGOTENSIS f. TERNATA Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 43 & 645. 1977; Moldenke, Phytologia 40: 210. 1978.

López-Palacios (1977) notes that Little 14144 has its leaves ternate, while Aristeguieta 2568 has them opposite on some branches and ternate on other branches. These he cites from Mérida and Táchira, Venezuela. He also cites Lehmann 690, the type collection.

AEGIPHILA CORDATA var. COLOMBIANA Moldenke

Additional bibliography: Moldenke, Phytologia 40: 213—214 & 218. 1978.

López-Palacios, in a personal communication to me suggests that this taxon may, rather, be a variety of A. fendleri Moldenke which has similar trifid bracts.

AEGIPHILA COSTARICENSIS Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 24, 29, 30, 48—50, & 645, fig. 4. 1977; Moldenke, Phytologia 40: 214. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [49], fig. 4. 1977.

Besides the type collection, López-Palacios (1977) cites Steyermark 94313 & 95242 from Carabobo, Venezuela.

AEGIPHILA DEPPEANA Steud.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 36, 37, 50—53, 631, 645, & 646, fig. 5. 1977; Moldenke, Phytologia 40: 215. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [51], fig. 5. 1977.

López-Palacios (1977) cites for this species from Venezuela: Apure: Steyermark 101376. Zulia: Delascio & Benkosky 3033. These were collected at altitudes of 280—1400 meters and Steyermark refers to the plant as a large vine (bejuco).

López-Palacios, in a personal communication to me, lists "sauco de monte" as a vernacular name for this species.

AEGIPHILA ELATA Sw.

Additional synonymy: Aegiphila elata var. elata [Sw.] apud López-Palacios, Fl. Venez. Verb. [56], fig. 7. 1977.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 23, 24, 26, 28, 35, 36, 54—63, 645, 646, 649, 651, & 652, fig. 6—8. 1977; Moldenke, Phytologia 40: 216—217 & 219. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [55], fig. 6. 1977.

López-Palacios (1977) cites the following from Venezuela: Apure: Steyermark 101646. Bolívar: Steyermark 86729; Ll. Williams 12828. Carabobo: Pittier 8806b; Suringer s.n. [Puerto Cabello, 25-IV-1920]. Mérida: Velasco & Ramia 606. Monagas: Lasser & Vareschi 4047. Trujillo: Moritz 973 & 1474. He notes that "Los ejemplares de Mérida y Apure, arriba citados, son formas intermedias entre la variedad típica y la var. macrophylla. El No 1478 de Moritz está citado en la Monográfia original de Moldenke para Colombia, departamento de Bolívar. Moritz nunca llegó a colectar en el territorio de la actual Colombia, pues no pasó de Mérida; posteriormente, Moldenke.....lo refiere a Trujillo."

AEGIPHILA ELATA var. MACROPHYLLA (H.B.K.) López-Palacios

Additional bibliography: López-Palacios, Fl. Venez. Verb. 35, 60—63, 74, 167, & 645, fig. 8. 1977; Moldenke, Phytologia 40: 217 & 219. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [62], fig. 8. 1977.

López-Palacios (1977) regards A. macrophylla A. Rich. (1866) as a synonym of A. elata var. macrophylla, but I regard it as a synonymy of typical A. elata of Cuba. From Venezuela he cites: Apure: López-Palacios 2007. Barinas: Breteler 3735; López-Palacios 3152; Ruiz-Terán 1782; Steyermark 102197. Carabobo: Kuntze 1730. Mérida: López-Palacios & Bautista 3313. Yaracuy: Aristeguieta & Pannier 1856. He notes that "El ejemplar Steyermark 102197, en cuyo rótulo aparece haber sido determinado por Moldenke como Ae. scandens, es interpretado por mí como perteneciente a la variedad que tratamos." In a personal communication to me he records for A. elata var. macrophylla the vernacular name, "Juan grande".

AEGIPHILA FALCATA Donn. Sm.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 59 & 645. 1977; Moldenke, Phytologia 40: 217, 230, & 232. 1978.

AEGIPHILA FARINOSA Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 146 & 645. 1977; Moldenke, Phytologia 40: 217. 1978.

López-Palacios, in a personal communication to me, asserts that this species may possibly also occur in Ecuador.

AEGIPHILA FENDLERI Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 33, 36, 64--67, & 645, fig. 9. 1977; Moldenke, Phytologia 40: 214 & 218. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [65], fig. 8. 1977.

López-Palacios (1977) points out that "A pesar de que Moldenke en su descripción habla de un cáliz profundamente 4-lobado, este carácter sólo aparece en cálices muy maduros y casi fructíferos; en los cálices jóvenes, de flores en antesis, sólo he encontrado borde trunco, y creo que esta especie pertenece también a las Edentatae. Colectada en antesis de septiembre a febrero." He cites from Venezuela the following collections: Aragua: Badilo 2007; Chardón 189; Fendler 2032; García 132; Karsten s.n.; Pittier 14982; Steyermark 89931; Tamayo 1643. Bolívar: Koyama & Agostini 7254. Federal District: Steyermark 56959. Yaracuy: Steyermark & Bunting 100229.

AEGIPHILA FILIPES Mart. & Schau.

Additional synonymy: Aegiphila filipes Mort. & Schan., in herb.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 26, 34, 67--70, 125, 167, 645, & 646, fig. 10. 1977; Moldenke, Phytologia 40: 218--219. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [68], fig. 10. 1977.

Cuatrecasas describes this plant as a shrub with pendent branches, the fruiting-calyx gray-green, and the fruit orange, 20 x 15 mm. in size. He found it in flower and fruit in January. The corollas are said to have been "greenish-white" on Cuatrecasas 23537.

López-Palacios (1977) cites the following collections: COLOMBIA: Magdalena: H. H. Smith 1831. VENEZUELA: Trujillo: Breteler 4081. PANAMA: Panamá: Standley 26853.

Additional citations: COLOMBIA: Cauca: Cuatrecasas 23537 (W--2817664).

AEGIPHILA FLORIBUNDA Moritz & Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 33, 34, 71--74, & 645, fig. 11. 1977; Moldenke, Phytologia 40: 216 & 219. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [72], fig. 11. 1977.

López-Palacios (1977) notes that "El ejemplar Steyermark 103520 ha sido determinado recientemente por Moldenke como perteneciente a esta taxon (carta al colector), y es con toda seguridad coespecífico con Aristeguieta 3944, que según nota del colector

fue determinado por Moldenke, en el año de 1959, come Ae. quinduensis. Yo coloco aquí, con cierta duda, estos dos ejemplares. Aristeguieta 3944, que repito es coespecífica con Steyermark 103520, arapece citada en Phytologia 7: 498 como Ae. quinduensis. En cuanto a la cita de Moldenke para Barinas, se debe a que él creyó que Breteler 3921 podía pertenecer a esta taxon, pero con seguridad es Ae. elata var. macrophylla." He cites as A. floribunda from Venezuela: Aragua: Badilo 1954. Lara: Aristeguieta 3944; Steyermark 103520.

AEGIPHILA GLANDULIFERA Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 24, 26, 31, 34, 70, 74--80, 139, 150, & 645, fig. 12. 1977; Moldenke, Phytologia 40: 220. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [75], fig. 12. 1978.

López-Palacios (1977) comments that "El ejemplar de Marcano está en fruto. Yo lo había determinado provisionalmente como Ae. pendula Moldenke por su concordancia con Ewel 199 (Phytologia 13: 337). En ninguno de los dos ejemplares citados arriba aparece abundancia de glándulas ni puntuación densa. Hay mucha similitud entre los ejemplares de Ae. glandulifera y Ae. pendula, y hasta he llegado a creer que se trata de formas extremas de la misma especie. Especímenes del Perú, Colombia y Venezuela, determinados por Moldenke como Ae. glandulifera (p.e. López-Palacios & Bautista 3211), con inflorescencias péndulas y largas, puedem ubicarse cómodamente en uno u otro taxon. A lo mejor la separación sólo alcance rango infraespecífico. Peri hasta un mejor estudio que dé una clara evidencia, se conservan aquí como especies separadas. Así, yo determiné en Harvard a Tejera 157 como Ae. glandulifera, que luego encontré en US determinada como Ae. pendula por Moldenke, lugar que sigue ocupando en esta monografía." He cites for A. glandulifera from Venezuela: Mérida: López-Palacios & Bautista 3211. Táchira: Marcano-Berti 2047. Yaracuy: Aristeguieta & Foldats 1451.

AEGIPHILA GLANDULIFERA var. PYRAMIDATA L. C. Rich. & Moldenke

Additional synonymy: Aegiphia pyramidata [L. C. Rich.] apud López-Palacios. Fl. Verez. Verb. 78, in syn. 1977.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 36, 78--80, 645, & 646, fig. 13. 1977; Moldenke, Phytologia 40: 293. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [79], fig. 13. 1977.

There is considerable confusion and uncertainty as to the true status of this taxon. López-Palacios (1977) has truly pointed out that at least some of the collections more recently attributed to this taxon do not match the holotype in important details. His argument is worth repeating here: "Sólo estas dos colecciones se han regis-

trado hasta la fecha para Venezuela. No he visto el ejemplar de Moritz citado por Moldenke (Phytologia 1: 204), pero el de Wurdack & Adderley, determinado por Moldenke en 1959, más parece pertenecer a Ae. deppeana por ser un bejuco y no árbol ni arbusto, y por su cáliz 4-lobado, por lo cual esta variedad queda en una subsección distinta a la que pertenece Ae. glandulifera var. glandulifera. Creo que algunos ejemplares determinados por Moldenke como Ae. glandulifera var. pyramidata sean simplement Ae. deppeana. El tipo de Richard es de inflorescencia terminal ('Flores sublutescentes in racemum (?) amplum terminales (!!!), y los otros ejemplares tienen inflorescencias axilares y su indumento y brácteas son algo distintas a los del tipo de París. En todos los ejemplares que he examinado he encontrado más afinidad con la Ae. deppeana que con la Ae. glandulifera. Ni siquiera se parecen en hábito: árbol or arbusto en la Ae. glandulifera y bejuco en la Ae. glandulifera var. pyramidata. Creo que gran candidad del material que aparece en los herbarios como perteneciente aquí debe reinterpretarse, y aun deben de tenerse en cuenta las diferencias anotadas (hábito, forma del cáliz (!), indumento longitud de los entrenudos), a ver si ésta, así llamada, variedad merece la catagoría de especie, o si se trata de ejemplares que pertenecen a otro taxon." He cites from Venezuela as A. grandulifera var. pyramidata only: Monagas: Moritz 364. Amazonas: Wurdack & Adderley 43392.

AEGIPHILA GLOMERATA Benth.

Additional bibliography: Moldenke, Phytologia 40: 220—221. 1978.

In a personal communication from López-Palacios he list the following as vernacular names for this species: "arritagua", "pale de cuchara", and "palo flojo".

AEGIPHILA GRANDIS Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 25, 30, 81—83, & 645, fig. 14. 1977; Moldenke, Phytologia 40: 208, 221—224, & 228. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [82], fig. 14. 1978.

López-Palacios (1977) comments that "Moldenke (Fifth Summary 1: 121. 1977) cita también los estados Mérida y Bolívar, pero creo que se trata de una mala interpretación. No he visto material de estos estados que pertenezca a este taxon. El de Mérida positivamente correspono no a Ae. grandis sino a Ae. moldenkeana. En Phytologia 13: 336 también se cita erróneamente el ejemplar Lasser 1167 come de Bolívar." He cites only for A. grandis from Venezuela the following collections: Portuguesa: R. Smith 7108, 7109. Trujillo: Lasser 1167; Ruiz-Terán & López-Palacios 7609. In a personal communication to me he lists as vernacular names for A. grandis: "oreja de burro" and "queso fresco".

AEGIPHILA GRANDIS var. SESSILIFLORA (Moldenke) Moldenke

Additional bibliography: Moldenke, Phytologia 40: 208, 222—224, & 228. 1978.

In a personal communication to me López-Palacios lists the vernacular name, "totumo de cafetal", for this taxon.

AEGIPHILA HIRSUTISSIMA Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 23, 24, 31, 39, 84—86, & 645, fig. 15. 1977; Moldenke, Phytologia 40: 226. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [85], fig. 15. 1977.

López-Palacios (1977) cites only the following collections: COLOMBIA: Bolívar: Pennell 4563. VENEZUELA: Miranda: Pittier 8257. He says that the species is known in Venezuela only from the type collection.

AEGIPHILA INTEGRIFOLIA (Jacq.) Jacq.

Additional synonymy: Aegiphila integrifolia var. integrifolia [(Jacq.) Jacq.] apud López-Palacios, Fl. Venez. Verb. 94. 1977.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 25, 27, 31, 87—98, 101, 631, 645, 647, & 651, fig. 16 & 17. 1977; Moldenke, Phytologia 40: 217, 222, 224, & 227—231. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [88], fig. 16. 1977.

López-Palacios (1977) comments that "Hay material de Barinas muy dudoso: así Agostini determinó el ejemplar de Breteler 4182 como Ae. integrifolia, que tanto Moldenke como yo interpretamos como Ae. integrifolia var. guianensis. En igual forma, algún material colocado aquí puede pertenecer a la var. guianensis, por ej. Steyermark 96600, colectado en la zona de Santa Bárbara, en donde yo sólo he visto dicha var. guianensis. Pittier 10626, del Zulia, tiene cimas pareadas, similares a las que aparecen en Ae. integrifolia var. guianensis. Steyermark & Bunting 102709, del Territorio Amazonas, fue inicialmente determinado por mi como Ae. parviflora; el Dr. Moldenke, en carta al Dr. Steyermark, también lo coloca en este taxon; pero después de yo haber visto material más completo de Steyermark y de haber conocido y examinado cuidadosamente el tipo de Ae. parviflora, he llegado al convencimiento de que no pertenece a ésta sino a Ae. integrifolia var. integrifolia." He cites the following material from Venezuela: Amazonas: Foldats 282; Holt & Gehriger 270; Humboldt & Bonpland s.n.; Ruiz-Terán 4328, 4518, 5238; Spruce 3113, s.n.; Steyermark & Bunting 102709, 102796; Ll. Williams 14533, 15080, 16005; Wurdack & Adderley 42905. Anzoategui: Aristeguieta & Agostini 4714. Barinas: Steyermark 96600. Bolívar: C. Blanco 247, 583; Curran 26; Fernández 1151; Lasser 1291, 1604; Little 16209; López-Palacios 3015; F. Oberwinkler 15377; Steyermark 57675; Tamayo 1604,

2982, s.n.; Trujillo 3618; Ll. Williams 13401. Carabobo: Benítez 714. Delta Amacuro: Trujillo 4557. Guárico: Aristeguieta 6302. Mérida: Little 16024. Monagas: Aristeguieta 3916; Aristeguieta & al. 7189; Aristeguieta & Vera 7536; Ruiz-Terán & López-Palacios 9797. Sucre: Steyermark & Rabe 96092; Ruiz-Terán & López-Palacios 10081. Táchira: Breteler 4905. Yaracuy: Bunting 4500. Zulia: Breteler 1015; Brujin 10115; Ferrari 382; Pittier 10626; Tejera 119, 124. In a personal communication to me he lists the following vernacular names for the species: "aquapán", "caniba-humarí", "tabaquero", and "tabaquillo".

AEGIPHILA INTEGRIFOLIA var. GUIANENSIS (Moldenke) López-Palacios

Additional bibliography: López-Palacios, Fl. Venez. Verb. 24, 30, 94—98, 631, & 645, fig. 18. 1977; Moldenke, Phytologia 40: 217, 224, & 228—230. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [95], fig. 18. 1977.

López-Palacios (1977) comments that "El ejemplar de Bernardi, citado en Phytologia 7: 476 como de Mérida, pertenece a Barinas. Es igualmente posible que también sea de Barinas, y no de Mérida, el ejemplar Bernardi 6495, pues tampoco conozco en Mérida ninguna localidad con el nombre de Calceta de la Botella. El ejemplar Ruiz-Terán 713, de Puerto Ayacucho, es una forma intermedia entre la variedades guianensis e integrifolia de Ae. integrifolia." Possibly it represents a natural hybrid, as such hybridity is to be expected between taxa so closely related. He cites from Venezuela for var. guianensis the following collections: Amazonas: Ruiz-Terán 713; Schultes & López 9260; Spruce 3113, 3578. Apure: Steyermark, Bunting, & Blanco 101793. Barinas: Aristeguieta 3272, 8158; Bernardi 3348; Breteler 4182, 4512; Hoheisel & Kohler 20; Little 15033; López-Palacios 2749, 2792; Marcano-Berti & Torres Lezama 226; Veillon 88. Bolívar: Pittier 13401. Carabono: Aristeguieta 2798; Benítez 180. Guárico: Aristeguieta 4215, 5034. Lara: R. F. Smith V.4141. Mérida: Bernardi 6495; López-Palacios 2992, 3159; López-Palacios & Bautista 3283, 3508; Ruiz-Terán 3157. Sucre: Steyermark & Manara 107806; Steyermark & Morillo 108631. Trujillo: Ruiz-Terán & López-Palacios 7639. Yaracuy: Diederich 189. In a personal communication to me he lists the following vernacular names for the species: "borrachero", "buen cristiano", "cenicero", "cigarrillo", "palo-casa", "palo de casa", "salvio", and "tabacote".

Emended citations: VENEZUELA: Barinas: Bernardi 3348 (N), 6495 (N).

AEGIPHILA INTERMEDIA Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 99—101 & 645, fig. 19. 1977; Moldenke, Phytologia 40: 231. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [100], fig. 19.

1977.

López-Palacios (1977) cites only Ll. Williams 13174 from Amazonas, Venezuela, and notes "El ejemplar de Caracas (VEN) aparece determinado como Ae. integrifolia. La especie misma, como su nombre lo indica, es dudosa." He lists the vernacular name, "tabaquillo". In a personal communication to me he notes that this "Especie para mí dudosa, muy cercana a Ae. integrifolia, si no coespecífica con ella. Los pocos ejemplares a ella atribuidos pertenecen el de Venezuela a la Orinoquia, Williams 13174, Isla de Ratón, y el colombiano a la Amazonia, Schultes & Cabrera 17200, Río Piraparaná, afluente del Apoporis. En ambas partes se le conoce como a la Ae. integrifolia, a la que creo deba reducirse, con el nombre de Tabaquillo."

AEGIPHILA LAETA H.B.K.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 23, 30, 31, 101—104, 121, 122, 632, 645, & 646, fig. 20. 1977; Moldenke, Phytologia 40: 231. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [102], fig. 20. 1977.

López-Palacios (1977) cites the following collections from Venezuela: Anzoategui: Potter 5154. Cojedes: Fernández 324. Guárico: Aristeguieta 6295. Lara: Saer 602. Mérida: Mocquerys 1018. Zulia: López-Palacios 1889; Pittier 10533; Plée 4133; Steyermark & Fernández 99702.

AEGIPHILA LAEVIS (Aubl.) Gmel.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 31, 58, 59, 104--108, 112, 645, & 651, fig. 21 & 21a. 1977; Moldenke, Phytologia 40: 232. 1978.

Illustrations: Aubl., Hist. Pl. Guian. 1: pl. 25. 1775; López-Palacios, Fl. Venez. Verb. [105] & [106]. 1977.

López-Palacios (1977) cites from Venezuela only Bernardi 893 from Bolívar, where it is described as an "Arbusto sarmentoso.... especie aparentemente escasa".

AEGIPHILA LAXIFLORA Benth.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 23, 24, 34, 35, 108—112, 153, 645, & 646, fig. 22. 1977; Moldenke, Phytologia 40: 233. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [109], fig. 22. 1977.

López-Palacios (1977) comments that "En noviembre de 1962, Moldenke determinó Steyermark 62242 como Ae. laxiflora, y Steyermark 62260 como Ae. perplexa. Pero examinado con detenimiento ambos ejemplares se ve que, además de haber sido colectados en la misma zona, son coespecíficos; y yo me atrevo a colocarlos juntos aquí. Otto 1092 aparece por primera vez citado por Schauer (Linnaea 20: 476) como Ae. laevis, lo que se repite en DC. Prodr. 11: 652. 1847, y en Knuth, Initia Fl. Venez. 606, pero que en realidad cor-

responde aquí." He cites from Venezuela only: Bolívar: Blanco 127; Otto 1092; Steyermark 57719. Monagas: Steyermark 62242, 62260.

AEGIPHILA LEHMANNII Moldenke

Additional bibliography: Moldenke, Phytologia 25: 415. 1973.

Cuatrecasas encountered this plant at 1540—1650 meters altitude, flowering in February.

Additional citations: COLOMBIA: Valle del Cauca: Cuatrecasas 23740 (W—2817208).

AEGIPHILA LEWISIANA Moldenke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 25, 27, 31, 112—115, 632, & 645, fig. 22a. 1977; Moldenke, Phytologia 40: 233. 1978; R. F. Sm., Act. Bot. Venez. 13: 193, 204, & 262. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [113], fig. 22a. 1977; R. F. Sm., Act. Bot. Venez. 13: 262. 1978.

López-Palacios (1977) list the following collections from Venezuela: Bolívar: Ruiz-Terán & López-Palacios 11537. Carabobo: Delascio 2408; Steyermark 94357. Federal District: Fendler 844. Lara: R. F. Smith V.1444; Steyermark & al. 111545; Steyermark & Carreño 108826; Trujillo 1942, 4120. Mérida: López-Palacios & Bautista 3492. Sucre: Steyermark & Rabe 96143. It has been found growing at altitudes of 10—2200 meters in "selva nublada". López-Palacios comments that López-Palacios & Bautista 3492 has "cálices circulares, como de Ae. membranacea, y fruto obovoide".

AEGIPHILA MACRANTHA Ducke

Additional bibliography: López-Palacios, Fl. Venez. Verb. 23, 25, 30, 115—118, & 645, fig. 23. 1977; Moldenke, Phytologia 40: 235. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [116], fig. 23. 1977.

López-Palacios (1977) cites the following collections from Venezuela: Bolívar: Ruiz-Terán & López-Palacios 11569; Steyermark 75384, 86660, 88157. Miranda: Steyermark 89365. State undetermined: Grosourdy Cat. 8 s.n.

AEGIPHILA MARTINICENSIS Jacq.

Additional bibliography: López-Palacios, Fl. Venez. Verb. 23, 24, 27, 28, 31, 35, 58, 59, 118—122, 125, 645, 646, & 652, fig. 24. 1977; Moldenke, Phytologia 40: 231 & 235. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [199], fig. 24. 1977.

Both Sweet (1830) and Loudon (1832) list A. martinicensis, which they call the "Martinico aegiphila", and A. diffusa, which they call "diffuse aegiphila", from British gardens, claiming that the former was introduced from the West Indies in 1780 and the lat-

ter from the West Indies in 1804.

Altschul (1973) cites Hodge & Hodge 3320 from Dominica, in the Gray Herbarium, and reports their statement that the "grain" of this species is used on that island "in traps to lure doves". Holdridge refers to the plant as "trees or shrubs, 10 ft. tall" in brush pastures at 300 feet altitude, flowering in October. Andrews found the plant in fruit in January and refers to it as a roadside shrub with orange fruit. Hallier (1918) cites Hallier C. 240 from cultivated plants in Sri Lanka, deposited in the Hamburg herbarium, the corollas having been "waxy-yellow". The Larsens encountered it in mixed evergreen forests with bamboo, at 50—100 meters altitude, flowering in April and November. The leaves on the main branch of their no. 35455 are ternate!

Morton (1977) tells us that "All the herb vendors in Panama sell the leafy branches. The decoction is taken as a diuretic and used for bathing the body. When the branches are boiled with those of 'guanabana toreta' (Annona purpurea Moc. & Sessé), the decoction is taken to clear up pimples."

López-Palacios (1977) say that "Los especímenes Jahn 384 (Bobures, Zulia), Saer 602 (El Placer de Cabudare, 443 m., Lara) y Pittier 8806 (bosques de Guaremales, Carabobo), citados por Badillo (in Pittier et al. Cat. Fl. Venez. 2: 337. 1947) como pertenecientes aquí, corresponden, el primero a Ae. membranacea, el segundo a Ae. laeta, y el último a Ae. quinduensis." As true A. martinicensis from Venezuela López-Palacios cites only: Sucre: Broadway 319. Zulia: Mocquerys 910. In a personal communication to me he lists for this species the vernacular names "Juan de la verdad" and "totumillo calentano".

The H. Pittier 10533, previously cited by me as A. martinicensis, actually is A. laeta H.B.K. I am grateful to my friend and colleague, Santiago López-Palacios, for pointing this out to me.

Molina (1975) cites A. martinicensis from Honduras, but probably is referring here to what I call A. panamensis Moldenke.

The Burger & Gentry 8878, distributed as A. martinicensis, actually is A. panamensis Moldenke.

Additional citations: PUERTO RICO: Holdridge IRH.423 [U. S. Forest Serv. 99389] (W—2761820). WINDWARD ISLANDS: Barbados: L. M. Andrews 679a (N), 679b (N). Martinique: Larsen & Larsen 34735 (Ac), 35337 (Ac), 35354 (Ac), 35455 (Ac). CULTIVATED: Sri Lanka: Collector undetermined s.n. [June 13, 1896] (Pd), s.n. [August 12, 1900] (Pd); MacRae & Gardner s.n. [Thwaites C.P.2895] (Pd); J. M. Silva 49-08 (Pd).

AEGIPHILA MARTINICENSIS f. BARBADENSIS (Moldenke) Moldenke

Additional bibliography: Moldenke, Phytologia 27: 88 (1973) and 28: 452. 1974; Hocking, Excerpt. Bot. A.23: 293. 1974.

AEGIPHILA MARTINICENSIS var. OLIGONEURA (Urb.) Moldenke

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 47 (2): 244. 1929; Moldenke, Phytologia 27: 88. 1973.

AEGIPHILA MATTOGROSSENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 27: 88. 1973; Moldenke, Biol. Abstr. 57: 3783. 1974; Hocking, Excerpt. Bot. A. 26: 5. 1975.

Hatschbach refers to this plant as a "Trepadeira, flor creme, florece alto árvores mata de galeria" and found it in flower in November.

Additional citations: BRAZIL: Mato Grosso: Hatschbach 37464 (N, Z).

AEGIPHILA MEDITERRANEA Vell.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 149—150 (1973) and 28: 438. 1974.

Recent collectors refer to this plant as a small tree, 8 m. tall, and have found it growing in old secondary forests, flowering in September and October.

Additional citations: BRAZIL: Guanabara: Duarte 5024 [Herb. Jard. Bot. Rio Jan. 110274] (N, W—282060); Pereira, Sucre, & Duarte 4367 [Herb. Jard. Bot. Rio Jan. 110273] (N, W—2820599).

AEGIPHILA MEDITERRANEA var. BREVILOBATA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 149—150. 1973.

Hatschbach & Guimarães have encountered this plant growing in Araucaria woods. Lindeman & Haas describe it as a small tree or treelet, or a tree 8—11 m. tall, the trunk 4—12 cm. in diameter, the leaves opposite or ternate, large, the petioles 2—3 cm. long, the leaf-blades to 44 cm. long and 10 cm. wide, the infructescences short, axillary, the fruiting-calyx "like a cupila", and the fruit dry, pale-brown, borne on "old twigs of 1—1.5 cm. diameter". They encountered it in forests on reddish loamy sand, in rainforests, and on high riverbanks, at altitudes of 180—300 meters, flowering in November, and fruiting in June. Other collectors have found it in flower in October. The vernacular name, "saco-de-bode", is reported for it.

Material has been misidentified and distributed in some herbaria as A. sellowiana Cham.

Additional citations: BRAZIL: Paraná: Hatschbach 35133 (Ld); Hatschbach & Guimarães 19837 (W—2706172); Lindeman & Haas 702 (Ut—320421), 925 (Ld), 1606 (Ld), 1694 (Ws), 1726 (Ac), 3326 (Ld), 3381 (Ld).

AEGIPHILA MEMBRANACEA Turcz.

Additional synonymy: Aegiphila membranaceae [Turcz.] apud López-Palacios, Fl. Venez. Verb. 646, sphalm. 1977.

Additional bibliography: Moldenke, Phytologia 27: 295 & 296.

1973; R. F. V. Cooper, Biol. Abstr. 57: 3788. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 22. 1974; Soukup, Biota 11: 4. 1976; López-Palacios, Fl. Venez. Verb. 24, 27, 31, 39, 115, 122, [123], 125, 139, 162, & 646, fig. 25. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [123], fig. 25. 1977.

López-Palacios (1974), in a note under A. mollis var. intermedia Moldenke, says that "Primeros registros para Venezuela, a no ser que también Williams 11220, del Caura medio, 11-11-1939, interpretada por el Dr. Moldenke como Aegiphila membranacea Turcz., pertenezca igualmente a este taxon; de ser así, éste vendría a ser el primer registro."

In his 1977 work he says: "Pittier 14993, citado por Badillo in Pittier et al. Cat. Fl. Venez. 2: 337. 1947, como perteneciente a este taxon, es Ae. quinduensis. Steyermark & Nilsson 193 fue determinado por Moldenke, en 1961, como Ae. membranacea y citado en Phytologia 8: 16. Sin atreverme a apartarme de este criterio, me permito observar lo siguiente: su hábito es bejuco y no arbusto erecto; sus hojas son cartáceas y no membranáceas, y la base de las mismas es redondeada y no aguda; el envés no es densamente impreso-punteado; y, finalmente, el indumento parece algo diferente. Steyermark & Dunsterville 104461 es coespecífico con el anterior. Considero que deben colocarse en Ae. racemosa (véase). Bernardi 2055 tiene también sus hojas de base redondeadas y, además, el ápice longiacuminado y los pecíolos fuertes; el cáliz fructífero es canaliculado como el de Ae. filipes.

"El Dr. Moldenke en su Monografía (Brittonia 1: 381) hace figurar el especimen Jahn 384 como de Falcón, y en su Fifth Summary (1: 121. 1971) también aparece Falcón como lugar de distribución de Ae. membranacea. Por su parte Badillo (in Pittier et al. Cat. Fl. Venez. 2: 337. 1947) lo coloca en Ae. martinicensis y lo registra así: 'Bobures, Trujillo'. Efectivamente, en el rótulo de Jahn se lee 'Bobures. Nbre. de 1914', pero aunque anteriormente hubo ciertos litigios sobre la costa sur del lago de Maracaibo, hoy Bobures pertenece al Edo. Zulia." In his 1977 work he cites the following collections of A. membranacea from Venezuela: Bolívar: Bernardi 6815, 7042; Steyermark & Dunsterville 104461; Steyermark & Nilson 193; Trujillo 5841; Ll. Williams 11220. Mérida: Bernardi 2055; Steyermark 56379. Zulia: Jahn 384. In regard to Ll. Williams 11220 he says: "Por su indumento, debe colocarse más bien en Ae. mollis var. intermedia". In a personal communication to me he records the vernacular name, "uvito", for A. membranacea.

Forero and his associates encountered A. membranacea at 40 m. altitude, flowering in May.

Additional & emended citations: COLOMBIA: Chocó: Forero, Jaramillo Mejia, & McElroy 1447 (N). VENEZUELA: Zulia: Jahn 384 (F--

photo, N—photo, W—603045, Z—photo). FRENCH GUIANA: Halle 2400 (N).

AEGIPHILA MERIDENSIS López-Palacios

This taxon is now regarded as identical to A. bogotensis var. aequinoctialis Moldenke, which see.

AEGIPHILA MICROCALYCINA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 151 & 376. 1973; Hocking, Excerpt. Bot. A.23: 291. 1974; Moldenke, Phytologia 40: 232. 1978.

Additional citations: BRAZIL: Roraima: Prance, Steward, Ramos, & Monteiro 11233 (N).

AEGIPHILA MOLDENKEANA López-Palacios

Additional bibliography: Moldenke, Phytologia 27: 295 (1973) and 28: 434. 1974; Hocking, Excerpt. Bot. A.26: 5. 1975; López-Palacios, Fl. Venez. Verb. 26, 31, 83, 126—130, & 646, fig. 26 & 27. 1977; Moldenke, Phytologia 40: 223. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [127] & [128], fig. 26 & 27. 1977.

López-Palacios (1977) says that this species is "Muy áfin a la Ae. novogranatensis Moldenke y a la Ae. odontophylla Donn.-Sm.; de la primera difiere en las inflorescencias axilares, en las cimas verruculosas, lenticeladas, y en el cáliz trunco; de la segunda, en el indumento completamente diferente y en la ausencia de pequeños aguijones." He cites from Venezuela the following collections: Mérida: López-Palacios 1538; Ruiz-Terán & López-Figueiras 581; Ruiz-Terán & López-Palacios 1983; Steyermark 56458.

Cuatrecasas describes this plant as a small tree, 5 m. tall, and found it growing at 2000 m. altitude, fruiting in March. Bernardi, misidentifying it as a species of Cestrum, describes the leaves as "red-vinose beneath" and the corollas as cream-colored. He found it in flower in February. The Cuatrecasas 8700, cited below, was previously erroneously reported by me as A. grandis Moldenke.

Additional citations: COLOMBIA: Caquetá: Cuatrecasas 8700 (W—1795403). VENEZUELA: Mérida: Bernardi 6191 (N).

AEGIPHILA MOLLIS H.B.K.

Additional & emended bibliography: Schau. in A. DC., Prodr. 11: 647 & 654. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Rojas Acosta, Cat. Hist. Nat. Corrient. 76. 1897; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. Paris 13 (4): 67. 1921; Pittier, Man. Pl. Usuel. Venez. 189, 386, & 416. 1926; Pittier, Supl. Pl. Usuel. Venez. 54. 1939; Moldenke, Biol. Abstr. 56: 3000. 1973; Moldenke, Phytologia 27: 354, 355, & 366 (1973) and 28: 434, 435, 437, 452, & 453. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 22 (1974) and 15: 22. 1975; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 365. 1975; Moldenke, Phytologia 34:

255 (1976) and 36: 34 & 41. 1977; López-Palacios, Fl. Venez. Verb. 24, 25, 27, 28, 33, 130—142, 145, 632, 646, & 648, fig. 28 & 29. 1977; Moldenke, Phytologia 40: 209, 234, & 235. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [131] & [132], fig. 28 & 29. 1977.

Hubert (1921) reports that "On emploie encorce l'Aegiphila salutaris H. B. Kth. comme antidote du venin de cobre. Les indiens font macérer les fleurs fraîches dans l'alcool et en prennent la teinture; les fleurs contusées sont mises, en forme de pensement, sur les morsures. Les fleurs sont encore employées dans le traitement de l'épilepsie. L'écorce de racines est employée comme purgatif."

Recent collectors describe this plant as a shrub or slender climber, 2—3 m. tall, the flower-buds white, the fruit pale-orange or "yellow to orange", and have found it growing along roadsides, in pastures and secondary forests, on savannas, and at the "edge of mata on hillside covered with savanna dominated by Trachypogon and Axonopus, the valleys and gullies with forest", at 50—1000 m. altitude, flowering and fruiting in February and November. Uribe describes the corollas as "pale-yellow".

López-Palacios (1975) has pointed out that the Fendler 843 collection, as indicated by original labels on the Gray Herbarium specimens, consists of material collected (1) in the Valley of Macarao, altitude 3600 feet, on 4/7/1856, and (2) near Biscaina, altitude 5000—6000 feet, 7/9/1855 — both localities being in the Federal District, not in Aragua as would be implied by the "Colonia Tovar" printed labels which accompany so many of his collections.

López-Palacios and his associates refer to the plant as an "arbusto de 1—3 m. Ramas péndulas. Hojas opuestas y 3-verticiladas. Cáliz subtrunco ligeramente articulado pubescente verde. Corola crema [or] amarillo-verdosas [or] amarillo-cremosas. Visitado por hormigas begras, algo agresivas" and found it at 1220—2500 m. altitude, flowering in August, with yellow fruit in December.

In his 1977 paper López-Palacios notes that "El Dr. Moldenke trae como sin localidad definida a Grosourdy s.n. Cat. 13 (P), pero al estar rotulado 'Angostura', corresponde a la actual Ciudad Bolívar. Pittier 7855, registrado por el Dr. Moldenke como de Miranda, está rotulado 'Cotiza', y por tanto corresponde al Distrito Federal. Funck 179, registrado por Moldenke como del Dto. Federal, tiene esta anotación en el ejemplar de P: 'Guanaguana, Caracas'; y entonces es de Monagas. También coloco aquí a Funck 643, que en el ejemplar de Ginebra está registrado igualmente como de Guanaguana aunque el Dr. Moldenke lo coloca en Sucre, seguramente ciñéndose al ejemplar de US, qu lo registra como de Cumaná. En París, entre el material venezolano, existe un Gray o Geay s.n. con esta anotación: 'savanas marecageuses de Guaritico. 1894'."

He cites the following collections from Venezuela: Amazonas: Chaffanjon 245; Eggers 13464; Humboldt 983; Pannier & Schwabe 192. Anzoategui: Otto 856. Apure: Lasser 791; López-Palacios s.n.

Aragua: Benítez de Rojas 437; Burkart 17014; Fendler 843, 2052; Fernández 639; Ferrari 113; Lasser 905; Montaldo 3486, 3548; Trujillo 2565, 3899; Vogl 1177, 1179, 1180, 1181, 1183; Ll. Williams 10222, 10314. Barinas: Aristeguieta 7992; López-Palacios 3089, 3111, 3127, 3148. Bolívar: Grosourdy Cat. 13 s.n. Carabobo: Pittier 7910. Federal District: Aristeguieta 2297, Fendler 843, Pittier 7855. Guárico: Aristeguieta 4629, 6164; Aristeguieta & Hernández 2307; Chardon 117; Ramia 2585. Lara: Saer 723. Mérida: Bernardi 6191; Ruiz-Terán & López-Figueiras 673; Steyermark 56314. Miranda: T. González s.n.; Trujillo 5300. Monagas: Funck 179, 473, 643; Moritz 1910; Collector undetermined 363. Sucre: Moritz 363; Steyermark & al. 107735. Yaracuy: Aristeguieta & Pannier 1803.

In a personal communication to me López-Palacios lists the following vernacular names for A. mollis: "borrachero", "contra-culebra", "gorritos", "palito de San Pablo", "palo santo", "tabaquire", "tabaquito", "totumillo", and "totumillo morado de cafetal".

It should be noted here that the "Aegiphila mutisii Moldenke" of Romero-Castañeda 7483 is actually A. bogotensis (Spreng.) Moldenke — I have never proposed the binomial which he accredits to me.

Material of A. mollis from Central America has been identified in some herbaria as A. magnifica var. pubescens Moldenke, a very similar taxon which need further critical study.

In the addenda to his 1977 work López-Palacios cites also Steyermark & Berry 112037 from Miranda, Venezuela, as A. mollis.

Additional & emended citations: COSTA RICA: Puntarenas: Croat 22141 (N, W—2745297). COLOMBIA: Arauca: López-Palacios 2968 (N), 3943 (N), 3949 (Ld, N), 3964 (Gz, N). Cundinamarca: López-Palacios 3907 (N, Tu); López-Palacios & Jaramillo Mejia 3678 (Ld, N). Meta: Cuatrecasas 4339 (W—2780404). Tolima: López-Palacios & Idrobo 3701 (Ac, N); Uribe Uribe 4021 (N). Valle del Cauca: Cuatrecasas 13869 (W—2815324), 14462 (W—2817667); Espinal T. 2030 (E—2059398); López-Palacios & Idrobo 3843 (N, Ws), 3845 (N, Ut). VENEZUELA: Aragua: Vogl 796 (Mu). Barinas: López-Palacios 3089 (N), 3111 (N), 3127 (N), 3971 (Ld). Bolívar: Grosourdy Cat. 13 s.n. (P). Federal District: Fendler 843 (F—photo, G, G, G, K, N—photo, Z—photo, Z—photo); Pittier 7855 (G, W—987953). Guárico: Davidse 4170 (W—2799436). Monagas: Funck 179 (P), 643 (Cb, P, V). Yaracuy: Aristeguieta & Pannier 1803 (N).

AEGIPHILA MOLLIS var. INTERMEDIA Moldenke

Synonymy: Aegiphila mollis var. intemedia Moldenke apud López-Palacios, Fl. Venez. Verb. 33, sphalm. 1977.

Additional bibliography: Moldenke, Phytologia 27: 293 & 295—296 (1973) and 28: 435 & 437. 1974; López-Palacios, Revist. Fac.

Farm. Univ. Los Andes 14: 22. 1974; López-Palacios, Fl. Venez. Verb. 31, 33, 125, 134, 137—139, 632, & 646, fig. 30. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [138], fig. 30. 1977.

López-Palacios (1974) cites this taxon from Barinas and Mérida, Venezuela, citing López-Palacios 3144 and López-Palacios & Bautista 3214, 3222, & 3269 in the Universidad de los Andes herbarium. He comments that "Primeros registros para Venezuela, a no ser que también Williams 11220, del Cauca medio, 11-11-1939, interpretada por el Dr. Moldenke como Aegiphila membranacea Turcz., pertenezca igualmente a este taxon; de ser así, éste vendría a ser el primer registro." In his 1977 work he cites as A. mollis var. intermedia from Venezuela: Amazonas: P. E. Berry 710. Apure: López-Palacios 2988. Mérida: Bautista 3338; López-Palacios & Bautista 3181, 3214, 3222, 3269. From Bolívar he says "Es posible que Williams 11220 (VEN), determinado como Ae. membranacea, deba colocarse aquí", while for López-Palacios & Bautista 3222 he notes "Aunque el Dr. Moldenke, en carta del 25 de septiembre de 1973, considera este ejemplar como Ae. mollis var. intermedia, yo he querido conservarlo en Ae. glandulifera, ya que corresponde en todo con López-Palacios & Bautista 3211, de la misma población y del mismo lugar."

AEGIPHILA MOLLIS var. LONGIFOLIA (Turcz.) López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 40. 1976.

Additional bibliography: Moldenke, Phytologia 27: 294. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 40. 1976; López-Palacios, Fl. Venez. Verb. 66 & 645. 1977; Moldenke, Phytologia 36: 31, 34, & 41 (1977) and 40: 234. 1978.

All the notes previously published by me in this series of notes under Aegiphila longifolia Turcz. should now be transferred to A. mollis var. longifolia.

Additional citations: COLOMBIA: Santander: Schlim 688 (W—1740093—isotype). MOUNTED CLIPPINGS: Moldenke, Brittonia 1: 373-374. 1934 (W).

AEGIPHILA MOLLIS var. PUBERULENTA (Moldenke) López-Palacios

Additional bibliography: Moldenke, Phytologia 27: 296, 354, & 355 (1973). 28: 434, 435, & 453 (1974), and 36: 31. 1977; López-Palacios, Fl. Venez. Verb. 23, 31, 34, 134, 140—141, & 646. 1977.

López-Palacios encountered this plant at 1200 meters altitude.

Additional citations: COLOMBIA: Antioquia: López-Palacios 4017 (Z).

AEGIPHILA MOLLIS var. SURFACEANA (Moldenke) Moldenke

Additional synonymy: Aegiphila mollis var. surfaceana Moldenke, Phytologia 28: 452, in syn. 1974.

Additional bibliography: Moldenke, Biol. Abstr. 56: 3000. 1973;

Moldenke, Phytologia 27: 296 & 366 (1973) and 28: 452. 1974; López-Palacios, Fl. Venez. Verb. 24, 31, 33, 134, 141—142, & 646. 1977.

Ducke describes this plant as a scandent subshrub both cultivated and subspontaneous in Amazônas, Brazil, and found it flowering in December, recording the vernacular name, "anúm". The corollas on Ducke 846 are described as having been "greenish-white".

López-Palacios (1977) maintains that the type collection, Tate 162, was not collected in Brazil, but in Venezuela — "San Carlos de Río Negro no ha pertenecido nunca al Brasil; ha sido siempre pertenencia venezolana. Es curioso, sin embargo, que fuera de este registro no exista ningún otro para territorio venezolana."

Additional citations: BRAZIL: Amazônas: Ducke 846 (Ca—M209058, W—2592951).

AEGIPHILA MONSTROSA Moldenke

Synonymy: Aegiphyla monstrosa Moldenke, Phytologia 34: 271, in syn. 1976. Aegophila monstrosa Moldenke, in herb.

Additional bibliography: Moldenke, Phytologia 27: 156—157. 1973; Molina R., Ceiba 19: 95. 1975; Moldenke, Phytologia 34: 271. 1976.

Recent collectors describe this species as a shrub or tree, 3—5 m. tall, the fruit green, borne on leafless branches, and have found it growing in disturbed forests, in the "transition zone", on steep slopes with montane rainforest, and areas of slopes and small streams, with tropical rainforest on the ridges, at 300—800 m. altitude, flowering in October, fruiting in January, February, and June. Chavelas and his associates encountered it in "suela arcilloso gris, roca caliza a 62 cm." The corollas are said to have been "white" on Breedlove & Thorne 20944.

The Játiva & Epling 543, distributed as A. monstrosa, is actually A. alba Moldenke, while Breedlove 9665 is A. wigandioides Lundell.

Additional citations: MEXICO: Campeche: Chavelas & al. ES 1035 (N). Chiapas: Breedlove 24227 (Mi, N); Breedlove & Thorne 20944 (N). GUATEMALA: El Petén: Contreras 1656 (Au—228060); Croat 24708 (N). BELIZE: Gentle 5078 (Ld), 7548 (Ld); Liesner & Dwyer 1632 (W—2788935); Proctor 30214 (Ld).

AEGIPHILA MONTICOLA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 157—158. 1973.

In a personal communication to me López-Palacios asserts that Acosta Solis in Recursos 1: 24 records this species from Bolívar, Ecuador, and give the vernacular name, "palo zapallo".

AEGIPHILA MORTONI Moldenke

Additional bibliography: Moldenke, Phytologia 27: 158. 1973; Soukup, Biota 11: 4. 1976.

Marin encountered this plant in "matorrales", at 3000—4000 m. altitude, flowering in July, and describes it as 4—5 m. tall, while Plowman & Davis call it a "treelet, 4—5 m. tall", with "cream-white" flowers, and found it growing in thickets, in flower and green fruit in February.

Material has been misidentified and distributed in some herbaria as Buddleia sp.

Additional citations: PERU: Cuzco: Marin 1636 (E—1995269); Plowman & Davis 4914 (Z).

AEGIPHILA MULTIFLORA Ruíz & Pav.

Additional & emended bibliography: Schau. in A. DC., Prodr. 11: 650. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 354 (1973) and 28: 437. 1974; Soukup, Biota 11: 4. 1976.

The Dodson & Thien 717, cited below, is placed here tentatively. Only one small leaf is present on the two specimens examined and the broken inflorescences show no corollas. It is described as having been a tree, 25 feet tall, with "green flowers" in September, growing at an altitude of only 50 meters.

Additional citations: ECUADOR: Guayas: Dodson & Thien 717 (Ws, Z).

AEGIPHILA NERVOSA Urb.

Additional bibliography: Moldenke, Phytologia 27: 296. 1973.

The Liogiers describe this plant as a vine, 2—3 m. tall, the corollas yellow, and encountered it at 1700 m. altitude, flowering in June.

Additional citations: HISPANIOLA: Dominican Republic: Liogier & Liogier 23247 (N).

AEGIPHILA NOVOGRANATENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 27: 297 (1973), 28: 453 (1974), and 36: 31 & 32. 1977; López-Palacios, Fl. Venez. Verb. 129 & 646. 1977; Moldenke, Phytologia 40: 223. 1978.

López-Palacios describes this plant as an "Arbol 6—12 m. Tallos marrón-gríseos, ligeramente lenticelados. Brotes jóvenes farinosos. Hojas elíptico-obovadas, verdes por la haz, algunas con tintes violáceos por el envéz [or, "hojas de envés purpurascente y borde dentado, discos"]; pecíolo 2.5 cm., limbo hasta 14 x 6 cm, ligeramente pubescente por la haz, punteados por el envés. Panículas axilares 2—4-dicotomas; cáliz verde, trunco, ca 3 mm. de largo, turbinado campanulado, ligeramente comprimido sobre el ovario, de 1.5—2 mm. de ancho. Corola 4-mera, verde en yema, amarillo verdoso en antesis. Estilo exserto bifurcado. Fruto inmaturo verde, amarillo verdoso en maduras." He found it growing at 2100—2400 meters altitude, flowering and fruiting in December.

Other collectors describe this species as a small tree, 3—10 m. tall, the fruit small, rounded, green with brown spots when immature, black when mature, and have encountered it along railroad tracks, at altitudes of 240—2200 m., flowering in February and

December, fruiting in February, May, July, and December. The corollas are said to have been "white" on Garcia-Barriga 8306 and on Metcalf & Cuatrecasas 30072. The vernacular names, "saca-ojo" and "tatumo", have been recorded for it.

In a personal communication to me López-Palacios says that "El Dr. Moldenke ha colocado aquí dos colecciones mías estériles del Ecuador, López-Palacios 4226 y 4239, que bien pueden representar otro taxon, p.e. Ae. farinosa Moldenke o Ae. purpurascens Moldenke. Ojalá algún día yo mismo u otro colector pueda aportar material completo, con flores y frutos. En cuanto a Colombia, el Dr. Moldenke extiende hacia el sur la distribución de esta taxon hasta el Departamento de el Cauca (Fifth Summary 1: 114, possiblemente conservando la cita de Brittonia 1: 349, basada en Lehmann 8524), pero esta localidad debe excluirse, ya que posteriormente el mismo Dr. Moldenke cambió la ubicación de esta colección y la constituyó tipo de Ae. aculeifera Moldenke, que se ha considerado como sinónimo de Ae. odontophylla Donn. Sm."

Material of A. novogranatensis has been misidentified, distributed in some herbaria, and even cited by me in previous installments of this series of notes as A. grandis Moldenke and A. truncata Moldenke.

Additional & emended citations: COLOMBIA: Antioquia: E. L. Core 723 (N); Daniel 3283 (N); López-Palacios 3579 (N, Z); Metcalf & Cuatrecasas 30072 (W—1833329); Tomás 1512 (N). Cundinamarca: Mutis 3657 (N, N—photo, S, W—1560048, W—1560049), 4554 (B—photo, Cb, F—712945, F—photo, G—photo, K, N, N—photo, N—photo, S, W—1560063, Z—photo); Triana 2080 [Macbride photos 28379] (F—830241-photo, Kr—photo, N—photo, P, W—photo, Z—photo). Tolima: Garcia-Barriga 8386 (W—1774157). ECUADOR: Pichincha: López-Palacios 4226 (Ld), 4239 (Ld).

AEGIPHILA OBDUCTA Vell.

Additional synonymy: Aegiphyla obducta Vell. ex Moldenke, Phytologia 28: 453, in syn. 1974.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. Paris 13 (4): 66—67. 1921;Moldenke, Phytologia 27: 297 & 360 (1973) and 28: 453. 1974; Troncoso, Darwiniana 18: 393 & 408. 1974; Moldenke, Phytologia 32: 195. 1975.

Hubert (1921) reports that "Peckolt en a isolé un corps amorphe qui présente les caractères d'un alcaloide. Cette écorce ne renferme pas de tannis.....Les semences pulvérisées sont données à la dose de 0.20 à 0.40, comme tonique dans la diarrhée, 2 á 3 fois par jour. L'écorce est employée comme tonique et diurétique."

Hatschbach describes the plant a woody vine growing to 2 m. tall in "capoeira". The corollas are said to have been "white" on Hatschbach 30078 & 32230 and on Liene, Sucre, & Pereira 3823 and Martins 6153 and "whitish" on Pereira 7127.

In addition to months previously reported by me, this species has

been collected in anthesis in May and September.

Material of A. obducta has been misidentified and distributed in some herbaria as Cordia sp. and as Ehretia tomentosa H.B.K.

Additional citations: BRAZIL: Guanabara: Duarte 4964 [Herb. Jard. Bot. Rio Jan. 110272] (N); Liene, Sucre, & Pereira 3823 [Herb. Jard. Bot. Rio Jan. 110271] (N); Martins s.n. [Herb. FEEMA 6153] (Ld, W—2613937). Minas Gerais: Hatschbach 30078 (N, W—2706487). Paraná: Hatschbach 4986 (Mu), 24389 (W—2705948), 32230 (Mi, N, W--2706615). Rio de Janeiro: E. Pereira 7127 [Herb. Brad. 23581] (Mu). Santa Catarina: Gaudichaud 173 (P); Guillemin 5 (P); Reitz & Klein 801 (Mu).

AEGIPHILA OBOVATA Andr.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Moldenke, Phytologia 27: 297. 1973.

The corollas on W. E. Broadway 9064 are described as having been "greenish-yellow" when fresh and this collector encountered the plant along roadsides, flowering in November. On Philcox & Wood 7087 the corollas were "pale lemon-yellow" and the plant was growing in secondary forests, at 1325 feet altitude, flowering in June, described as a small tree, 2.5 m. tall.

Both Sweet (1830) and Loudon (1832) list A. obovata as cultivated in British gardens, introduced from the West Indies in 1804. They call it the "oval-leaved aegiphila".

Additional citations: TRINIDAD & TOBAGO: Tobago: W. E. Broadway 9064 (E—1031139); Philcox & Wood 7087 (N).

AEGIPHILA OBTUSA Urb.

Additional bibliography: Moldenke, Phytologia 27: 162. 1973.

Adams encountered this species on limestone in woodland, at 2600 meters altitude, fruiting in September.

Additional citations: JAMAICA: C. D. Adams 11720 (Mu).

AEGIPHILA ODONTOPHYLLA Donn. Sm.

Additional bibliography: Moldenke, Phytologia 27: 297. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102, 107, & 144. 1973; Moldenke, Phytologia 31: 382. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 38 & 39. 1976; López-Palacios, Fl. Venez. Verb. 24, 31, 129, 136, [143]—146, 645, & 646, fig. 31. 1977; Moldenke, Phytologia 40: 217 & 218. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [143], fig. 31. 1977.

Ruiz-Terán describes this species as an "arbusto inerme, 2.5—3 m. Ramitas jóvenes 4-gonas, marrones. Hojas discoloras, verde subobscuras, sublucientes y con nervios marrones por la haz, marrón purpúreas por el envés, con dientes cortos. Ejes inflorescenciales marrones. Cáliz verde intenso. Corola amarillento verdósula. Dru-

pas inmaturas globoso-deprimidas, verde intensas, con puntos blancos" and found it in fruit in September at 2450 m. altitude.

López-Palacios (1977) comments that "Creo debe hacerse un estudio más completo de Ae. odontophylla Donn. Sm., Ae. aculeifera Moldenke y Ae. farinosa Moldenke, pues es posible que en su interpretación haya errores y en consecuencia puede haber material interpretado y mal ubicado." In his 1976 work he also points out that A. odontophylla and A. farinosa are very closely related or perhaps even cospecific. He cites from Venezuela the following collections as A. odontophylla: Mérida: Bernardi 6157, 6191; Ijjasz 435; Little 15350; López-Figueiras & Rodríguez 8894; Ruiz-Terán 3201; Ruiz-Terán & López-Figueiras 8756. Trujillo: Ruiz-Terán & López-Palacios 9203. For Bernardi 6191 he comments that "Con este mismo número existe un ejemplar de Ae. mollis, pero parece deberse a un cambio de rótula y que Ae. odontophylla es la verdadera colección." In a personal communication to me he raises the possibility that A. odontophylla may actually be endemic to Costa Rica. If, on the other hand, the South American populations are the same as the Costa Rican, vernacular names reported are "salvio" and "salvio-chilco".

Lent refers to A. odontophylla as a "reclining tree of 10 m." or as a "reclining shrub", and found it growing along brooksides at 1635—1750 meters altitude, flowering in October and December. Jiménez M. calls it a tree, 6—7 m. tall, the trunk 10 cm. in diameter, the corolla-lobes reflexed, and the fruit green in July. He encountered it at 2500—2600 m. altitude, flowering in May.

The corollas on Maas & Plowman 2156 are said to have been "creamy-white" when fresh and these collectors refer to the plant as a shrub, 2 m. tall, "hanging over steep hillside" at 2000 m. altitude, flowering in October. Kirkbride & Duke encountered it in secondgrowth, and report the flower-buds white in April. The corollas on Jiménez M. 2192 & 3944 and Lent 2191 & 2300 are said to have been "white".

The photograph of Lehmann 8524 made at the Field Museum is accompanied by a label claiming that it depicts "T. G. Yuncker 8524", which is erroneous. It depicts F. T. Lehmann 8524.

Additional citations: COSTA RICA: Alajuela: Jiménez M. 3944 (Ws). Cartago: Jiménez M. 2192 (W—2751899). San José: Lent 2191 (N), 2300 (N, W—2746475). PANAMA: Bocas del Toro: Kirkbride & Duke 753 (N). COLOMBIA: Cauca: Lehmann 8524 (Au—190784—photo); Maas & Plowman 2156 (Ld, Ut—320468). VENEZUELA: Trujillo: Ruiz-Terán 9203 (Ld).

AEGIPHILA OVATA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 354. 1973; Soukup, Biota 11: 4. 1976.

AEGIPHILA PANAMENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 27: 297. 1973; Mol-

denke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102, 103, 109—112, & 144, fig. 10. 1973; Moldenke, Phytologia 31: 381 (1975), 32: 70 (1975), 34: 253 (1976), and 40: 216, 231, & 233. 1978.

Illustrations: Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 110, fig. 10. 1973.

Recent collectors describe this plant as a small, single-stemmed, spreading shrub or tree, 2—3 m. tall, the immature fruit light-green or yellow-green, turning orange and have encountered it in cafetal (in Mexico), along fencerows (in Costa Rica), and along fencerows and roadsides in disturbed forests, in second-growth in cleared areas of rainforests, in "rocky often much disturbed secondgrowth of tropical moist forests", and in brushy weedy pastures (in Panama), at altitudes of 80—400 meters. They have found it in anthesis in November (in addition to months previously recorded by me) and in fruit in December.

The corollas on P. H. Allen 5346 are said to have been "pale-yellow" when fresh, while those on Croat 12434, Ebinger 954, and A. Gentry 6306 were "white"; those on Nee 6987 were "light greenish-yellow" and those on Breedlove 28551, A. Gentry 5623, and Lent 2122 were "cream"-colored.

Gentry describes this species as a "small tree". Luteyn describes it as a shrub, 3 m. tall, the calyx pale-green, the corollas "cream to pale yellow-green", and the stamens yellow. Ebinger 954 is accompanied by a wood sample. Plowman and his associates describe the plant as a "scandent shrub, 2—3 m. tall", the fruit deep-yellow in September. Lent refers to it as a "trail-side treelet, 6 m. tall", while Burger & Gentry found it in a "moist forest in valley bottoms, tropical wet forest with open understory on steep slopes and ridges of secondary vegetation". It has been found growing at altitudes of 30—1100 meters.

Material of this species has been misidentified and distributed in some herbaria as A. elata Sw., A. pendula Moldenke, and Citharexylum reticulatum H.B.K. On the other hand, the Harmon & Dwyer 3335, distributed as A. panamensis, seems better placed as A. laxicupulis Moldenke, while Ebinger 243 is A. laeta H.B.K.

Additional citations: MEXICO: Chiapas: Breedlove 28551 (N). COSTA RICA: Heredia: Lent 2122 (N). Puntarenas: P. H. Allen 5346 (N); Burger & Gentry 8878 (N). PANAMA: Bocas del Toro: Storck 48 1/2 (Ca—M109277). Canal Zone: Croat 12434 (N), 12903 (N); Greenman & Greenman 5227 (E—906487); Hansen & Nee 3014 (Ws). Coclé: Ebinger 954 (W—2728870); A. Gentry 5623 (Ld, N); Luteyn 1197 (Mi). Colón: Davidse & D'Arcy 10067 (N); A. Gentry 6306 (W—2800091); M. Nee 6987 [MADw.32394] (Ws). Panamá: M. Nee 8869 (W—2787283). Barro Colorado Island: Croat s.n. [1973] (Ac, Ld). COLOMBIA: Meta: Plowman, Davis, & Jacobs 4260 (Ld).

AEGIPHILA PARAGUARIENSIS Briq.

Additional synonymy: Aegiphila paraguayensis Briq. ex Moldenke, Phytologia 28: 453, in syn. 1974.

Additional bibliography: Moldenke, Phytologia 27: 297 & 360 (1973) and 28: 453. 1974; Troncoso, Darwiniana 18: 393 & 408. 1974; Silberbauer-Gottsberger, Morawetz, & Gottsberger, Biotropica 9: 257 & 259. 1977.

Recent collectors describe this plant as an erect or depressed shrub or small tree, 1—5 m. tall, the trunk to 10 cm. in diameter, the small flowers in almost spherical clusters (or "umbels") ca. 4 cm. in diameter, the "flower face 7 mm. in diameter", the calyxes green and "inflated", the stamens white, and the fruit ellipsoid-prolate, dark-green when immature, then orange-green and finally orange in color, 4—10 mm. long, 5—7 mm. wide, shiny, "baga, oleosa". They have found it growing in dry ground of disturbed woodland, sandy soil of dense cerrado, dry open cerrado subject to browsing, along roadsides in cerrado vegetation near houses, and in riacho margins in areas of pastures slopes and riacho margins, at altitudes of 500—1600 m., flowering in February and November, fruiting from January to March and in November. Mimura found it in an "área originàriamente de mata entrelaçada com cerrado, ahora é campo com algumas árvores baixas e arbustos". Fosberg encountered it as "occasional on roadsides in campo cerrado vegetation badly invaded by Melinis".

The corollas are said to have been "whitish" on Anderson 11153, Fosberg 43325, and Hatschbach 37747, "white" on Castro 10669, Gibbs & Leitão Filho 3551, and Krapovickas & al. 23398, "cream" on Hatschbach 37572 and Héringer 12952, "greenish-white" on Eiten & al. 6028, and "yellowish-green" on Pedersen 9287. Goodland records the vernacular name, "compoid".

The Irwin, Harley, & Onishi 29468, distributed and previously cited by me as A. paraguariensis, seems to combine characters of this species and A. sellowiana Cham. and may represent a natural hybrid between the two taxa. Tentatively it is now cited by me under A. sellowiana.

Additional citations: BRAZIL: Distrito Federal: Héringer 12952 (N). Goiás: Hatschbach 37747 (Ld); Irwin, Maxwell, & Wasshausen 18665 (Ld, N). Mato Grosso: R. de Castro 10669 (N); Hatschbach 37572 (Ld). Minas Gerais: Anderson, Stieber, & Kirkbride 35553 (W—2709827); Irwin, Harley, & Onishi 30340 (Ld, W—2752368). Paraná: W. R. Anderson 11153 (Ld, N). São Paulo: Eiten, Eiten, & Mimura 6028 (Hl, W—2687859); F. R. Fosberg 43325 (Ld); Gibbs & Leitão Filho 3551 (N); Goodland 407 (N); Krapovickas, Cristóbal, & Maruñak 23398 (N); Mimura 301 (W—2555603). PARAGUAY: Pedersen 9287 (N).

AEGIPHILA PARVIFLORA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 297 & 299. 1973; Moldenke, Biol. Abstr. 57: 5679. 1974; Hocking, Excerpt. Bot.

A.26: 5. 1975; López-Palacios, Fl. Venez. Verb. 24, 25, 30, 94, 146—147, & 646. 1977.

López-Palacios (1977) cites from Venezuela the following collections: Apure: Borsotti 3, 53. Bolívar: Grosourdy Cat. No. 13 s.n.

Additional citations: BRAZIL: Bahia: Irwin, Harley, & Smith 31110 (W—2709815); Lanna 776 [Castellanos 25526; Herb. FEEMA 4783] (Ld).

AEGIPHILA PAUCIFLORA Standl.

Additional bibliography: Moldenke, Phytologia 27: 298 (1973) and 34: 253. 1976.

Illustrations: page 342 (overleaf)

Gentry & Mori have collected what appears to be this taxon, although on their collection the leaf-blades are extremely thin-membranous and nigrescent in drying. They encountered it in the "lower montane wet forest - premontane wet forest transition", at 1400—1500 meters altitude, in Darién, Panama, and describe the plant as a small tree, 4 m. tall, the flower-buds cream-color in January. The figure (overleaf) drawn by Charles C. Clare from their collection: A, habit; B, unopened flower-bud; C, corolla laid open; D, stamen, abaxial view; E, gynoecium; F, calyx, exterior view.

Additional citations: PANAMA: Darién: Gentry & Mori 13802 (Z).

AEGIPHILA PENDULA Moldenke

Additional bibliography: Pittier, Supl. Pl. Usuel. Venez. 54. 1939; Moldenke, Phytologia 27: 298. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 102, 107—108, & 144. 1973; López-Palacios, Fl. Venez. Verb. 31, 77, 148—150, & 646, fig. 32. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [149], fig. 32. 1977.

López-Palacios (1977) cites from Venezuela only the following collections: Amazonas: Ewel 199. Zulia: Pittier 10645; Tejera 157, 168. The last-mentioned was earlier identified by him as A. glandulifera Moldenke.

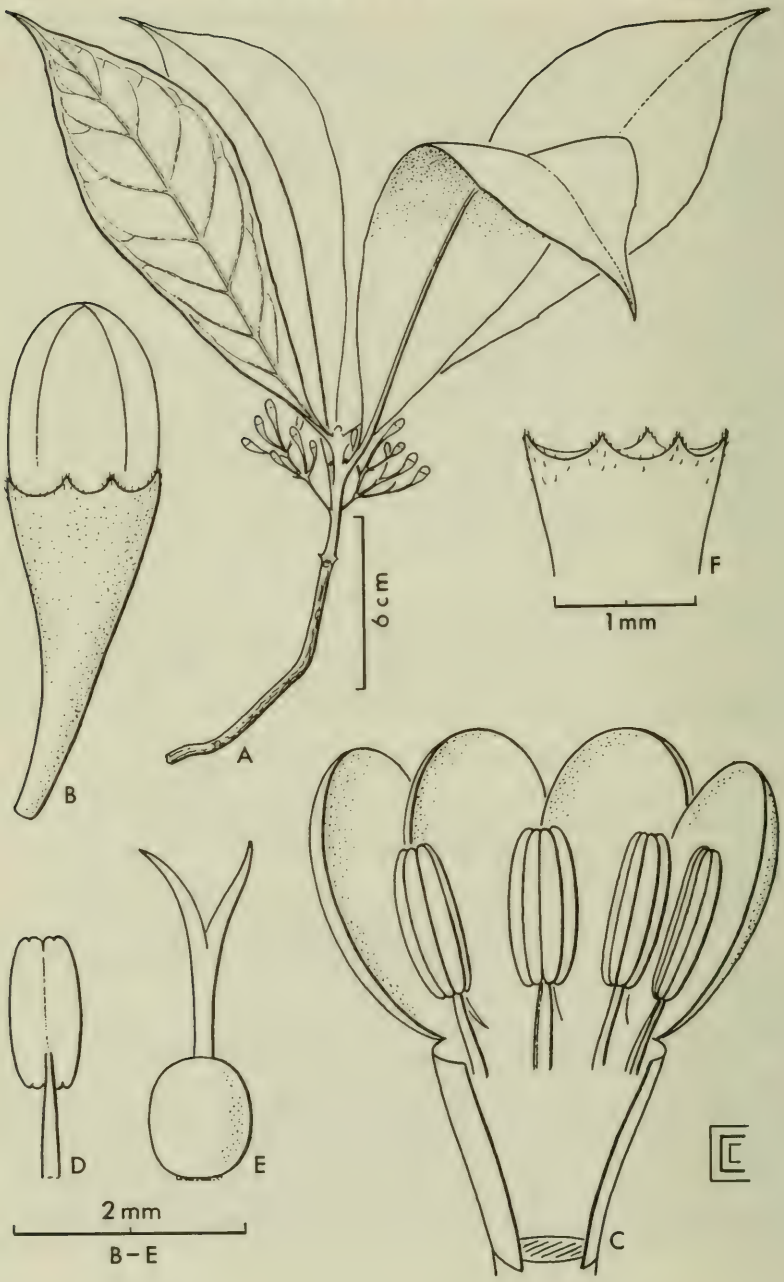
The Hansen & Dwyer 3014, distributed as A. pendula, seems better regarded as representing A. panamensis Moldenke

Additional citations: ECUADOR: Napo-Pastaza: Asplund 18677 (Ld).

AEGIPHILA PERNAMBUCENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 27: 299 (1973) and 31: 384. 1975.

Harley and his associates describe this plant as a shrub to 2 m. tall, the leaves green above, gray-green beneath, and the flowers with a strong scent of apple blossoms. The corollas are said to have been "white" on their collection. They encountered the species on dry quartzite hillsides with disturbed woodland on the lower slopes and scrub above, at 1200—1400 m. altitude.


6 cm
A
B
F
1 mm
C
D
E
2 mm
B-E

Davidse and his associates found it in brushy areas at 250 meters altitude and refer to it as a shrub, 3 m. tall, with white flowers. Santos calls it a tree, the "flor branca antera marrom cálice verde".

Additional citations: BRAZIL: Bahia: Davidse, Ramamoorthy, & Vital 11682 (Ld); Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15189 (Z), 15464 (Ld); Santos 2535 (N).

AEGIPHILA PERPLEXA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 299. 1973; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; López-Palacios, Fl. Venez. Verb. 24, 27, 31, 34, 111, 150—153, & 646, fig. 33. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [151], fig. 33. 1977.

López-Palacios (1977) cites only the type collection, Rusby & Squires 316, from Delta Amacuro, Venezuela, and comments that "En mi concepto, para Venezuela sólo debe citarse la colección y la localidad típicas. Las demás, aun las mencionadas por Moldenke, como Steyermark 62240, pertenecen a otras denominaciones, como por ej. Ae. laxiflora, con la que sospecho puede ser coespecífica."

AEGIPHILA PERUVIANA Turcz.

Additional bibliography: Moldenke, Phytologia 27: 354—355. 1973; Hocking, Excerpt. Bot. A.23: 293. 1974; Moldenke, Biol. Abstr. 58: 685. 1974; Soukup, Biota 11: 4. 1976; López-Palacios, Fl. Venez. Verb. 70 & 646. 1977.

Recent collectors describe this plant as a shrub, small tree, or treelet, 2—5 m. tall, the calyxes green, and the fruit yellow, orange-red, or "black with yellow". The corollas are said to have been "white" on Martin & Lau-Cam 1052, "cream" on Martin & Plowman 1780, and "yellow" on Martin & Lau-Cam 1130. These collectors found the plant in flower in June, August, and December and both in flower and fruit in July, record the vernacular names, "arco sacha", "chiripa sacha", and "huingo quiro", and report that the ground bark is mixed with water and applied as a poultice for inflammation and "tumors from sunburn". The corollas on Schunke Vigo 6674 are said to have been "brilliant greenish-yellow (10 Y 9/9)" and this collector reports the plant as being toxic, but used medicinally in Peru to treating infected ulcers.

Additional citations: PERU: Loreto: Martin & Lau-Cam 1036 (Oa), 1052 (Oa), 1130 (Oa); Martin & Plowman 1780 (Oa); Martin, Plowman, & Lau-Cam 1625 (Oa); Schunke Vigo 6674 (W—2653869). BRAZIL: Roraima: Prance, Steward, Ramos, & Monteiro 11057 (N). BOLIVIA: El Beni: H. H. Rusby 2473 (Ws).

AEGIPHILA PULCHERRIMA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 355. 1973; Soukup, Biota 11: 4. 1976.

AEGIPHILA QUINDUENSIS (H.B.K.) Moldenke

Additional synonymy: Petitia ternifolia López-Palacios, Fl. Venez. Verb. 651, in syn. 1977.

Additional & emended bibliography: Schau. in A. DC., Prodr. 11: 639, 652, & 657. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 9 & 338. 1858; Moldenke, Phytologia 27: 356—357 (1973) and 28: 435. 1974; López-Palacios, Fl. Venez. Verb. 23, 25, 36, 122, 153—158, 632—633, 645, 646, & 651, fig. 34 & 35. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [154] & [155], fig. 34 & 35. 1977.

López-Palacios describes this plant as an "arbusto de tallos blancos. Fruto amarillo anaranjado" and encountered it at 1400 m. altitude, fruiting in August. In his 1977 work he cites the following collections from Venezuela: Aragua: Aristeguieta 5155; Badillo 1825; Delgado 115; J. García 53; Lasser 2058; Pittier 14993, 15474, 15481, 15550, 15648; Steyermark 91800; Trujillo 2380, 5733; Ll. Williams 10251, 10391. Carabobo: Karsten s.n.; Pittier 8806a, 14993. Falcón: Ruiz-Terán 460; Smith V.7883. Federal District: Lasser 2121; Morillo & Manara 2149; Pittier 10404; Steyermark 91507, 98250. Mérida: López-Palacios & Bautista 3504. Miranda: Aristeguieta 4854. Monagas: Ruiz-Terán & López-Palacios 9822; Steyermark 64406. Yaracuy: Aristeguieta 3840; Steyermark & Wessels-Boer 100476. He also cites Nehlin s.n. from Santa Lucia Island.

Additional citations: COLOMBIA: Cundinamarca: López-Palacios 3633 (Ld, N). VENEZUELA: Lara: Aristeguieta 3944 (N).

AEGIPHILA RACEMOSA Vell.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 357. 1973; López-Palacios, Fl. Venez. Verb. 23, 24, 36, 125, 159—162, & 646, fig. 36. 1977.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [160], fig. 36. 1977.

Anderson calls this species a woody vine to 2.5 m. tall and found it growing at the edge of a forest in an area of forest and shrubby campo, the fruit green in February. Ruiz-Terán & López-Palacios refer to it as an "Arbusto erecto, inerme, 2 m., com ramas arcuadas. Yemas florales amarillo verdosas. Corola blanca en la antesis. Cáliz verde intenso" and found it growing at 650 m. altitude, flowering in July. López-Palacios (1977) comments that "Los ejemplares Steyermark & Dunsterville 104461 y Steyermark & Nilsson 193 son coespecíficos; este último aparece como determinado por Moldenke, en 1961, como Ae. membranacea Turcz. Sin embargo, yo considero que no pueda pertenecer a este taxon, y me baso para ello en carta de 21 de julio de 1973 del mismo Dr. Moldenke, en que llama mi atención sobre la descripción original de Turczaninow, que dice "foliis.....utrinque praeter costam glabris". Debido a su envés esparcido-puberulento, los coloco provisionalmente aquí, aunque con cierta duda, a causa de sus cimas laxas y abiertas."

Bruijn collected what appears to be A. racemosa at very low altitudes (sealevel to 100 meters) and describes his plant as a liana, the stems grayish-brown, twigs dull dark-green with brownish hairs, the leaves papery, glossy and medium-green above, dull and paler green beneath, the calyx pale-green, the corollas greenish-white, the filaments white, and the anthers medium-brown. He encountered it in "primary forests". It was incorrectly distributed as A. verrucosa Schau.

López-Palacios (1977) cites the following collections from Venezuela: Amazonas: Steyermark & Bunting 102891. Bolívar: Lasser 1893; Steyermark 75420, 88441; Steyermark & Dunsterville 104461; Steyermark & Nilsson 193. Mérida: López-Palacios 1641, 2123; Steyermark 55728. Táchira: Ijjasz 316. Zulia: Bruijn 1431; Ruten & al. 40.

Additional citations: VENEZUELA: Zulia: Bruijn 1431 (N). BRAZIL: Pará: W. R. Anderson 10719 (Ld, N). Roraima: Ruiz-Terán & López-Palacios 11004 (Ld).

AEGIPHILA RETICULATA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 358. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 40. 1976.

López-Palacios (1976) feels that this taxon is not a valid species, but probably represents an anomalous form of some other taxon.

AEGIPHILA RIEDELIANA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 358. 1973.

The Eitens describe this plant as a tree, 8—10 m. tall, with orange-red fruit in November, and have found it growing in roadside secondary shrubbery. They assert that their no. 7828 was taken "from the same tree as G. Gottsberger 17191166".

Additional citations: BRAZIL: Rio de Janeiro: Eiten & Eiten 7828 (W—2688171).

AEGIPHILA RIMBACHII Moldenke

Additional bibliography: Moldenke, Phytologia 27: 358 (1973) and 36: 32. 1977.

López-Palacios describes this plant as an "arbor 6—8 m, fls. 5-meras, blanco cremosas, cáliz subtrunco, verrucoso, fruto verdósulo" and found it growing at 2900 meters altitude, flowering and fruiting in February.

Additional citations: ECUADOR: Pichincha: López-Palacios 4218 (Z).

AEGIPHILA RORAIMENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 27: 358, 365, & 372. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21. 1974; López-Palacios, Fl. Venez. Verb. 31, 36, 37, 163—166, &

646, fig. 37. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [164], fig. 37. 1977.

Ruiz-Terán & López-Palacios describe this plant as an "Arbusto erecto, ramificado, inerme, 1,2—2,5 m. Corola blanca. Frutos (drupas) inmaturos, amarillo verdosos. Hojas glabras por la haz, suavemente indumentadas por el envés" and found it growing at altitudes of 300—1300 meters, flowering and fruiting in July. They report the vernacular name, "joméi-yek".

The Ruiz-Terán & López-Palacios 11387, distributed as A. roraimensis, seems more likely to me to represent A. steyermarkii, if, indeed, that taxon is to be kept distinct. López-Palacios (1977) does not feel that it is distinct. He says: "Ae. venezuelensis, Ae. roraimensis y sus sinónimos forman un complejo que para mí son un solo y mismo taxon con diferentes ecótipos. Quise reducirlo todo a Ae. roraimensis, pero el Dr. Moldenke insiste en la validez de Ae. venezuelensis. Yo, aunque no muy convencido, respeto su criterio y por tanto la conservo. Posteriores estudios de campo decidirán quien tiene la razón." He cites for A. roraimensis from Venezuela the following collections: Bolívar: Lasser 1838; Maguire 32851, 32930; Ruiz-Terán & López-Palacios 10991, 11118, 11127, 11385, 11387; Steyermark 59960, 60113, 60182, 93834, 94085.

Additional citations: VENEZUELA: Bolívar: Ruiz-Terán & López-Palacios 10991 (Ld), 11118 (Mi), 11127 (Ac), 11385 (Tu).

AEGIPHILA SALTENSIS Legname, Lilloa 33: [329]—333, fig. 1 & 2. 1974.

Bibliography: Legname, Lilloa 33: [329]—333, fig. 1 & 2. 1974; Moldenke, Phytologia 28: 440. 1974; Troncoso, Darwiniana 18: 393 & 408. 1974; Legname, Biol. Abstr. 59: 6928. 1975; Moldenke, Phytologia 36: 36. 1977.

Illustrations: Legname, Lilloa 33: 330 & 332, fig. 1 & 2. 1974.

This species is based on Legname & Cuezzo 6152, from Finca Jacúlica, Quebrada el Arasayal, dept. Orán, Salta, Argentina, collected on May 6, 1969, and deposited in the herbarium of the Instituto Miguel Lillo at Tucumán, Argentina. The plant is said to be dioecious. Additional collections cited from Salta and deposited in the same herbarium are Legname & Cuezzo 8266 & 8450, Mármol, Cuezzo, & Cuezzo 9229 & 9275, Mármol, Legname, & Cuezzo 8758 & 8824, and Vervoorst & Cuezzo 7799. The vernacular name, "ediondilla blanca", is reported for it.

Recent collectors describe this species as a tree or treelet, 3—8 m. tall, the trunk to 20 cm. in diameter at breast height, and the bark rough. They have encountered it at 690—1060 m. altitude, in flower in November and in fruit in October. Other collectors refer to it as a shrub, 3 m. tall, or a tree, 8 m. tall, the trunk 5—20 cm. in diameter, the "corteza rugosa, delgado, surcos longitudinales, grisaceo marrón, frutos maduros morado-oscuro, primero morado vinoso" and found it in fruit in September. [to be continued]

Fusarium moniliforme Sheld. Association with Species of Orchids

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Abstract. The fungal species *Fusarium moniliforme* Sheld. was repeatedly isolated in nature from orchid species *Cypripedium calceolus* L. and *C. reginae* Walt. A symbiotic relationship was found between the fungus and orchids native to Michigan. Induced fungal pathogenicity was obtained with *F. moniliforme* in the orchid *Zygopetalum machaeii*.

Introduction

Over 50 orchid species are found native to Michigan (11,17). Occasionally good populations of selected species occur in undisturbed habitats. From the Michigan species, *Cypripedium reginae* Walt and *C. calceolus* L. were selected for mycological investigations. The habitat of *C. calceolus* is cosmopolitan and it can be found in tamarack - black spruce bogs, in heavily wooded sphagnum swamps, in thickets along streams, in bushy meadows, on sandy swampy lake shores, and in damp meadows, fields and roadsides. *Cypripedium reginae* is slightly more restricted to such areas as bogs, heavily wooded swamps, swampy lake shores, and in areas where sphagnum grows well.

Initial investigations examined selected orchid plants for the presence of fungi. Repeated isolations of *Fusarium moniliforme* Sheld. were obtained from various parts of mature orchid plants growing in nature. Orchids are known to possess chemical and morphological qualities which control or hinder fungal growth. Phytoalexins keep invading fungal species under control, creating symbiotic, commensalistic or slightly parasitic relationships (1,3,4).

Various inoculations of *Fusarium* conidia, originally isolated from field material, were made on domestic orchids. The fungal associations with the orchids created by the inoculations were then examined. Studies were designed to identify the relationship of *Fusarium* sp. to domestic and native orchids of Michigan.

Literature Review

Regardless of differences in morphological, anatomical, or physiological characteristics, all orchids at some phase in their life cycle are associated with certain fungi. Hyphal filaments serve as absorbing organs within cortical cells of orchid roots (31, 32,33). This orchid - fungal association may be advantageous, neutral, or disadvantageous and parasitic (2). Some species of fungi are found throughout the orchid plant, but mycorrhizae create a symbiotic relationship in the host root system (10,34,38,41). In a mycorrhizal relationship, reciprocal movements of substances between the orchid and the fungus occurs (3,4,35). Little evidence either supporting or discounting the specificity of the host - endophytic relationship has been established, but it appears that certain fungal species seem to

be more effective with select taxonomic groups of orchids (29,31,34).

According to Marx (38), the micorrhizae of orchids have an endomycorrhizal association. Hyphae of the symbiont penetrate the cells and establish close contact with the cytoplasm. Endomycorrhizal fungi have the ability to degrade cellulosic cell walls, but ectomycorrhizal fungi do not have this ability and are limited to utilizing a few simple carbohydrates (41). Apparently seedlings require association with specific fungi soon after seed germination. Fungi infect orchid embryos in the early protocorm stage. Without this infection, embryonic growth continues only by an artificial supply of sugars, vitamins, as well as mineral nutrients (19,42,47,48). Nutrients are first absorbed by the fungal hyphae and then released into the host tissue. Fungal hyphae are digested in the host cells, which is the transfer mechanism of nutrients from fungus to host (15,28,33).

The orchid host has many methods of controlling the fungal symbiont. It is clear that the host - endophyte complex must maintain factors or conditions that bring enzyme activity of the fungus under control. If this control is not attained, a pathogenic association could result. The controls of the enzyme activity of the fungus are due to the interaction of metabolic processes of the endophyte and the host. The fungus is able to break down soil cellulose into nutritive compounds that can be absorbed by the fungus and then in turn by the host (47,48). The absence of invading hyphae in various parts of terrestrial orchids has suggested that orchids possess a mechanism of resistance to, or a substance that is toxic to, mycorrhizal fungi (32). This fungistatic control compound is secreted only by living cells due to the activity of the fungus upon them. Structurally, the chemical is a benzene soluble fungistatic compound with a molecular weight of 256. The chemical was named Orchinol (25,26). It was the first of several compounds to be discovered that were produced by orchids after infection by fungi and which were classified as phytoalexins (1,3,13,14,21,22,24,31,40,49). Phytoalexins are described as plant antibiotics which are inhibitory to microorganisms attacking plants. The compounds arise from metabolic interactions of hosts and parasites (43). Other compounds discovered following studies on phytoalexins were Hircinol and Loroglossol which had a wide spectrum of activity on fungi, however, their modes of action were not specific against only mycorrhizal fungi (20,21).

The formation of phytoalexin is induced in the plant by diverse fungi. The fungal types include obligate and facultative parasites, specifically adapted pathogens to the plant, and phytopathogenic fungi not infecting the given plant species (40). However, all fungi do not necessarily bring about phytoalexin formation. Orchinol was not formed when common saprophytic and semiparasitic soil fungi were used for the infection of orchids (25,26). Phytoalexin formation occurs in all host plant organs. A plant is resistant to a parasite if the concentration of phytoalexin is high enough to inhibit the growth of a parasite. The orchid becomes a susceptable host if the phytoalexin concentration is insufficient to inhibit the pathogen (40). It is not known if the effect of these substances allows certain mycorrhizal fungi to exist in roots and at the same time inhibit the asso-

ciation of other fungal species. This could explain the selectivity of fungal species to orchid symbiosis (32).

Hyphae invading orchid tissues are surrounded by a membrane that is close to the fungal wall or separated from the host tissue by a distinct layer. This membrane is considered to be of host origin while the metabolic transfer is from fungus to host (13). Intracellular hyphae did not penetrate the plasmalemma of the orchid cell (29).

Not all fungal relationships with orchids are beneficial, and a pathogenic state can exist between the fungus and its host. The difference between a mycorrhizal fungus and a root pathogen may not be great (48). The occurrences of fungal pathogenicity in orchids are few, but there are examples of serious pathogenic associations (9,16,18,39). Certain species of fungi can cause severe root rot in various genera of orchids (2,36,46). Bud rots and leaf stains are other diseases caused by fungi and are characterized by discolored spots or patches on the leaves, stems, and fruit which are followed by death or rotting of these organs (5). The association of F. moniliforme with domestic and wild orchids was examined to determine what relationship was established between the orchids and the fungal isolate.

Materials and Methods

Two orchid species, Cypripedium reginae Walt. and Cypripedium calceolus L. were selected for study. The collection site was Kalkaska County, Michigan. The habitat consisted of a balsam - cedar forest opening onto a bog. Mature plants, soil samples, and orchid leaf litter were obtained at the collection sites then taken to the laboratory.

One inch sections of orchid leaves from living plants were surface sterilized with 70% ETOH 5 seconds and 5% Chlorox bleach 15 minutes before placing in the moist petri chamber. Sterile distilled H_2O was periodically added to the petri plates to prevent drying of the orchid material. Pure cultures of the fungi isolated from the incubated material were maintained on Potato Dextrose Agar (PDA) and identified according to the literature (6,7,8,12,23,24,27,37,45,46).

Serial dilutions of soil suspensions were plated on PDA and incubated at room temperature. Orchid leaf litter collected in nature was placed in moist petri dish chambers and incubated. Fungal isolates were identified and maintained in pure culture.

Mature hybrid orchid plants were obtained from the collections of Ilgenfritz Nurseries, Monroe, and Black River Orchids, Grand Haven. Hybrids selected included Cattleya sp., Cypripedium sp., Cymbidium sp., Dendrobium sp., Diacattleya sp., Epicattleya sp., Epilaeliocattleya sp., Laeliocattleya sp., Oncidium sp., Paphiopetalum sp., Phalaenopsis sp., Sophrolaeliocattleya sp., and Zygopetalum sp.

Hybrid orchid leaves were incubated with fungal colonies on agar by placing the colony surface down on the leaf blade. After 3 weeks incubation leaf sections containing the colony inocula were removed from the plant, fixed in FAA, dehydrated in an alcohol series, and embedded in Tissuemat. Material was sectioned at 8-10 u then placed on slides controled with Haupts adhesive (1 g gelation, 2 g phenol,

15 ml glycerine to 30 ml distilled H_2O) and flooded with 4% formalin. Slides were drained and air dried one week before staining. Sectioned plant material invaded with fungi was stained with a modified Conants quadruple stain in a xylene alcohol dehydration, safranin in 30% ETOH, orange gold and fast green in clove oil, with a Canada balsam mounting.

Excised Cypripedium roots, leaf sections, and stems were obtained from living plants in nature, surface sterilized then placed on PDA, Knudson's Orchid Agar, and Noble Agar for growth and isolation of fungi associated with the plant tissue.

Results

Leaf litter and soil obtained adjacent to Cypripedium species in nature contained numerous fungi and bacteria. Fusarium moniliforme was the dominant fungal species most frequently found in each collection. Repeatedly F. moniliforme was isolated from living Cypripedium leaves that were surface sterilized and placed in incubation chambers. A suspension of F. moniliforme conidia inoculated into various hybrid orchids caused blackening of the host tissue at the inoculation site with no further fungal involvement.

One orchid, Zygopetalum machaeii served as a suitable host plant for fungal invasion from agar block transfers of F. moniliforme cultures to the orchid leaves. Other orchids that proved negative with this method included Cymbidium balkis, Dendrobium rididum, Diacattleya sp., Epicattleya sp., Epilaeliocattleya sp., Laeliocattleya sp., Oncidium ampliatum, Paphiopetalum callosum, Phalaenopsis sp., and Sophrolaeliocattleya sp. With Zygopetalum sp., a darkened area appeared similar to the inoculations on the other plants, and in addition, Fusarium established a vigorous colony on the leaf surface independent of the agar block.

Sectioned Z. machaeii leaf tissue demonstrated a definite fungal association. Sclerotia were found in abundance in the leaf tissue. Most sclerotia were round or kidney shaped with a defined dark colored outer rind enclosing a medulla of densely packed hyphae lacking any consistent orientation. Some microsclerotia were observed containing few cells without an outer rind. In one case the whole end of the leaf had been taken over by a sclerotial cap. The sclerotial rind contained coalesced hyphal segments with thick, agglutinated, dark colored walls. Agglutinated segments were also found within the medulla interior. Internal consolidation consisted of intercalary expansion and septation associated with hyphal anastomoses. Reserve materials accumulate as the wall thickened.

The palisade and mesophyll areas of the leaf were heavily invaded with mycelia. The upper and lower epidermis appeared desiccated and completely replaced by hyphae. Macroconidia were common near a sclerotium. Aerial hyphae on the abaxial sides of the leaves were abundant, and remnants of the leaf cells could be seen surrounding the rind of the sclerotium on the adaxial side.

In several leaf sections of Z. machaeii, many stromatic pustules were found. These pustules served as perithecial initials or immature sporodochia. Hyphae were dominant throughout the entire leaf section, and the epidermis on both adaxial and abaxial sides was lifted or sloughed off near the stromatic pustules (Fig.1). Pustules

found directly over a vascular bundle had a tendency to invade the vascular bundle but apparently did not disrupt the function of the tissue. Macroconidia were very abundant and aerial hyphae were again found in large amounts. Hyphal penetration appeared to be both intercellular and intracellular and some cells were completely packed with hyphal strands. The pustules appeared heavily packed with pseudoparenchymatous material with small amounts of agglutinated cells as found in the sclerotium.

Sectioned Cypripedium roots appeared heavily infected with F. moniliforme. The epidermis and inner cortical cells were dense with hyphae and conidia (Fig.2). Inner cortical cells also contained loosely packed hyphal strands with macroconidial formation on phialides. Large stroma were also observed which appeared dark in areas and contained large isodiametric cells with slightly thickened walls. Aerial hyphae were found in abundance with macroconidia.

Cypripedium sp. seeds collected in nature were surface sterilized and shaken vigorously in sodium hypochlorite solution and inoculated on orchid agar plates. The seeds prior to inoculation were stored 6 months at room temperature and 6 months in a freezer to induce the overwinter cycle. Soon after incubation the seeds supported fungal growth. The organism was identified as pure cultures of F. moniliforme.

Cypripedium roots were obtained from potted plants transported to the laboratory from the original collecting site. Surface sterilized roots placed on PDA, orchid agar, or nutrient agar supported abundant mycelial growth within 5 to 7 days incubation at room temperature. The predominant fungal species again was F. moniliforme.

Fusarium moniliforme form microconidia in chains or on polyphialides, spindle to ovoid in shape. The macroconidia are slender with thin walls, commonly three septate, having an appearance of quarter moons. The cultures range in coloration from brownish-white to orange-cinnamon with a stroma white to deep violet. No chlamydospores are formed, however, large sclerotial beds occur over the host or substrate. Growth on PDA is initially filmy, colorless, and rapid. The reverse colony surface becomes typically deep violet but sometimes lilac or cream. Aerial mycelium is generally dense with a felt texture.

Discussion

It was determined by this study that an association does exist between Cypripedium reginae, C. calceolus and Fusarium moniliforme. The complete nature of this association remains unknown. It is highly probable that a symbiotic relationship developed between the opportunistic fungus F. moniliforme and the Cypripedium species, and that a mycorrhizal situation exists within the roots of these orchids.

The greatest Fusarium growth was associated with the roots of the Cypripedium species. This is the area in the orchid plant where the concentration of phytoalexins would be at the lowest level therefore accounting for the profuseness of Fusarium. When pure cultures of Fusarium moniliforme were reintroduced onto leaves, stems, or other tissues of living Cypripedium orchids there was no response and the fungus eventually died after the small agar block on which

it was growing was depleted. When various commercial orchids were used for inoculation purposes, in all but one example, Zygopetalum machaeii var. Lee, there was no outward response noted. Only a browning effect caused by the apparent scar tissue produced by the orchid in response to the scalpel cuts. Microscopic examination of embedded tissue of this brown area revealed no fungal hyphae or fungal remnants, and the underlying orchid cells appeared normal. A lesion appeared on Zygopetalum after Fusarium inoculation. The Fusarium eventually grew entirely through the leaf and appeared healthy and vigorous. Stromatic pustule lesions were observed on both the adaxial and abaxial sides of the leaf. These lesions may be perithecial initials or they may develop into true sporodochia (12). Scattered lesions on the Zygopetalum leaves appeared craterous with the centers sunken and containing a large amount of hyphal material situated around the outside of these pustule craters. Macroconidia were apparent on the surface around the pustules, and agglutinated hyphae were also present. Host leaf cells were partially filled with hyphae. No vascular tissue of the Zygopetalum orchid plants was affected by the fusarial growth. Even in cases where the fungus was growing adjacent to the vascular bundles there was no evidence of plugging or any disarray of xylem vessels. In most fusarial infections of other plants the vascular system is attacked and the fungal presence is observed. Cells immediately beneath the stromatic pustule appear to be normal without the appearance of being crushed or mutilated even though many cells are filled with fungal hyphae. The infected area was localized to the section of leaf where initial infection had taken place. There was no evidence of wilt as if the vascular system was being invaded and only the local lesions were apparent. Sclerotia formed on the ends and sides of the Zygopetalum leaves and apparently caused malformation of host cells. Epidermal areas as well as cortical cells were completely dominated by the sclerotia.

In the Cypripedium roots no stromatic pustules were formed or detected upon examination of the infected tissue. The emerging Fusarium fungus was allowed to completely envelop the root in the incubation chambers before killing-fixing. When sectioned, infected roots were found to be free of any outward breaks in the root epidermis caused by the fungus, however, the roots were completely infiltrated with Fusarium. It was quite evident that the fusarial growth developed within the root before it emerged at the surface. The epidermal cells were packed with the fungus, but there was little disruption of cell walls.

The relationship of fungi with orchids whether pathogenic, saprophytic, opportunistic or symbiotic is of a highly complex nature. Hardy orchid species survive by the establishment of an association with the fungal invader. Cypripedium species are similar to other orchid genera in that associations exist with a fungus which are necessary for the survival of the orchid. Fusarium moniliforme was determined by this study to have a definite association with Cypripedium reginae and C. calceolus. No lesions occurred in Cypripedium in spite of the dominance of F. moniliforme in healthy plant material, however, a commercial orchid developed lesions by the invading fungus. Fusarium moniliforme and Cypripedium species in Michigan appear to be

symbiotic while F. moniliforme with Zygopetalum machaeii is parasitic.

Summary

Fusarium moniliforme Sheld. was isolated repeatedly in nature from Cypripedium reginae and Cypripedium calceolus, orchids native to Michigan. Fusarium moniliforme introduced onto various cultured orchid species produced no pathogenicity in all but one species. Stromatic pustules developed on upper and lower leaf surfaces of Zygopetalum machaeii, and macroconidia were found in abundance. Sclerotia formed on Zypopetalum leaf tissue and they were composed of well developed outer rinds surrounding the medullae of agglutinated hyphae. The leaf was also desiccated and malformed by the fungus. Fusarium moniliforme was symbiotic to C. reginae and C. calceolus, and pathogenic to Z. machaeii.

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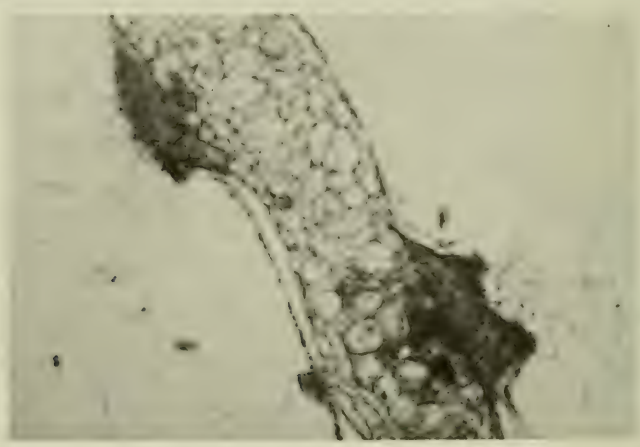

Figure 1. Stromatic pustules of Fusarium moniliforme on the adaxial and abaxial surfaces of Zygopetalum machaeii leaf. x 390.

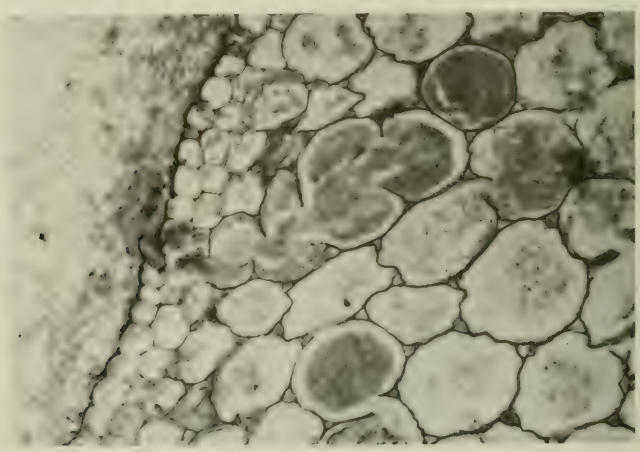

Figure 2. Cypripedium root with a dense lateral development of Fusarium moniliforme in epidermal and cortical cells in addition to loosely organized mycelial formation randomly found in host tissue and a dense growth on the host leaf surface. x 390.

BOOK REVIEWS

Alma L. Moldenke

"PHOTORESPIRATION IN MARINE PLANTS" edited by N. E. Tolbert & C. B. Osmond, iv & 137 pp., 34 b/w fig., 224 tab. CSIRO, East Melbourne, Australia 3002 & University Park Press, Tokyo, London, & Baltimore, Maryland 21202. 1976. $19.50.

The Great Barrier Reef Photorespiration Expedition (March-May 1973), under the auspices of the United States-Australian Agreement on Scientific and Technical Cooperation, used the research vessel Alpha Helix and facilities on Lizard Island so that "biochemists and plant physiologists experienced in the field of photorespiration in terrestrial plants [could] investigate this process in the marine plants of an important but relatively unresearched environment, the tropical waters of the Great Barrier Reef, Australia". "A Check List of Marine Benthic Plants Collected in the Lizard Island Area" provides authentication for voucher specimens as well as enriching knowledge of an area that had only four kinds of plants listed for it previously. A carbon assimilation pathway from sea water through autotroph and heterotroph to reef calcification is demonstrated. Seagrasses did not use C_3, C_4 or crassulacean acid metabolism but whatever they did use is not yet known. Photorespiration is demonstrated in "specific marine plants at levels similar to those found in terrestrial plants with the reductive pentose phosphate cycle".

An interesting project: an interesting neat 18-paper report.

"CO_2 METABOLISM AND PLANT PRODUCTIVITY" edited by R. H. Burris & C. C. Black, xi & 431 pp., 113 b/w fig. & 53 tab. University Park Press, Tokyo, London & Baltimore, Maryland 21202. 1976. $39.50.

This book contains a great deal of valuable information as the Proceedings of the Fifth Annual Harry Steenbock Symposium held in Madison, Wisconsin, June 1975 to consider "new methods that could supplement classical techniques in plant breeding programs to improve productivity" to feed the expanding world population. This book is so well organized and so effectively presents a cluster of 25 papers by an international group of 44 "sun-trapper" authors that it is consequently difficult to select a few highlights for mention. Should they be about (1) C_3 and C_4 photosynthetic pathways where the C_3 plants include most crops and some have their productivity lowered by photorespiration and where the more productive C_4 plants include some of our most important crops (corn, sorghum, sugarcane) but also our worst weeds especially those growing in with C_3 crops, or (2) development of selective weed-

icides affecting specific target enzymes disrupting the C_4 and not the C_3 cycle, or (3) experimental haploids from anthers as effective tools for improving cultivated crop species as shown in corn, tobacco and potatoes, or (4) crassulacean acid metabolism (CAM) of survival value in deserts of some succulents in 18 known dicot and monocot families and one fern and how it works, or .. ? This book should prove of very great value to many researchers, professors and advanced students in many related fields.

"BIOCHEMISTRY Series One, Volume Eleven PLANT BIOCHEMISTRY" edited by D. H. Northcote, vi & 287 pp., 41 b/w fig. & 10 tab. Butterworths, London, & University Park Press, Baltimore, Maryland 21202. 1974. $19.50.

This issue consists of seven papers on (1) movement of key substances across the chloroplast envelope, (2) algal cell wall polysaccharides, (3) pathways of breakdown of carbohydrates in higher plants and hexose oxidation from glycolysis or pentose phosphate pathway leading to NADH and NADPH production within the same cell, (4) phytohormones, (5) photomorphogenesis of the synthesis of enzymes that is not yet backed by evidence, (6) metalloenzymes of nitrate and nitrite reduction with two amazingly detailed figures, and (7) enzymological aspects of plant flavonoids and lignin biosynthesis and degradation.

"PLANT BIOCHEMISTRY Series Two, Volume Thirteen PLANT BIOCHEMISTRY II" edited by D. H. Northcote, ix & 262 pp., 18 b/w fig. & 18 tab. University Park Press, London, Tokyo, & Baltimore, Maryland 21202. 1977. $29.50.

There has been some change — at least nominative — in this publication series of the MTP International Review of Biochemistry.

This book consists, like the previous issues, of seven papers on such basic topics as (1) plastocyanin demonstrated by electron paramagnetic resonance spectroscopy in chloroplasts of several vascular plants and several green and blue-green algae, (2) electron and proton transfer in chloroplasts controlled mainly by the kinetic effects of the internal pH, (3) sucrose as regulator of plant metabolism, as the main form of translocation in nearly all higher plants and as comparable to trehalose in fungi and insects and glucose in most of the remaining animal world, (4) osmotic regulation, (5) plant pathogens, (6) glycoproteins which are widely "distributed throughout the biological kingdom" and usually "extracellular or associated with cell surface structures" with arabinose as the "most common carbohydrate constituent, and (7) functions of cell and tissue ion transport in hormone responses, developmental processes and possibly endogenous rhythms.

There are several other more detailed similar serial publications available. This is good, but does not have any "extra ad-

vantages" that warrant separate perpetuation. Its fine editorial and writing staff might well be absorbed by a larger journal or another good journal might be absorbed by it.

"TRANSPORT OF IONS AND WATER IN ANIMALS" edited by B. L. Gupta, R. B. Moreton, J. L. Oschman & B. J. Wall, xx & 817 pp., 196 b/w fig. & 49 tab. Academic Press Ltd., New York, N. Y. & London NW1 7DX. 1977. $62.50 or £ 32.00.

The appreciative introduction by Sir Vincent Wigglesworth, a confrère and friend of many years, and the thirty substantive papers by former students are presented as a "Festschrift" or tribute dedicated to J. Arthur Ramsay upon his retirement from the Chair of Comparative Physiology at Cambridge University where his leadership had worldwide impact on quantitative micro-techniques.

The papers are grouped into the following six categories: (1) Current Approaches in X-ray analysis, micropuncture techniques, microperfusion and computer model analysis; (2) Mechanisms and Control of Transport of fresh and salt water, cations and anions, amino acids, and the hormone control of excretion; (3) Transport at the Cell Level with volume control, gap junctions (plasmodesmata?), pinocytosis and osmo-regulation; (4) Ion Transport at Tissue Level in insect midguts, fish gills and in vertebrate gall bladders; (5) Fluid Transport in Epithelia in Insect Malpighian tubules and rectum, in crayfish antennal glands and in exocrine glands; and (6) Osmoregulation in terrestrial, fresh and salt water arthropods, in mollusk integuments and annelid nephridia.

What a fine tribute to Dr. Ramsay is this excellent, advanced, detailed, modern survey of this field in which many of the techniques were pioneered by him! What a boon to researchers, advanced students and those whose teaching involves these topics to have all this material so well garnered for them!

"RECENT ADVANCES IN THE CHEMISTRY AND BIOCHEMISTRY OF PLANT LIPIDS" edited by T. Galliard & E. I. Mercer, xvi & 398 pp., 92 b/w fig. & 95 tab. Academic Press, San Francisco, New York, N. Y. & London NW1 7DX. [1975] 1976. £10.80.

This carefully prepared study is published as the Proceedings of the Phytochemical Society Number 12 and was presented as 12 papers at a symposium at the University of East Anglia and was sponsored jointly by this society and the Lipid Group of the Biochemical Society, concentrating on acyl lipids or fatty acids. The topics include: structure, biosynthesis, degradation and distribution of plant acyl lipids in spinach chloroplasts, castor-bean seedlings, phosphoglycerides, glycolipids, cutin, suberin, waxes, etc. For linoleic and linolenic acids which are "essen-

tial" in animal and bacterial diets the natural source can only be plants. A great deal of valuable material is presented on these pages.

"BIOSYNTHESIS AND ITS CONTROL IN PLANTS" edited by B. V. Milborrow, xv & 364 pp., 142 b/w fig. & 60 tab. Academic Press Ltd., New York, N. Y. & London NW1 7DX. 1973. £8.00

This valuable presentation is Number 9 in the Annual Proceedings of the Phytochemical Society and contains 13 papers. They cover such pertinent topics as metabolic control in higher plants, amino acid biosynthesis in plants and bacteria, ethylene as a universal higher plant hormone and even as a plant pheromone, gibberellin, fatty acid, chloroplast enzyme and flavonoid biosynthesis. The editor's preface states wisely that "By gathering together in one volume examples of the different kinds of control mechanism we can appreciate more fully the intricacy of metabolism and perhaps become more aware of the dangers of trusting a hypothesis when it accommodates the facts."

"POLLEN FLORA OF ARGENTINA — Modern Spore and Pollen Types of Pteridophyta, Gymnospermae, and Angiospermae" by Vera Markgraf & Hector L. D'Antoni, ix & 208 pp., 10 b/w fig. & 43 plates. University of Arizona Press, Tucson, Arizona 85722. 1978. $9.50 paperbound.

Herein the microspores of 374 species have been described, illustrated and keyed both to genera and to their ecosystems or plant geographic regions: (1) Amazonic with subtropic forest of the north like much of the neotropical world, (2) Chaguaño with xerophilous, deciduous forest and with Arizonan floristic similarity, (3) Andean-Patagonic with open grass or scrub steppe of higher altitudes, and (4) Subantarctic with mixed southern beech (Nothofagus) forest.

"The pollendescriptions and photomicrographs are in alphabetical order by family". The nomenclature of Iversen, Erdtman and Faegri is followed with all terms defined in the glossary. Voucher specimens were verified by specialists. Also included is a 'Spore Morphology Key and Photomicrographs of the Genera of the Fuego-Patagonian Pteridophyta' by Marta A. Morbelli. These, with Heusser's "Pollen and Spores of Chile" from the same press with an overlap of only twenty percent of the genera and twelve percent of the species, make South America palynologically well documented by these careful studies.

"COASTAL DESERTS —Their Natural and Human Environments" edited by David H. K. Amiran & Andrew W. Wilson, xiii & 207 pp., 124 b/w fig. & 31 tab. University of Arizona Press, Tucson,

Arizona 85722. 1973. $13.50 oversize.

This is a valuable and well organized collection of 24 papers of increasing importance because deserts, especially coastal ones, are becoming ever more important in today's and tomorrow's world for (1) Lebensraum for the increasing world population, (2) water and/or water prospects more available except that the economics are not as well developed as the technology, and (3) increased speed (by plane) and refrigeration (by ships) making agricultural and mineral products more readily exportable and tourist trade more importable at the sunny beaches and commercial fishing more productive at the overcast ones. These papers discuss interesting general considerations and Latin American, Old World and Australian deserts climato-geomorphically and economically, illustrating them very effectively with diagrams and remote sensing photography. Figure 10-1 has so much valuable detail in it that it is a pity that it is not printed on a larger scale.

"FLORA DE VENEZUELA — VERBENACEAE" by Santiago López-Palacios, 655 pp., 146 fig. Universidad de los Andes Publicaciones, Mérida, Venezuela. 1977 paperbound & hardcover.

We cannot help but know how earnestly this important taxonomic treatise has been prepared through field and herbarium studies since the author has been in frequent communication with my husband over the past many years. My husband and I were able only to make one trip to Venezuela for field and herbarium study of this group of plants. This was in 1948 under the inspiring aegis of the late Dr. Henri Pittier and others. Both before and since that date my husband has studied, both in the field and in the herbarium, vast amounts of material of this and related families on a worldwide basis. López-Palacios very graciously dedicated his most valuable work not only to all botanists but more especially to my husband.

Venezuela ranks high among the countries of the world as to number of verbenaceous taxa in its native and introduced flora. Therefore this work by López-Palacios has to be ranked as one of the most important studies of this plant family in recent times. It is to be hoped that he will continue his studies of the group in other Latin American countries. It should be of interest to him, however, to note that Aganon Raf. is not verbenaceous, Denisaea Neck., Plexipus Raf., and Pleurostigma Hochst. are not synonyms of Bouchea but, rather, are synonyms of the African genus Chascanum E. Mey., Callicarpa americana Sessé & Moc. is a synonym of C. acuminata var. pringlei (Briq.) Mold., Phelloderma Miers does not belong in the synonymy of Priva but, rather, in that of Pitraea Turcz., Tetrathyranthus A. Gray is not a synonym of Clerodendrum but, rather, of Faradaya F. Muell., and Verbena

globiflora L'Hér. is the name-bringing synonym for the taxon now known as Lippia alba var. globiflora (L'Hér.) Mold.

"POLLINATION MECHANISMS, REPRODUCTION AND PLANT BREEDING" by R. Frankel & E. Galun, xi & 281 pp., 77 b/w fig. & tab. Springer-Verlag, Berlin, Heidelberg & New Y$_o$rk, N. Y. 10010. 1977. $26.40.

This is Volume 2 in the Monographs on Theoretical and Applied Genetics Series with the first author being the coordinating editor for the series. This goal-achieving "book intends to furnish under one cover an integrated botanical, genetical and breeding-methodological treatment of the reproductive biology of...mainly angiosperms; it is based on an advanced topical course in plant breeding taught at the Hebrew University of Jerusalem" and is provided with a very full bibliography and subject index.

The first part of this excellent book analyzes different pollination mechanisms, the second part specific breeding procedures for self-pollinating crops, and the third part sexual reproduction or cross-fertilization with checks for selfing, male sterility and incompatibility. There is a great wealth of clearly explained material here for "biology and agriculture students at the graduate level,.....botanists, geneticists, plant breeders and agriculturists."

"BIOCHEMIE DER PFLANZEN: Ein Lehrbuch" by H. Kindl & G. Wöber, xii & 364 pp., 271 fig. Springer-Verlag, New York, N. Y., Heidelberg & D-1000 West Berlin 33. 1975. $32.00 or DM 78.

This is a fine German-language text on the biochemistry of plants explaining expected topics directly and effectively. The illustrations diagramming the various biochemical pathways are universally recognizable, varying only by local language minor differences.

A library shelf copy of this book would prove a great asset to all biochemistry and phytochemistry courses in the United States and elsewhere because the diagrams are rendered so outstandingly well. Readers afflicted with any degree of red colorblindness will wish that a medium blue or yellow had been used instead.

"ENZYM-HISTOCHEMISCHE METHODEN" by Z. Lojda, R. Gossrau, & T. H. Schiebler, ix & 300 pp., 20 b/w fig. & 10 tab. Springer-Verlag, New York, N. Y., Heidelberg & D-1000 West Berlin 33. 1976. $23.80 or DM 58, softcover.

This carefully prepared, advanced text correlates the chemical activities initiated by all of the known enzymes (such as the phosphatases, galactosidases, peptidases, transferases, oxidore-

ductases, dehydrogenases) with the cellular structures and their subsequent reactions. Also the techniques for laboratory replication of these processes are given in detail.

"SECONDARY METABOLISM AND CELL DIFFERENTIATION" by M. Luckner, L. Nover & H. Böhm, vi & 130 pp., 52 b/w fig. & 6 tab. Springer-Verlag, Berlin, Heidelberg & New York, N. Y. 10010. 1977. $21.20.

The first two authors present a detailed paper with a copious bibliography on "Expression of Secondary Metabolism — An Aspect of Cell Specialization of Microorganisms, Higher Plants, and Animals" such as alkaloids, antibiotics, cardiac glycosides, tannins, saponins, volatile oils, etc. with most of these found in the plant kingdom. The third author presents his, also carefully prepared, paper on "Secondary Metabolism in Cell Structures of Higher Plants and Problems of Differentiation" which is biochemical and based on callus, tissue and cell suspension cultures. This valuable publication is Volume 23 in the Molecular Biology, Biochemistry and Biophysics Series.

"A FIELD GUIDE TO REPTILES AND AMPHIBIANS of Eastern and Central North America" Second Edition by Roger Conant, xviii & 429 pp., 472 color & 174 b/w photographs, 353 line drawings, 311 distribution maps. Houghton Mifflin Company, Publishers, Burlington, Massachusetts 01803. 1975. $10.00.

This excellent book is in the Peterson Field Guide Series, is sponsored by the National Audubon Society and the National Wildlife Federation, and presents 68 new kinds of these animals in the slightly enlarged geographic area that here includes all of Texas and north for a total of 574 species and subspecies.

The first edition of 1958 was the best for content and illustration in the field for young amateurs to skilled scientists until this enriched new edition became available as "better than best".

"BIOLOGICAL MANAGEMENT AND CONSERVATION — Ecological Theory, Application and Planning" by M. B. Usher, xiii & 394 pp., 93 fig. & 19 photograph plates. Chapman & Hall Ltd., London EC4P 4EET and Halsted Press of John Wiley & Sons, U.S.A. distributors, New York, N. Y. 10016. 1973. $22.00.

It is encouraging to find this careful study still on many reading shelves and in libraries for students in the many phases of ecology and conservation. The people of the British Isles have long been more understanding of or more amenable to ideas, policies and practices (except for air pollution in their factory

towns) that preserve the countryside than the widespread exploitative approach long extant in the United States. The author usually chooses less common examples "from conservation activities in Britain that relate to the analytic or mathematical approach to the subject".

"PRINCIPLES AND PROCESSES OF BIOLOGY" by M. J. Hollingsworth & K. Bowler, x & 457 pp., 195 b/w fig. & 14 tab. Chapman & Hall Ltd., London EC4P 4EE & Halsted Press of John Wiley & Sons, Inc., Distributors in the U. S., New York, N. Y. 10016. 1972. $17.50.

Following the pattern of modern biology texts for the beginning college or university level, the authors presuppose a background in lower school chemistry and physics and have organized their text on the underlying principles and processes fundamental to biology. Therefore it starts out with biochemistry and goes on to molecular structure and functioning, energy, nutrition, growth, reproduction, irritability, living responses to the environment, genetic change, variation and evolution. This seems, by comparison with several modern U. S. texts, to be carefully prepared, well developed but more difficult. The line drawings of the stomatal cells show no chloroplasts. In this country the book would serve best as an auxiliary source of information.

"THE HORIZON BOOK OF VANISHING PRIMITIVE MAN" by Timothy Severin, 384 pp., 300+ color & b/w illus. McGraw-Hill Book Company, Inc., New York, N. Y. 10020. 1973. $22.00.

This is one of the many beautiful productions of the American Heritage Publishing Company now incorporated into McGraw-Hill. The author is not a professional anthropologist but he surely learned a great deal about this discipline in the production of this fascinating book. In the foreword Colin Turnbull states that "Anthropology, by its nature, makes no initial judgement. It observes what people do but also asks itself why they do it....The true significance of anthropology [is] that it informs us about ourselves more than about others.....through our biology, our history and evolution, our social and cultural forms". Through effective interesting text and wonderfully fine photographs (that are to be expected in this series) early man, African pygmies, Cunas, various peoples of Micronesia and Melanesia, Lapps, Mato Grosso Indians and others these goals are achieved.

"CONFESSIONS OF A BIRD WATCHER" by Roger Barton, xii & 237 pp., McGraw-Hill Book Company, New York, N.Y. 10020. 1974. $7.95.

This book will prove to be a delight and joy for years to come

for the many folks who have been bird and nature watchers in the New Jersey area and in the many nature havens therein described along the Atlantic, Middle and Pacific flyways and other places. Ah, the nostalgia in re-viewing these places and creatures through the author's appreciative accounts! Our family has seen most of the birds in most of the places described even though our main focus has been on plants and has enjoyed the author's weekly nature columns in the "Newark Sunday News" and in our local "Courier-News".

There are instructions for making bird feeders, for bird club affiliations and environmental conservation needs for birds and consequently for ourselves.

"THE ANIMAL IN MAN" by Lorus & Margery Milne, iii & 250 pp. McGraw-Hill Book Company, New York, N. Y. 10020. 1973. $7.95.

The Milnes, in their many good books, have offered simply and interestingly so many clear insights into various phases of biology. And they have done so again in this fascinating book which draws basic parallels and contrasts between human acts and acts of a wide range of other animals, differentiating those from a shared inheritance and those not so acquired. The chapters deal with such topics as: progressions in awareness and sapience, courtship, nature of and limits to freedom, social groupings, effects of crowding, and symbiosis — broadly and literally interpreted — as the only way of life. "No species other than our own can look back and recognize the difference, or look ahead and fear the future".

"EVOLUTION" by Theodore H. Eaton, Jr., xi & 270 pp., 68 b/w fig. & 3 tab. W. W. Norton & Company, Inc., New York, N. Y. 10036. 1970. $7.50.

This is still a fine modern concise text by the author who earlier published the text entitled "Comparative Anatomy of the Vertebrates". Since "evolutionary biology is as wide as the world of animals and plants, past and present....[this book reflects] a wide range of evolutionary principles....to help the student develop a large number of ideas or centers of interest of his own concerning evolution". A very wide range of organisms are used as examples of speciation, adaptation, natural selection, behavior, geographical distribution as they affect evolution and/or are affected by it.

"ENVIRONMENT AND MAN" by Richard H. Wagner, xiii & 491 pp., 236 b/w fig. & 10 tab. W. W. Norton & Company, Inc., New York, N. Y. 10036. 1971. $7.50.

This carefully prepared comprehensive text grew out of and has

been used in the author's course of the same title at the State University of Pennsylvania for students without special training in collegiate biological sciences. It covers the whole field well and explains intelligently "the magnitude of man-environment problems" especially in urbanized, industrialized areas in reference to water, air and land pollution in its many forms.

"RHODODENDRONS — A Selected, Annotated Bibliography" Revised Second Edition compiled by Diane Schwartz, iii & 43 pp. New York Botanical Garden Library, New York, N. Y. 10458. 1978. $3.50 paperbound.

This new edition was prepared for the International Rhododendron Conference convened at the New York Botanical Garden, May 1978, and has additional entries since 1975 to January 1978. The material is organized under the following topics: general, chemical, cultural, pathogeny, developmental, horticultural research, hybrids, plant exploration, propagation and taxonomy. The book should prove of great value to so many kinds of gardeners and horticulturists.

"PLANT PROPAGATION — Principles and Practices" 3rd Edition by Hudson T. Hartmann & Dale E. Kester, x & 662 pp., 249 b/w fig. & 9 tab. Prentice-Hall Publishers, Inc., Englewood Cliffs, New Jersey 07632. 1975. $17.95.

From the publishing house presses and college mimeograph machines over the years in the United States and other English language areas ever so many books and booklets have been run off on this topic, but only a very few have been consistently well constructed as scientific horticultural works and at the same time provided with all needed practical details. Each edition of this work has been one of the very best in its time. Maybe the next edition will use "clerodendron" as a common name and Clerodendrum as the correct scientific generic name and will use the more correct Lantana montevidensis for what is here still called L. sellowiana. Each chapter is enriched with much fuller bibliographic material than is usual.

"BASIC MICROBIOLOGY with Applications" by Thomas D. Brock & Katherine M. Brock, x & 406 pp., 215 b/w fig., 4 color plates, 23 tab. Prentice-Hall, Inc., Englewood Cliffs, New Jersey 07632. 1973. $19.95.

This is an excellent text on "applied" microbiology at the beginning or junior college level for students hopeful of entering such fields as public and environmental health, nursing, laboratory technician and any of the many allied areas. The authors claim a "distinctly ecological flavor to this book" which is microorganism centered. The chapters deal with (1) the nature, structure, culture

and control of microbes, (2) infection, immunity and disease spread, (3) the major microbial and viral diseases, and (4) agricultural, food and industrial microbiology. The enlightening illustrations, the well explained text, the succinct chapter summaries, and worthwhile review questions all indicate that the book is the work of highly skilled teachers. This is a text that could also be put to particularly advantageous use for English reading students outside of the United States.

"PROCESSES OF ORGANIC EVOLUTION" Second Edition by G. Ledyard Stebbins, xiii & 193 pp. Prentice-Hall, Inc., Publishers, Englewood Cliffs, New Jersey 07632. 1971. $7.50 clothbound & $3.95 paperbound.

The present review notice of this excellent work is unfortunately so belated that the book is already off the current "Books In Print" listings. The book follows the format of the excellent first edition of 1966, adding newer material particularly about molecular and biochemical aspects of evolution generally and of human evolution. "The most distinctive feature of modern man has been cultural evolution....It has involved primarily the modification of his environment to suit his needs rather than hereditary modifications of the body to suit his environment".

Fortunately the third edition — which can safely be considered "excellent" even though "sight unseen" — has been available since last year in paperbinding for $7.50. I assume that it is also published in the Concepts of Modern Biology Series.

"JOHSEL NAMKUNG: AN ARTIST'S VIEW OF NATURE" compiled by Charles Cowles for the Seattle Art Museum, 36 pp., 30 color plates. University of Washington Press, Seattle, Washington 98105. 1978. $5.95 paperbound.

These exquisite photographs of nature images were taken by Namkung in our Northwest. "I think photography is the reflection of things which already exist in their own right, but they need an artist so that they may be fully seen and understood.....I would like to impart that impression of sound, music, emotion or philosophy.....of that moment when you are on top of the mountain standing all by yourself with your camera, that moment's loneliness and exultation.....not just visual sensations but the third dimension of the visual world." See for yourself.

What an inexpensive gift to give to a friend, library, school or yourself!

"OCEAN RESOURCES AND PUBLIC POLICY" edited by T. Saunders English, viii & 184 pp., 38 b/w fig. & 6 tab. University of Washington Press, Seattle, Washington 98105. 1973. $8.50.

At the Graduate School for Public Affairs of this university inter-disciplinary natural resources seminars led by experts in their respective fields attracted faculty and graduate students from Schools or Departments of Law, Atmospheric Sciences, Oceanography, Botany, Zoology, Fisheries, Forestry, Physics, Chemistry, Geology, Geography, Engineering, Economics and Political Sciences and governmental officials. The eleven papers in this volume include such topics as: the inevitable greater use of the ocean by man, characteristics of continental shelves and estuaries, efficiency of the marine food chain, energy and minerals from the sea, and policy planning in marine sciences. The articles make reasoned, interesting reading for the intelligent layman.

"MILESTONES OF SCIENCE — Epochal Books in the History of Science as Represented in the Library of the Buffalo Society of Natural History" compiled by Ruth A. Sparrow, xiv & 307 pp., 1 color frontispiece & 207 b/w photographic plates. Buffalo Museum of Science, Buffalo, New York 14211. 1972.

The book is published as Collection Catalog Number 1, a beautiful compilation of treasured publications garnered by this society starting in 1937 with the purchase of an editio princeps of Copernicus under the leadership of its then president, Chauncey J. Hamlin. The more than 200 fullpage plates are photographic copies from these writings and illustrations of almost as many scientists including the famous ancients through those of the 1800s such as Theophrastus, Grew, Linnaeus in his Lapp outfit and DeVries among the botanists. There are short biographical notes on the authors and an annotated title chronology. This is an enduring work of great interest, value and beauty.

"THE CHEMICAL FORMULARY — Collection of Commercial Formulas for Making Thousands of Products in Many Fields" Volume XX edited by H. Bennett, vii & 399 pp. Chemical Publishing Co., Inc., New York, N. Y. 10011. 1977. $15.00.

The Table of Contents lists adhesives, coatings, cosmetics, detergents and disinfectants, drug products, emulsions and dispersions, food products including bubble-gum, metals, polish, resins, textile chemical specialties like foam backing, etc. The introduction explains and emphasizes directions; the appendix explains the federal laws regulating foods, drugs and cosmetics and gives first aid directions for contact and swallowed poisons. Many types of workers will find this volume and its predecessors most valuable.

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Price of this number $2.00; 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 full volume; claims for numbers lost in the mails must be made immediately after receipt of the next following number.

REVISION OF JOINVILLEA (JOINVILLEACEAE)
PACIFIC PLANT STUDIES 37

Harold St. John
Bishop Museum, Box 6037, Honolulu, Hawaii, 96818, USA.

In his recent monograph of the genus Joinvillea, Newell (1969: 529) evaluated the original publication of it by Gaudichaud, and rejected the genus and its two effectively published binomials as invalid. This rejection is here challenged.

After making his second world voyage, this one in La Bonite, Gaudichaud returned to Paris and at the Museum d'Histoire Naturelle undertook the study of and the publication on his botanical gatherings. It is clear that he spent much time at it, and that he found in his collections many new species and genera. Skilled illustrators at the Museum prepared large habit drawings and accompanying detailed flower and fruit analyses. These were engraved, totaling 150 folio plates. Coöperating authors were Leveillé for the fungi; Montagne for the algae, lichens, mosses, and hepatics; and Spring for the Lycopodiaceae. Gaudichaud was an experienced, competent systematist, but midway in his research he lost interest in systematic botany and shifted all his attention and energy to the study of morphogenesis and his new theory of it. This theory was fantastic, and was vigorously opposed by his comtemporaries, and is ignored by his successors.

Gaudichaud's Atlas of botanical plates of the Bonite Voyage was published in parts, between 1841 and 1852. There is a brief table of contents, and the legend on the plates gives solely the binomials. There are no diagnoses, no citation of specimens, and no localities. During the 19th Century most botanists accepted these taxa of Gaudichaud as validly published, though there were no generally accepted international rules of nomenclature at the time. Since 1905 we have had the ICBN and its slightly modified successors. We now must judge the genus Joinvillea and the species J. ascendens and J. elegans by these rules. Newell and Stone (1967: 193) reject the genus

of Gaudichaud, and the two species, because there were no diagnoses or references to previous descriptions, and because the genus was not monotypic. Newell in his monograph (1969: 193) does the same.

It is agreed that this generic name and the epithets have no descriptions and no references to a previously printed one. However, the status of J. ascendens needs a reconsideration. It appears solely on plates 39-40, as figures 1-6 which show short sections of a stem, a sterile shoot, and short cross sections of a part of a leaf. Under ICBN (1972: Art 44), "The name of a species or an infraspecific taxon published before 1 Jan. 1908 is validly published if it is accompanied only by an illustration with analysis showing essential characters." No flowers or fruits or other essential parts were shown on Gaudichaud's plate for this species. Hence, J. ascendens Gaud. was not validly published. Consequently, it is illegitimate, and has no status in nomenclature. The ICBN (1972: Art 45) rules that, "For purposes of priority only legitimate names and epithets are taken into consideration." As a consquence, J. ascendens Gaud. has no standing, and legally does not exist. That elimination leaves Joinvillea Gaud., as originally published, with the single species, J. elegans Gaud., and its illustration contains figures 7-9 of the stem, leaves, and inflorescence, and figures 10-26 of detailed analyses of the flowers, fruit, and their sections, but there is no scale of magnification, and no statement as to the degree of enlargement. The plates are unsigned. Consequently, under the ICBN (1972: Art 42) the genus Joinvillea Gaud., and J. elegans Gaud. (1841) are validly published. This causes a revision in the status of J. plicata as accepted in Newell's monograph.

Joinvilleaceae

Joinvillea elegans Gaud., Voy. La Bonite, Bot. Atlas pl. 39-40, figs. 7-26, 1841.

J. plicata (Hook. f.) Newell & Stone, Taxon 16: 193, 1967; Newell, Journ. Arn. Arb. 50: 550, 1969.

Flagellaria plicata Hook. f., Journ. Bot. Kew Gard. Miscel. 7: 200, pl. VIII, 1855.
subsp. elegans
Lectotype, New Caledonia, Ile des Pins, Macgillivray 770 (K), designated by Newell (1969: 551).
Distribution: Fiji, Viti Levu, Vanua Levu, and Taveuni; New Caledonia, Ile des Pins; New Hebrides, Aneityum; Solomon Islands, Santa Ysabel, Guadalcanal, and San Cristobal.

Upon the assumption that all the plants described in Gaudichaud's Botanical Atlas of La Bonite must have been collected by Gaudichaud at places visited by the vessel, Newell and Stone (1967: 194) express doubt as to the type locality of J. elegans, as it is not known at any of the places visited on this voyage. Later, Newell (1969: 552) suggests that, "a specimen was probably sent to Gaudichaud. However, he may have collected it on a previous visit to the New Caledonian area."

In fact, he had not made such a visit.

Gaudichaud of course studied his own collections made on the La Bonite voyage, but he also compared and studied other collections available in the Paris herbarium. For instance, he published in that same Atlas several species of Pandanus, and others in ten segregate genera, all of which are now reduced to Pandanus, as follows:

Gaudichaud's Genera and Species Based on Specimens Gathered by Other Collectors

Tuckeya candelabrum Gaud., pl. 26, figs. 10-20. (Nigeria), not visited by Gaudichaud. Collector unknown.

Heterostigma Heudelotianum Gaud., pl. 25, figs. 15-31. Senegambie (=Senegal), Heudelot.

Roussinia indica Gaud., pl. 21, figs. 1-9. Ile des Indes (=Nicobar), not visited by Gaudichaud.

Tuckeya candelabrum Gaud., pl. 26, figs. 10-20. (Nigeria), not visited by Gaudichaud. Collector unknown.

Barrotia diodon Gaud., pl. 13, figs. 9-14. Calcutta, Wallich. = Pandaus furcatus Roxb.

Bryantia butyrophora Webb. in Gaud., pl. 20, figs. 1-15. = Pandanus conoideus Lam.Ceram & Amboina, not visited by Gaudichaud.

Dorystigma madagascariense Gaud., pl. 31, figs. 12-13. Madagascar, collected by Richard. = Pandanus madagascariensis Warb.

Eydouxia ? Delessertii Gaud., pl. 18, figs. 7-8. Ile de la Réunion, Collected by Ach. Delessert. = Pandaus Delessertii Warb.

Sussea conoidea Gaud., pl. 24, figs. 1-12. Madagascar, collected by Bernier, Pervillé.

Vinsonia drupacea Gaud., pl. 31, figs. 8-11. Ile de France (=Mauritius)., collector Richard.

V. elegans Gaud., pl. 17, ligs. 12-13. ex. coll. Delessrt.

V. palustris Gaud., pl. 17, figs. 18-23. Mauritius ?; collector A. Richard.

V. sylvestris Gaud., pl. 17, figs. 16-17. ex col. A. Richard.

V. Pervilleana Gaud., pl. 31, figs. 1-7. Madagascar, collector, Pervillé.

It is clear that J. elegans Gaud. was based upon one or more collections by botansts other than Gaudichaud. However, no identifiable original type is now found in the herbaria of either Paris or Geneva.

subsp. Bryanii (Christophersen) comb. nov.

J. Bryanii Christophersen, Bishop Mus., Bull. 128: 44-46, fig. 6, 1935.

J. plicata (Hook. f.) Newell & Stone, subsp. bryanii (Christophersen) Newell, Journ. Arn. Arb. 50: 552-3, 1969.

Holotype: Western Samoa, Savaii, Aopo, 900-1,000 m elev., 7 Dec. 1931, E. Christophersen 2,714 (BISH).

Distribution: Samoa, Savaii.

J. ascendens Gaud. ex Brongn. & Gris, Soc. Bot. France, Bull. 8: 269, 1861; Wawra, Flora 58: 248, 1875; Hbd., Fl. Haw. Is. 447-8, 1888 (as adscendens).

Holotype: Insulis Sandwicensibus, insula Kauai dicta, Remy 156A (P).

J. Gaudichaudiana Brongn. & Gris, Soc. Bot. France, Bull. 8: 269, 1861; Ann. Sci. Nat.

Bot. V, 1: 337, 1864.

Holotype: Insulis Sandwicensibus, insula Kauai dicta, Remy 156A (P).

Distribution: Hawaiian Islands, on Kauai, Oahu, Molokai, Maui, and Hawaii.

As has been discussed, J. ascendens as first published in 1841 by Gaudichaud was invalid. It was accepted as Hawaiian, and provided with a description in 1861 by Brongniart and Gris who atributed it to Gaudichaud, and also announced a second Hawaiian species, J. Gaudichaudiana. In the publication by Hillebrand (1888: 447-8) and that by Newell (1969: 546-7) it was agreed that there is but a single Joinvillea species in the Hawaiian Islands. Hillebrand used for it an orthographic variant of the epithet, J. adscendens, and credited it to Gaudichaud in the La Bonite Atlas. Under it he reduced J. Gaudichaudiana Brongn. & Gris (1861) to synonymy. Since J. adscendens Gaud., sensu Hillebrand, is legally J. ascendens Gaud. (1841), a binomial validated by Brongniart & Gris in 1861, clearly Hillebrand's choice of J. ascendens Gaud. ex Brongn. & Gris, puts J. Gaudichaudiana Brongn. & Gris (1861) as the synonym, and establishes J. ascendens as the chosen name.

In Remy's collection number list under the number 156 there are two entries:

156 Joinvillea Gaudich Hawaii, Maui, Molokai.
" Kauai ou Nihau, Oahu.

For J. ascendens, Brongiart and Gris (1861: 269) chose as the holotype Remy 156A, from Kauai.

subsp. borneensis (Beccari) Newell, Journ. Arn. Arb. 50: 549, 1969.

J. borneensis Beccari, Nelle Foreste di Borneo 198, 1902; Merrill, Enum. Philip. Fl. Pl. 1: 190, 1903; Backer, Fl. Males. I, 4: 245, 1951.

J. malayana Ridl., Asiat. Soc. Straits Br., Journ. 44: 199, 1905; Fl. Malay Penin. 4: 368, 1924.

Lectotype: Sarawak, Gunong Wa, Nov. 1866, U. Beccari 2,816 (FI), chosen by Newell (1969: 549).

Distribution: Philippines, Jolo, and Palawan, Sabah, Sarawak, Kalimantan, Sumatra, Ponape.

subsp. glabra Newell, Journ. Arn. Arb. 50: 550, 1969.

Holotype: New Caledonia, Plateau de Dogny, edge of gallery forest, 950 m elev., Oct. 1966, T. K. Newell 196 (BISH).

Distribution: New Caledonia.

subsp. samoensis Newell, Journ. Arn. Arb. 50: 548, 1969.

J. Gaudichaudiana Brongn. & Gris, var. samoensis (Newell) Deg. & Deg., Fl. Haw. fam. 53a, 3/31/1973.

Holotype: Samoa, Upolu, Lake Lanutoo Crater, 700 m elev., 26 Oct. 1966, T. K. Newell (BISH).

Distribution: Samoa, Savaii and Upolu.

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Brongniart, A. & A. Gris, 1861. Note sur le genre Joinvillea de Gaudichaud et sur la famille des Flagellariées, Soc. Bot. France, Bull. 8: 264-269.

Newell, Thomas K., 1969. A Study of the Genus Joinvillea (Flagellariaceae). Journ. Arn. Arb., 50: 527-555, figs. 1-6.

Newell & B. C. Stone, 1967. Flagellaria (Chortodes) plicata Hooker fil. is a Joinvillea. Taxon 16: 192-194.

ISODENDRION CHRISTENSENII (VIOLACEAE) OF KAUAI
HAWAIIAN PLANT STUDIES 81

Harold St. John
Bishop Museum, Box 6037, Honolulu, Hawaii, 96818, USA.

Isodendrion, of the Violaceae, is a genus endemic to the Hawaiian Islands. It consists of 14 species, 5 of which are probably extant, but the other 9 are evidently extinct. They mostly grew in the lower dry forest zone, or dry scrub zone, areas which have been exploited and heavily grazed. Three of the living species grow only on the island of Kauai. The discovery of a fourth surviving species on that island is noteworthy. The recent monograph of the genus was by St. John (1952).

Isodendrion Christensenii sp. nov., fig. 1.

Diagnosis Holotypi: Frutex 30 cm altus glaber est, ramula foliosa 2-3 mm diametro viridi sed rubrimaculata, internodis 7-15 mm longis, nodis non incrassatis, stipulis 2.5 mm longis 2 mm latis deltoideis paulum inconcinnis in basi bullatis midnervo incrassato elevato margini et apice obtuso badi-membranaceis, petiolis 3-3.5 mm longis supra late canaliculatis, laminis 6.5-12.5 cm longis 3-4 cm latis subcoriaceis anguste oblanceolatis subintegribus sed remote minutiore serrulatis supra olivaceis infra albis in paginis ambis prominente reticulatis, inflorescentiis axillaribus 1-floriferis, pedunculo 2 mm longo, bracteis basalibus, sepalis 3-3.5 mm longis 1.5-2.2 mm latis ovatis ad ovati-lanceolatis albis translucentibus minime erosis, petala infera maxima 9.5 mm longa et in puncto 3/4 ex basi contrahenti ungui 1.7 mm lato ligulato 3-nervoso canaliculato vitta centrali incrassata, limbo 3 mm longo 1.8 mm lato elliptico subcrasso nervis lateralibus compluri-furcatis, petalis lateralibus 9.5 mm longis et in puncto 3/4 ex basi contrahentibus, ungui 1.5 mm lato simulanti limbo 2.2 mm longo 1.5 mm lato elliptico, petala supera 9 mm longa paulum contrahenti ungui 1.4 mm lato limbo 2.2 mm longo 1.8 mm lato, filamentis 1 mm longis, antheris 1 mm longis deltoideis, ovario 0.5 mm longo anguste ovoideo, stylo 2.3 mm

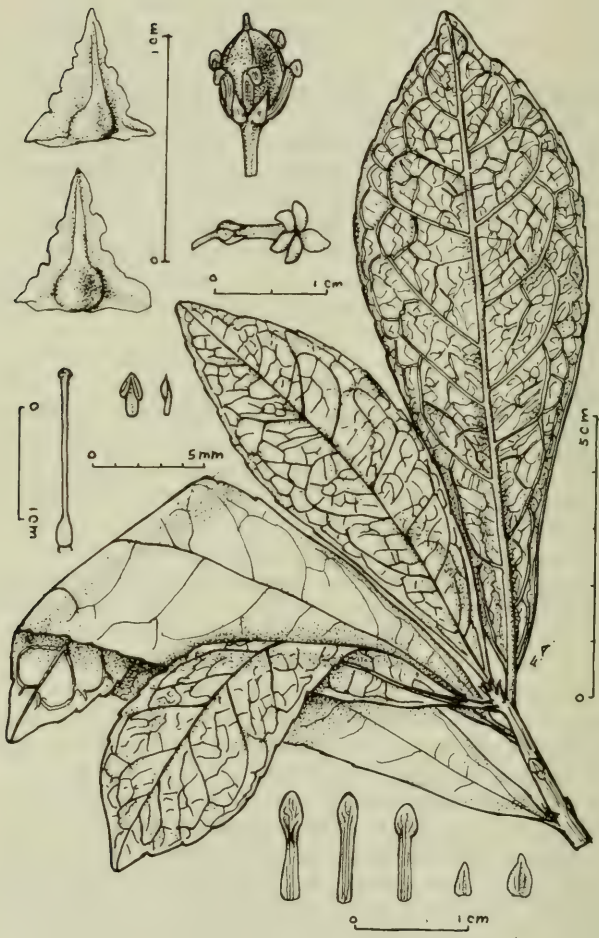

Fig. 1. Isodendrion Christensenii St. J. Kauai, Wainiha-Manoa - 1920 ft. VII/30/77. C. Christensen 281 (BISH)

longo, pedunculo in fructu 4 mm longo cernuo, capsulis 10 mm longis 5 mm diametro obovoideo subacuto papilloso paulum 3-laterato, 3 suturis impressis.

Diagnosis of Holotype: Shrub 30 cm tall, glabrous; leafy part of branch 2-3 mm in diameter, green, but red maculate; internodes 7-15 mm long; nodes not enlarged; stipules 2.5 mm long, 2 mm wide, deltoid, slightly asymmetric, green, bullate at base and with a thickened raised midrib, the margin and the obtuse apex brown membranous; petioles 3-3.5 mm long, widely channeled above; blades 6.5-12.5 cm long, 3-4 cm wide, subcoriaceous, narrowly oblanceolate, subentire, but very minutely remotely serrulate, above olive green, below white, prominently reticulate on both sides; inflorescences axillary, 1-flowered; peduncle 2 mm long; bracts basal, shriveled; sepals 3-3.5 mm long, 1.5-2.2 mm wide, ovate to ovate lanceolate, white, translucent, slightly erose; lower petal the largest, 9.5 mm long, contracted 3/4 way from the base, claw 1.7 mm wide, ligulate, 3-nerved, channeled, the central strip thickened, the limb 3 mm long, 1.8 mm wide, elliptic, thickish, the lateral veins several times forked; lateral petals 9.5 mm long, contracted 3/4 way from the base, the claw 1.5 mm wide, similar, the limb 2.2 mm long, 1.5 mm wide, elliptic; upper petal 9 mm long, scarcely contracted, the claw 1.4 mm wide, the limb 2.2 mm long, 1.8 mm wide; filaments 1 mm long; anthers 1 mm long, deltoid; ovary 0.5 mm long, narrowly ovoid; style 2.3 mm long; peduncle becoming 4 mm long, cernuous; capsule 10 mm long, 5 mm wide, obovoid, subacute, papillose, slightly 3-sided, and with 3 impressed sutures.

Holotypus: Hawaiian Islands, Kauai Island, Wainiha-Manoa drainage, just s. of Kulanaililia, wet forest in small gulchrunning into Manoa Stream, 1,920 ft. elev., July 30, 1977, Charles Christensen 281 (BISH).

Discussion: I. Christensenii is most closely related to I. maculatum St. John, a species of Hanakapiai, Kauai, which has the petioles 5-17 mm long; blades 6.4-22 cm. long, 1.8-7.7 cm wide; lower petal 7.8-9 mm long, the limb 2.6-2.7 mm long, 1.7-1.8 mm wide, oval, the apex subcucullate, the claw 5.2-6.3 mm long; lateral petals 7.6-8.8 mm

the limb 2.5-3.2 mm long, 0.4-1.9 mm wide, narrowly ovate, the claw 5.1-5.6 mm long, 1.5-1.9 mm wide; anther obcuneate oblong, minutely apiculate; and the sepals 4.5-4.7 mm long, 1.4-2.4 mm wide, 5-7-nerved, ciliate above. I. Christensenii has the petioles 3-3.5 mm long; blades 6.5-12.5 cm long; lower petal 9.5 mm long, the limb 3 mm long, 2.3 mm wide, obtuse, the claw 7 mm long; lateral petals 9.5 mm long, the limb 2.2 mm long, 1.5 mm wide, elliptic; anthers deltoid; and the sepals 3-3.5 mm long, 1.5-2.2 mm wide, 3-nerved, entire.

The new epithet is chosen to honor the collector, Charles Christensen (1934 -), born at Kendrick, Idaho, studied at the University of Idaho, earning his B.S in Agriculture 1956; M.S in 1964; he lived on Hawaii from 1957 to 1969, on Kauai from 1970 to the present. He serves at Lihue as Plant Quarantine Inspector for the State of Hawaii.

Literature Cited

St. John, Harold. 1952. Monograph of the Genus Isodendrion (Violaceae). Hawaiian Plant Studies 21. Pacif. Sci. 6: 213-255, figs. 1-15.

Legend

Fig. 1. Isodendrion Christensenii St. John, from holotype. a, habit, X 1; b, c, stipules, X 8; d, flower, X 2; e, f, sepals, X 2; g, lower petal, X 2; h, lateral petal, X 2; i, upper petal, X 2; j, k, stamen, X 4; l, pistil, X 2; m, capsule and perianth, X 2.

SOLANUM ROEII: A NEW SPECIES FROM CHIAPAS, MEXICO

Donald Ugent and Hugh H. Iltis

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and
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SOLANUM ROEII Ugent et Iltis, sp. nov.

Planta ramosissima; caulis lignosus; ramulis et foliis pubescentibus vel tomentosis cum pilis stellata fulvis, aetate glabrescens; folia simplicia, elliptico vel elliptico-oblonga et obtusa; foliola stipuliformia non visi; inflorescentia pauciflora; pedunculus abbreviatus; pedicelli basi articulati; flores albi; calycis lobi eglandular, ovato-triangulati; corolla stellata; lobi elliptico lanceolati et acuti; fructus globosus, viridis.

Plant woody and much branched; the leaves and young twigs pubescent to tomentose with tawny, stellate hairs, the older branchlets glabrous and covered with thin gray bark; leaves simple and entire, with 4 to 6 pairs of lateral nerves, elliptic to elliptic-oblong, blunt or roundish to slightly emarginate at tip, up to 7.5 cm long and 3.5 cm wide, on petioles ca. 1 cm long; pseudostipular leaves apparently absent; inflorescence few-flowered, the peduncle 1 to 2 mm long; pedicels 15 to 20 mm long; flowers white; calyx lobes eglandular, ovate-triangular, ca. 4 mm long, elongating to ca. 7 mm in fruit; corolla stellate, with elliptic-lanceolate lobes ca. 1 cm in length; anthers terminal-pored, 3.5 mm long; filaments 1 mm long; stigma capitate; fruit globose, green, ca. 1 cm in dia.; seeds flattened, suborbicular to reniform, reticulate-punctate, ca. 4 mm long and 3 mm wide.

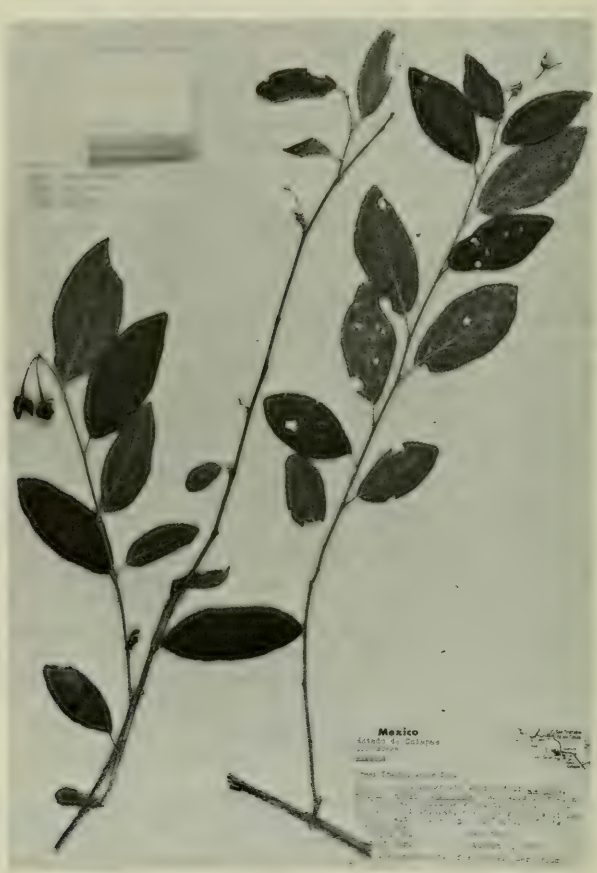
Type: MEXICO, Chiapas, 6 km NW of Las Rosas. Dense secondary growth woodland of Quercus, Acacia, Agave, Heliconia, fan palms, in region of tropical deciduous vegetation on NE slope of Valley of Chiapas. Alt. ca. 900 m. Aug. 8, 1965. K. Roe, E. Roe, & S. Mori 1045 (Holotype, WIS).

This new Solanum from the state of Chiapas in southern Mexico represents still another link in a long chain of closely related species (Artenkreis) which stretches from Panama to northern Mexico. Taxonomically, the various members of this closely knit complex belong to Solanum, subgenus Brevantherum (Seithe) D'Arcy. All are non-spiny shrubs which bear simple leaves, stellate hairs, and small, white, stellate corollas.

With the exception of two closely allied species, S. cordavense Sesse & Mocino and S. lignescens Fernald, none of the other species of this subgenus would appear to be easily confused with S. Roeii. Our new species, however, can be readily told apart from S. cordavense, a Central American species ranging from Belize to Costa Rica, by its smaller calyx lobes and less dense covering of hairs over its stems, pedicels and leaves. Moreover, the lower leaf surfaces of S. Roeii are prominently marked with light-colored veins, a feature not borne by S. cordavense.

From S. lignescens, the type of which was collected by Palmer from the hills above Acapulco, Guerrero in 1894, S. Roeii differs in having but 4 to 6 pairs of lateral leaf veins, rather than 7 to 11. Also, our new species has noticeably longer pedicels and shorter peduncles than S. lignescens.

The specific epithet of our plant honors Dr. Keith Roe, outstanding student of Solanum and monographer of Sect. Brevantherum (Brittonia 1967, 1972).



Solanum Roeii Ugent et Iltis. Holotype, University of Wisconsin Herbarium, Madison.

DISTRIBUTION AND RARITY OF *ERYTHRONIUM PROPULLANS* OF MINNESOTA, WITH COMMENTS ON CERTAIN DISTINGUISHING FEATURES

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ABSTRACT

The following topics are discussed for *Erythronium propullans*: major distinguishing morphological features, details of leaf shape, habitat, soil preference, distribution, point of origin, colony formation, rarity, and state of preservation.

Erythronium propullans Gray is Minnesota's only endemic species of flowering plant. Two other species of the genus also grow in the state, *E. albidum* Nutt. and *E. americanum* Ker., but whereas these are both widespread, *E. propullans* occurs in only two counties. Of the other two species, only *E. albidum* grows in the same region as *E. propullans*, often mingling freely with it. For twenty years off and on I have been searching out the localities of the endemic, and I believe most have been found by now, although a few may remain undiscovered. Therefore it seems an appropriate time to report on the distribution and rarity of the plant, especially in view of the pressures for development on the region concerned. Details of certain characteristic features of the plant and other related matters are also described herein.

The species is distinctive. As noted above, in its distributional range it could only be confused with *E. albidum*, and from this species it can easily be separated when in flower or fruit. The distinctive morphological features of *E. propullans* are: (1) the original bulb does not produce offsets as in *E. albidum*, but rather vegetative reproduction is accomplished by the production of a single offshoot which appears on the stem of the flowering plant well above the bulb; (2) the leaf apex tapers more gradually on the average than in *E. albidum*, producing a sharper point which often appears pinched or inrolled at the tip; (3)the flowers are smaller than those of *E. albidum*, are pinkish compared to the usually whiter flowers of the other species, and are more variable in numbers of parts; and (4) the fruits are smaller and rise only to an approximately horizontal or below horizontal position from the nodding attitude of the flower, whereas the larger fruits of *E. albidum* become erect.

In order to determine more accurately how different the leaf shapes of the two sympatric species are, measurements were made on living plants of both at ten different sites. Separate records were kept for (1) the lower and larger leaf of the two leaves on the flowering plants,(2) the upper and smaller leaf, and (3) leaves on non-flowering plants. The most useful measurements were found to be the leaf width and the included angle of the tip. The angle measured was that of the whole end of the leaf, not measuring any inverse or concave curve that might be present just below the apex but rather measuring to the tissue below it. The results are shown in figs. 1, 2, and 3. It will be seen that the differences between the species are greatest in the large lower leaves on the flowering plants and least on the leaves of the sterile plants. Tracings of fresh leaf tips of the lower leaves from both species are shown in fig. 4. Some overlap in form exists between the two kinds, but generally the shape is a usable character.

At the leaf apex the two edges are incurved and come together to form a small solid tip, round in cross section, which is elongate and rod-like to some degree in many plants, mostly those of E. propullans. This tip is 0.8-3.5 mm long in E. propullans, and 0.5-1.8 mm long in E. albidum.

The habitat of E. propullans is most commonly a wooded north-facing slope 15-27 m high rising above or near a stream bed, the latter either of a present stream or of an old abandoned channel. The plants usually occupy the lower part of the slope and may extend out onto the flood plain if one is present, even crossing to the far side of the stream sometimes. Less often they climb nearly to the top of the slope. At one location the slope is only about 4 m high. Sometimes the exposure is northeast or northwest or even, rarely, east or west. At two sites, Kenyon and Cannon Falls, the plants are scattered on the flood plain only and are so far north of the slope that there may be no relation to it, and a third place now destroyed was similar. The Cannon Falls location is on the north side of the river, and although apparently suitable habitat occurs on the south side, nearer the foot of the slope, no plants are found there. Therefore one has to conclude that the plants can succeed in the absence of a north-facing slope under the right conditions.

The plants occur most often in moderate to heavy shade. The shading trees are deciduous, of many kinds. Occasionally plants will be found in the open, apparently after tree removal, yet they appear to survive well enough. Elms were common cover trees and are now mostly dead or dying; the effect of their loss is yet to be seen. Cattle are often pastured in the habitats of these trout lilies, but the plants appear to stand up well under light to moderate grazing. They may persist in the open and in the presence of grazing after many other herbs have disappeared. Possibly

this success is only because the cattle aren't introduced till after the plants have nearly completed their life cycle for the year.

Plants of E. propullans appear to grow best in undisturbed places with at least a surface layer of rich black well-aerated humus soil. However, once established, they appear to withstand moderate disturbance rather well, as implied above in relation to grazing. The flood plains inhabitated are subject to occasional siltation at long intervals. The plants can be found not infrequently in rather sandy and almost gravelly soil.

Soil surveys have been published by the USDA Soil Conservation Service for both Rice (March 1975) and Goodhue (Oct. 1976) counties, the counties in which the endemic grows. At one trout lily site, that at Kenyon, there is evidently a correlation between soil type and distribution of the plants. Here the plants grow on a strip of relatively well-drained alluvial soil brought in apparently by a tributary entering from the south, and they appear to avoid the poorly drained silty clay loam of the main valley of the North Branch of the Zumbro, a soil type occurring both upstream and downstream from the trout lily area. For the rest of the sites, however, no correlation is apparent between distribution of the species and soil type. Often the trout lily locations fall in areas merely identified as "rough broken land". When sites do fall in definite soil types, no pattern of selectivity is detectable that would explain the limited distribution of the species. Soil characteristics for the different types are given rather generally and do not permit close comparisons of structure and chemistry. Properties given for the soil types occupied by E. propullans vary from loamy to loamy sand or sandy loam, from well-drained soils to those moderately so, from soils with a high organic content and fertility to those with moderate ones, and from neutral soils to slightly acid ones.

The factors limiting distribution of the species remain unknown. Sites in nearby regions with apparently suitable topography, vegetation, and soil lack the plant. So much of the surrounding countryside has been cut and cultivated that it is not even certain that the present situations, on slopes and floodplains, were the only ones ever occupied. The apparent preference for north-facing slopes suggests a plant better suited to cooler climes, but if so one would of course expect it to occur farther north, which it does not. Its chosen sites, although moderately sheltered, are still too warm and exposed for it to be a stranded lost element of the northern conifer zone. As examples of speculation it could be suggested that the plants may be trapped between a need for summer coolness and winter warmth; or that they originated under cooler conditions but that their reproductive or dispersal system was too inefficient to permit spread-

ing much to the north as the climate warmed or spreading in any direction if climatic change was not involved; or that subtle unknown differences in microclimate or soils are controlling.

Figure 5 shows the known distribution of E. propullans. The largest and best sites occur along the Straight and Cannon rivers, all within or not far from the city of Faribault. I have searched but cannot find the plant in adjoining counties. The association of the plants with streams, very plain on the map, reflects largely the local topography. Steep slopes are rare in that part of the country except along streams. However, there is a possibility that floodwaters played a part in spreading the species from place to place. It will be noted that all the locations east of Faribault are on streams that head up not far from that city. It looks very much as if the species spread from the Faribault area where it is now most abundant. Appearances also suggest that the plants may once have occupied certain parts of the upland to the east where they presumably have since been eradicated, and that from there they produced disseminules which were carried down the streams to the east and northeast. The sites farthest downstream, at Kenyon and Cannon Falls, are only on floodplains, not slopes although slopes are present, which would agree with the notion that there is something peculiarly suited to the species in the upland soils of the Faribault area. The Zumbrota site has not been relocated. Uplands accordingly would be the primary habitat of the species, the floodplains secondary. If the plants never occupied parts of the now cultivated lands east of Faribault, one would have to suppose that some dispersal agent carried seeds either to the headwaters of the streams or directly to the present locations.

Lest it be thought that the city of Faribault itself might have influenced the environment favorably for E. propullans, it should be pointed out that the city is small and that one of the best areas for the species is about 1.5 miles northeast of town, well beyond any likely influence.

The point of origin of E. propullans is not clear. Two main options seem available: either the species originated in the Faribault area after the departure of the glaciers about 13000 years ago, or it existed before that time and shifted position with the changing climate. I think the evidence favors the former explanation, for the following reasons: (1) the plants seem to have a narrow range of acceptable habitats and to require a rather exact set of environmental conditions which would have been hard to duplicate over a wide area as would be necessary for successful migrations; (2) they appear to be slow spreaders, a poor quality with which to face climatic change; and (3) the appearance of having spread eastward from Faribault is not the pattern one would expect from a plant shifting north and south with the climate.

However, phylogenetic data for the genus must be considered before conclusions can be drawn. And the time span seems too short.

Although the vegetative reproduction system of the plant is modest, the plants nonetheless do tend to form clones in the form of irregular clumps or colonies. The colonies are usually 2-5 dm or more in diameter, although they may be smaller or the plants may be scattered individually. In some situations colonies tend to form at or around the bases of trees but in general this is only occasional. One can make a rough estimate of the abundance of the species at a given site by counting the colonies, saving the trouble of counting individuals. 25 sites are known. The largest ones have about 110, 69, 62, 39, and 20 colonies, and the rest carry from about 15 to one each. A very rough estimate of the total number of colonies in all known locations comes to a little over 400. A conservative estimate of the average number of individuals per colony would be about 20.

One of the interesting aspects of the endemic is the fact that the majority of the plants in a colony will usually bloom, whereas the opposite is true of E. albidum. This behavior of E. propullans appears at least superficially to be a compensation for its very limited vegetative reproduction in contrast to the other species. Whether the nearly full flowering has been maintained from a primitive condition or developed secondarily is not clear. Miss Jody A. Banks, graduate student at the University of Wisconsin at La Crosse, has recently studied the reproductive biology of the endemic and will report her findings in due time.

Two sites are believed to have disappeared some time ago. I could not relocate the Zumbrota plants, which are represented in the University of Minnesota herbarium by an 1892 collection, and I believe them to have been eliminated by growth of the city. A plowed field at the foot of a bluff about 1.5 miles northeast of Faribault is in prime territory for the species, and I think the ground must originally have produced many of the plants.

How uncommon should this species be considered, and are there any threats to its existence? Although the plants are indeed abundant within a few small areas and are moderately well dispersed in the two counties, I think an overview will support the opinion that E. propullans is a very uncommon or rare species. Its preference for rather steep north-facing slopes has tended to spare it, but the plants are now increasingly in danger of destruction largely because the best localities are within the Faribault city limits or less than two miles from them. The city is expanding, and the bluff tops above the slopes are becoming desirable as house sites. Homes have already been built above two of the smaller locations and threaten one of the medium sites. A locality with a few colonies southeast of Faribault was wiped out by a road recently, and another in the same direction but

within the city limits has been largely destroyed by motorbikes. Several large colonies on relatively flat land at the foot of the bluffs about 1.5 miles northeast of Faribault have recently been plowed under, as a farmer converted from pasture to crop land. A program for protection of the species is therefore a necessity.

One of the sites with roughly 20 colonies, near Kenyon, has been acquired for preservation by The Nature Conservancy. The Conservancy is also making efforts to bring about protection of the bigger localities in and near Faribault, with the help of interested persons in the city, and prospects of success are fairly good at the moment. A 62 colony site in extreme southeast Faribault seems assured of protection, and there are hopes of saving some of the other locations. However, more losses will probably be suffered before the situation stabilizes.

Unfortunately, there is an element of danger in giving publicity to a project of this kind. Although the plants are small and the flowers inconspicuous, they appeal to some garden lovers and are probably subject to theft by a few people. Therefore the necessary steps of preservation should be undertaken with circumspection and without publicity.

Scientists wishing to work with the species naturally should refrain from doing any but the most minimal damage. Populations have been established at the University of Minnesota Landscape Arboretum near Chanhassen and at the Eloise Butler Wildflower Garden in Minneapolis, the latter population quite small. This cultivated material might be adequate for the use of the serious student; he should seek permission from the directors.

Selected References

Gray, A. 1871. A new species of Erythronium. Amer. Naturalist 5: 298-300.

Johnson, A. G. & Smithberg, M. K. 1968. Erythronium propullans. A wild flower unique to Minnesota. Minnesota Hort. 96: 38-39.

Rosendahl, C. O. 1919. Variations in the flowers of Erythronium propullans Gray. Torreya 19: 43-47.

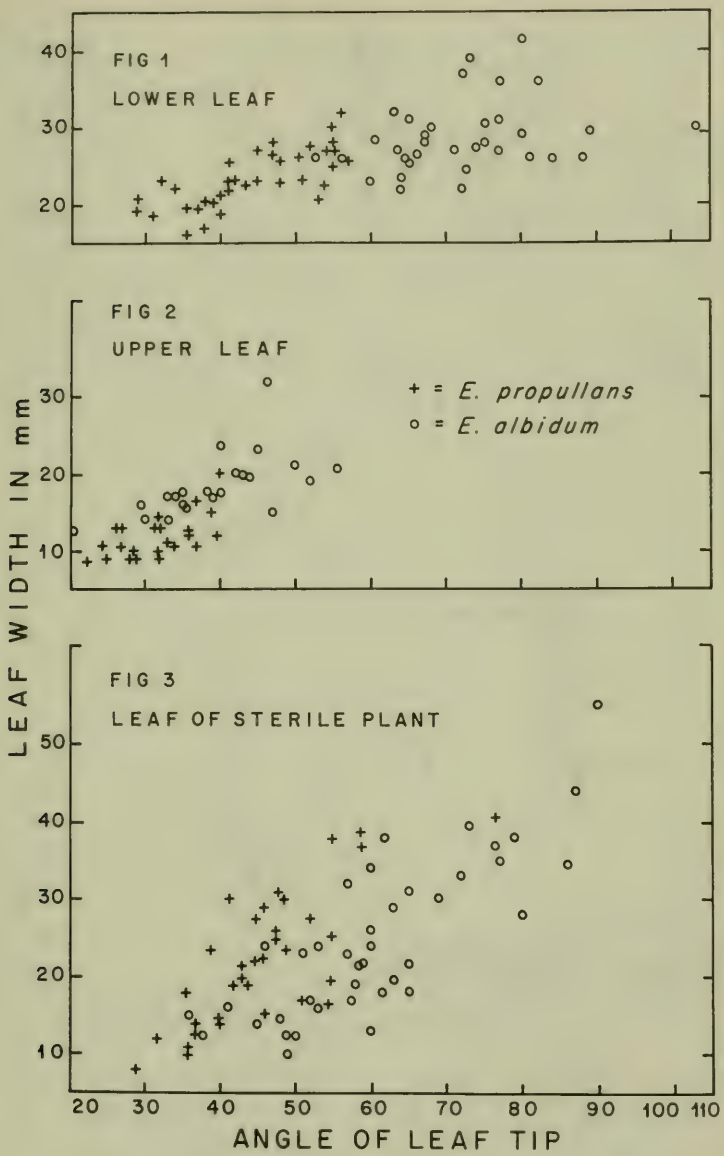
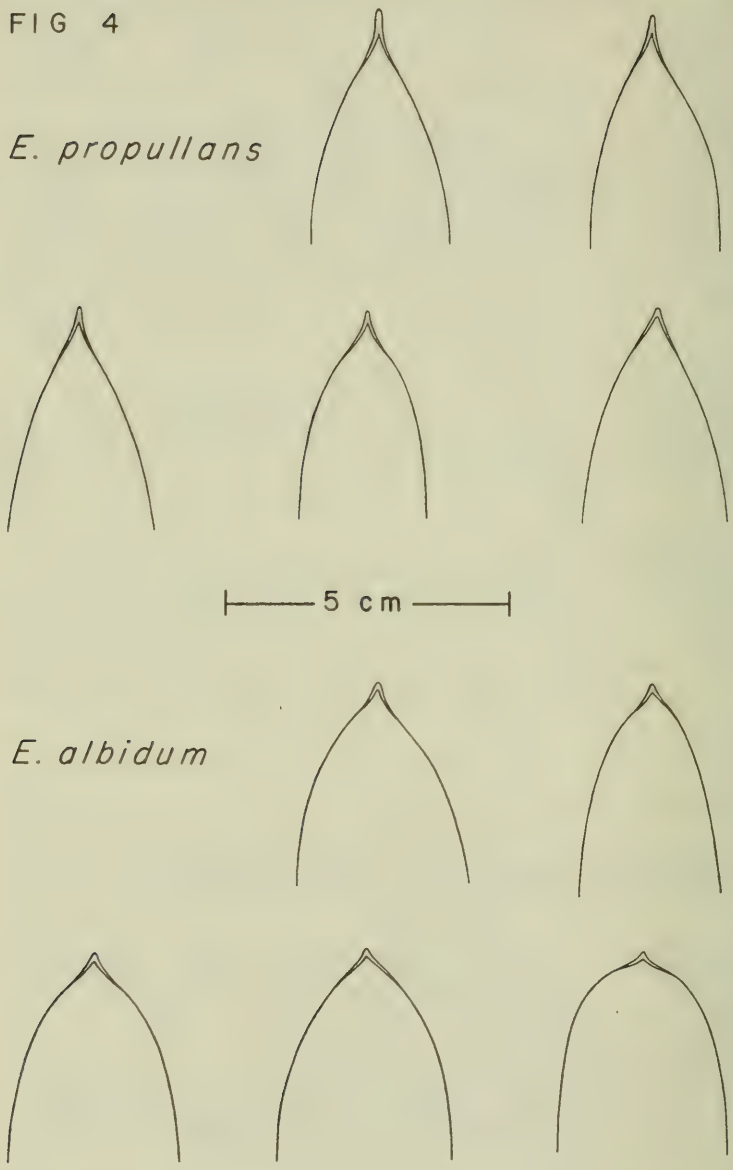


FIG 1
LOWER LEAF
FIG 2
UPPER LEAF
+ = E. propullans
o = E. albidum
FIG 3
LEAF OF STERILE PLANT
LEAF WIDTH IN mm
ANGLE OF LEAF TIP
10
20
30
40
50
60
70
80
90
100
110

FIG 4



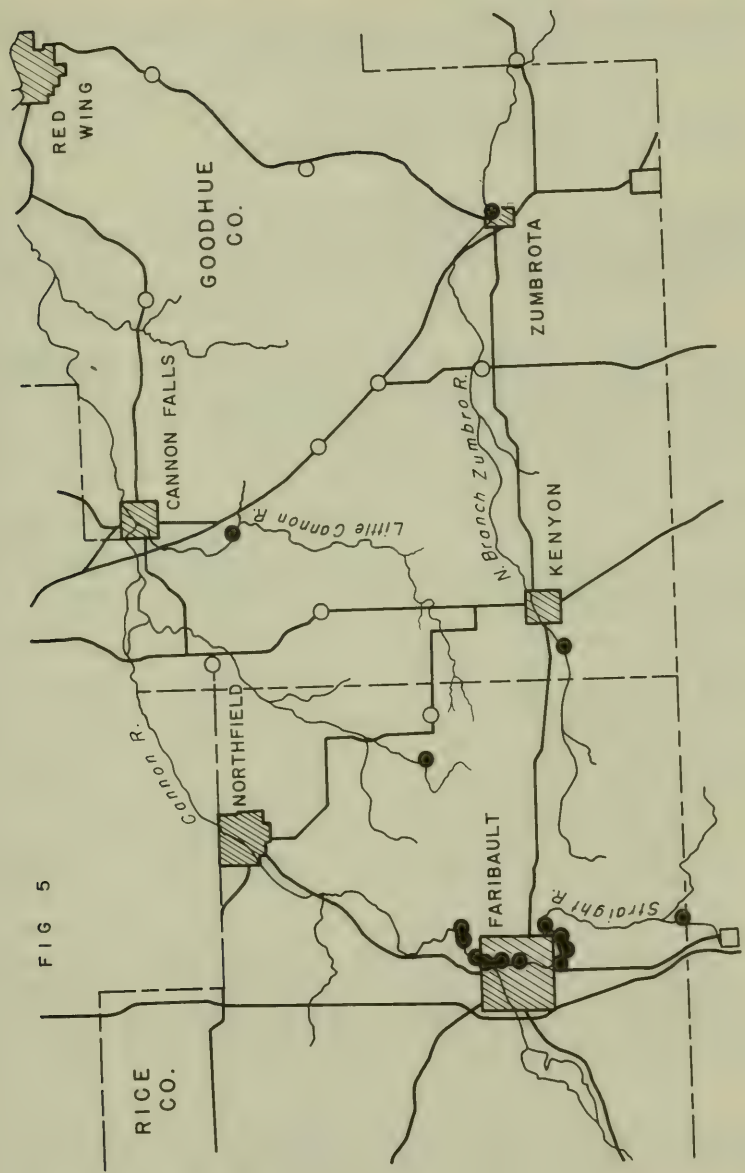

RED WING
GOODHUE CO.
CANNON FALLS
Little Cannon R.
N. Branch Zumbro R.
ZUMBROTA
KENYON
NORTHFIELD
Cannon R.
FARIBAULT
Straight R.
RICE CO.

FIG 5

A NEW COLOR FORM OF SCAEVOLA TACCADA (GOODENIACEAE)
PACIFIC PLANT STUDIES 38

Harold St. John
Bishop Museum, Box 6037, Honolulu, Hawaii, 96818, USA.

Goodeniaceae

Scaevola Taccada (Roxb.) Gaertn., var. Taccada, forma punicea forma nova.

Lobis corollae excepta alis omnino puniceis.

Body of the corolla lobes rose-magenta within and without.

Holotypus: Micronesia, Marshall Islands, Likiep Atoll, Likiep Island, cult., Aug. 28, 1946, H. St. John & R. S. Cowan 21,782 (BISH).

Discussion: This 4 m shrub was in cultivation beside the house of a native Marshallese. It had been found growing wild on the island, and was brought into cultivation because of the beauty of its rose-magenta flowers. The typical species differs by having its corollas white or white with a few tiny reddish veins.

The new epithet is the Latin adjective puniceus, purplish red, and it refers to the color of the corolla lobes.

FURTHER NEW COMBINATIONS IN THE GENUS CHAMAESYCE SF GRAY (EUPHORBIACEAE)

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Since our last publication (Phytologia 37: 453-454, 1977) some more species of Euphorbia subg. Chamaesyce Raf. which are to be transferred to the genus Chamaesyce Gray have been met with and the resultant new combinations are given hereunder:

Chamaesyce celastroides (Boiss.) Croizat & Degener
CHAMAESYCE CELASTROIDES var. NELSONII (Harold) comb. nov.
Bas.: Euphorbia celastroides Boiss. var. Nelsonii Harold St. John. Pacific Science, 30(1): 15, Fig. 5, 1976.
Type: SANDWICH ISLAND: Menzies & Nelson s.n. (B.P. Bishop Museum, Hawaii).

Chamaesyce granulata (Forsk.) Soják
C. g. var. granulata
CHAMAESYCE GRANULATA var. DENTATA (Brown) comb. nov.
Bas.: Euphorbia granulata Forsk. var. dentata N.E.Brown in Thiselton-Dyer, W.T., ed., Flora of Tropical Africa 6(1): 503, 1911.

CHAMAESYCE GRANULATA var. GLABRATA (Boiss.) comb. nov.
Bas.: Euphorbia granulata Forsk. var. glabrata E. Boissier in DC., Prodr. 15(2): 34, no. 98, 1862 et Flora Orientalis 4: 1087, 1879. Syntype: MUSCAT: Aucher 5304(K!)
Note: E. g. var. glabrata Muell. Arg. in DC., Prodr. 15 (2): 34, 1862 in E. Blatter's Fl. Arabica, Rec. Bot. Surv. Ind. 8: 427, 1923 is an obvious miscitation of the authority, while E. g. var. glabra Blatt. & Hallb,, JBNHS 26(4): 970, 1920 could be an apparent synonym.

CHAMAESYCE GRANULATA var. TURCOMANICA (Boiss.) comb. nov.
Bas.: Euphorbia turcomanica E. Boissier, Centuria Euphorbiarum 13, 1860; in DC., Prodr. 15(2): 34, no. 100, 1862 et Flora Orientalis 4: 1087, 1879. Euphorbia granulata var. turcomanica (Boiss.) Hadidi, Bull. Jard. Bot. Nat. Belg. 43: 93, 1973. Type: TURCOMANIA: Karelin s.n. (DC- Geneva).

CHAMAESYCE HIRTELLA (Boiss.) comb. nov.
Bas.: Euphorbia hirtella E. Boissier, Centuria Euphorbiarum 7, 1860 et in DC., Prodr. 15(2): 24, no. 55, 1862.
Type: BRAZIL: Sellow ex Herb. Berlin.

CHAMAESYCE JODHPURENSIS (Blatt. et Hallb.) comb. nov.
Bas.: Euphorbia jodhpurensis E. Blatter et F. Hallberg in Journal of the Bombay Natural History Society 26(4): 971, 1920. Type: JODHPUR: Blatter & Hallberg 9228 (Blatter Herbarium, Bombay).

CHAMAESYCE KOERNERIANA (Allem et Irgang) comb. nov.
Bas.: Euphorbia koerneriana A.C. Allem et B.E. Irgang in Schultz, A.R., Flora Illustrada do Rio Grande do Sul, Fasc. XI. Euphorbiaceae tribo Euphorbieae, sér. Bot., 4,34: 54, Fig. 12, 1975. Type: BRAZIL (Rio Grande do Sul): Irgang & Allem s/n.° (ICN 25414).

CHAMAESYCE LONGINSULICOLA (Hill) comb. nov.
Bas.: Euphorbia longinsulicola S.R. Hill, Sida 6(4): 313, 1976. Type: BAHAMAS (Lang Island): Steven R. Hill 2383 (NY, Isotypes: FTG, US & VT).

Chamaesyce scopulorum (Brandegee) Millspaugh
C. s. var. scopulorum
CHAMAESYCE SCOPULORUM var. INORNATA (Johnst.) comb. nov.
Bas.: Euphorbia scopulorum Brandegee var. inornata M.C. Johnston, Wrightia 5(5): 142, 1975. Type: MEXICO (Coahuila): I.M.Johnston 9382 (LL).

CHAMAESYCE SCOPULORUM var. NUDA (Johnst.) comb. nov.
Bas.: Euphorbia scopulorum Brandegee var. nuda M.C. Johnston, Wrightia 5(5): 142, 1975. Type: MEXICO (Coahuila): D.C. Correll & I.M. Johnston 21314 (LL).

Chamaesyce stictospora (Engelm.) Small
C. s. var. stictospora
CHAMAESYCE STICTOSPORA var. SUBLAEVIS (Johnst.) comb. nov.
Bas.: Euphorbia stictospora Engelm. var. sublaevis M.C. Johnston, Wrightia 5(5): 142, 1975. Type: MEXICO (San Luis Potosi): J. Henrickson 6638 (LL).

Acknowledgements:

The first author is thankful to the CSIR (INDIA) for the award of a Research Fellowship and to Drs. Otto & Isa Degener (New York Botanic Garden, Hawaii) for encouragement.

ADDITIONAL NOTES ON THE GENUS AEGIPHILA. XXVI

Harold N. Moldenke

AEGIPHILA Jacq.

Additional synonymy: Aegiphia [L. C. Rich.] apud López-Palacios, Fl. Venez. Verb. 78, in syn. 1977.

Additional bibliography: Hocking, Excerpt. Bot. A.25: 378. 1975; Moldenke, Phytologia 40: 316—346. 1978.

AEGIPHILA COWANI Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.25: 378. 1975; Moldenke, Phytologia 40: 214. 1978.

AEGIPHILA DEPPEANA Steud.

Emended synonymy: Aegiphila deppeana Moldenke, Suppl. List Inv. Names [1], in syn. 1941; López-Palacios, Fl. Venez. Verb. [51], fig. 5. 1977.

Additional bibliography: Moldenke, Phytologia 40: 318—319. 1978.

AEGIPHILA HIRSUTA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 353 (1973) and 40: 226. 1978.

AEGIPHILA LAXIFLORA Benth.

Additional synonymy: Aegiphila laxiflora Moldenke apud López-Palacios, Fl. Venez. Verb. [109], fig. 22. 1977.

AEGIPHILA SALTENSIS Legname

Additional bibliography: Moldenke, Phytologia 40: 346. 1978.

The corollas on Schiavone & al. 11865C are said to have been "white".

Although the original publication of A. saltensis is dated "1973", it was apparently not actually published until 1974.

Citations: BOLIVIA: Tarija: Schiavone, Cuezzo, Figueroa, & Legname 11865C (N). ARGENTINA: Salta: Legname & Cuezzo 8450C (Ld, Ws); Mármol, Legname, & Cuezzo 8824C (Ws); Vervoorst & Cuezzo 7776C (N).

AEGIPHILA SALTICOLA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 358—359. 1973.

Additional citations: BRAZIL: Pará: Mexia 5922 (Au—197709—isotype).

AEGIPHILA SCANDENS Moldenke

Additional bibliography: Moldenke, Phytologia 27: 359. 1973; López-Palacios, Fl. Venez. Verb. 23, 34, 63, 166—167, & 646. 1977; Moldenke, Phytologia 40: 319. 1978.

The corollas on Ribeiro 974 are said to have been "yellow" when fresh. López-Palacios (1977) cites Steyermark, Bunting, & Blanco 101487 from Apure, Venezuela, but with a question. In a personal communication to me he says that he now feels that this collection is better regarded as representing A. elata var. macrophylla (H.B.K.) López-Palacios.

Additional citations: BRAZIL: Amazônas: Ribeiro 974 [Herb. IPEAN. 149664] (Ld).

AEGIPHILA SELLOWIANA Cham.

Additional synonymy: Aegyphylla sellowiana Cham., in herb.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 359—361 (1973) and 28: 438. 1974; Troncoso, Darwiniana 18: 393 & 408. 1974; Moldenke, Phytologia 34: 257 (1976), 36: 34 (1977), and 40: 211 & 340. 1978.

Recent collectors describe this species as a branched shrub or small slender tree or treelet, 1.5—6 m. tall, the trunk 5—10 cm. in diameter, the twigs "thick, pale purple-brown velvety", the leaves large and flaccid, to 45 cm. long and 20 cm. wide, the immature fruit green or "green proximally, yellow-green distally", and the mature fruit dry, "marrão" or "marron pálido".

They have found it growing in rainforests or dark rainforests, campo cerrado, capoeira, along brushy roadsides, in areas of forest and shrubby campo, forest clearings on terra firma, in semidestroyed Araucaria forests, and "among shrubs and trees on grassy cutover hillsides with streams and blocky sandstone outcrops", at altitudes of 150—1050 meters, flowering in January, April, October, and December, fruiting in February, March, May, and July.

The corollas are said to have been "white" on Hatschbach 25007, Kummrow 867, Pereira 5651, and Vinha & Castellanos 20 and "whitish" on Hatschbach 35683.

Material of A. sellowiana has been misidentified and distributed in some herbaria as A. paraguariensis Briq. and as "Solanaceae".

On Lindeman & Haas 373 there is a note saying that it "agrees well with Krukoff 5060 determined as A. bracteolosa Moldenke". The latter, however, is a very different Amazonian species.

The Little & al. 364, cited below, has only immature leaves, although it is in full anthesis, and is placed here tentatively. It is described as a tree, 6 m. tall, the trunk 10 cm. in diameter, and was encountered at 700 meters altitude, in flower in September, known locally as "cusum".

The Irwin, Harley, & Onishi 29468, cited below, was distributed as and previously cited by me as A. paraguariensis Briq. This collection seems to combine the characters of A. sellowiana and A. par-

aguariensis and may represent a natural hybrid between the two taxa. Tentatively, it is probably better placed here as A. sellowiana. The collectors describe it as a tree, 3.5 m. tall, the trunk 8 cm. in diameter, the immature fruit green in January, and found it growing among rock outcrops at 1750 m. altitude.

The Lindeman & Haas 702, 925, 1606, 1694, 1726, 3321, & 3381, distributed as A. sellowiana, actually are A. mediterranea var. brevilobata Moldenke.

Additional citations: ECUADOR: Morona Santiago: Little, Ortega U., Samaniego V., & Vivar C. 364 (Ld). Napo-Pastaza: Asplund 18789 (Ld, N). Pastaza: Holm-Nielsen & Jeppesen 497 (N). BRAZIL: Amazônas: Campbell, Ongley, & Ramos P.20801 (Ld, N). Bahia: T. S. Santos 835 (N), 1451 (N); Vinha & Castellanos 20 (Ld, N). Espirito Santo: Lanna Sobrinho 1002 [Herb. FEEMA. 5023] (Ld). Goiás: Irwin, Anderson, Stieber, & Lee 34355 (W—2709845). Mato Grosso: Hatschbach 25007 (W—2706096). Minas Gerais: Anderson, Stieber, & Kirkbride 35995 (Ld, N, Ws); Irwin 2063 (Au—172818); Irwin, Harley, & Onishi 29468 (Ld, N, W—2759075). Paraná: Hatschbach 35683 (Ld), 39947 (Ld); Hatschbach, Lindeman, & Haas 13669b (N); Kummrow 867 (Ld); Lindeman & Haas 373 (Ld), 1927 (Ld), 4042 (Ws). Rio de Janeiro: E. Pereira 5651 [Herb. Brad. 14377] (Mu, N). Rio Grande do Sul: Lindeman & Garcia 6422 (Ut—320430). São Paulo: W. R. Anderson 10710 (Ld, N); Davidse 10507 (Ld); Eiten & Eiten 7918 (N, W—2688198); F. C. Hoehne s.n. [Herb. Inst. Bot. S. Paulo 24535] (N). State undetermined: Clausen s.n. (P); Herb. Richard s.n. (P).

AEGIPHILA SESSILIFLORA Moldenke

This taxon is now known as A. grandis var. sessiliflora (Moldenke) Moldenke, which see.

AEGIPHILA SESSILIFLORA var. CUATRECASASI Moldenke

This taxon is now known as A. grandis var. cuatrecasasi (Moldenke) López-Palacios, which see.

AEGIPHILA SKUTCHII Moldenke

Additional bibliography: Moldenke, Phytologia 27: 362. 1973; Molina R., Ceiba 19: 95. 1975; Moldenke, Phytologia 34: 252. 1976.

AEGIPHILA SMITHII Moldenke

Additional bibliography: Moldenke, Phytologia 27: 362—363. 1973; Soukup, Biota 11: 4. 1976.

The corollas on McDaniel & Santiago 2510 are said to have been "greenish" when fresh and these collectors refer to the plant as a "liana flor color beige", and have found it growing in clay soil at the edge of upland rainforests, at an altitude of 130 meters, flowering in June. They report that it is not employed in any way by the natives of the area. Other recent collectors describe it

as a vine or liana, 3 m. long, the stem diameter 3 cm., the flower-buds cream-color, and the immature fruit green or pale-green. They encountered it along paths on terra firma and in primary rain-forests, flowering in July and fruiting in August.

Additional citations: PERU: Loreto: Croat 18666 (W—2800325, Ws), P.18452 (W—2786741); Lleras, Steward, Ongley, Coêlho, Ramos, & Lima P.17162 (Ld, N); Mathias & Taylor 5453 (W—2653072); McDaniel & Santiago 2510 (W—2667055).

AEGIPHILA SORDIDA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 363. 1973; Soukup, Biota 11: 4. 1976.

AEGIPHILA SPICATA (Rusby) Moldenke

Additional bibliography: Moldenke, Phytologia 27: 363—364 (1973) and 32: 52. 1975.

Schunke Vigo describes this plant as a liana, 6—7 meters long, with "brilliant yellow-green (2.5 GY 9/8)" corollas and found the plant in anthesis in November.

Additional citations: PERU: Loreto: Schunke Vigo 6640 (W—2703832).

AEGIPHILA SPLENDENS Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 364. 1973.

AEGIPHILA SPRUCEANA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 364 (1973) and 28: 453. 1974; López-Palacios, Fl. Venez. Verb. 25, 36, 168—169, & 646. 1977.

López-Palacios (1977) claims that Spruce 3017, previously cited by me as from Brazil, actually was collected in Venezuela since the Kew specimen is inscribed "In silvis recentioribus ad pedem montis Cocui, Julio /53". It is not a cotype collection.

Emended citations: VENEZUELA: Amazonas: Spruce 3017 (B, K, N—photo, N—photo, N—photo, S, S, V, Z—photo, Z—photo, Z—photo).

AEGIPHILA STEYERMARKII Moldenke

Additional bibliography: Moldenke, Phytologia 27: 358 & 365 (1973) and 28: 453. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21. 1974; López-Palacios, Fl. Venez. Verb. 14, 163, 165, 177, & 646. 1977; Moldenke, Phytologia 40: 346. 1978.

Ruiz-Terán & López-Palacios describe this plant as an "Arbusto erecto, ramificado, inerme, 80—100 cm. Cáliz verde claro a verde pardúsculo" and found it growing at 1300 meters altitude, flowering in July. They report the vernacular name, "komái-yek", a name also reported by them for A. roraimensis Moldenke, a species which López-Palacios regards as conspecific.

Additional citations: VENEZUELA: Bolívar: Ruiz-Terán & López-Palacios 11387 (Ld).

AEGIPHILA STEYERMARKII var. MACROPHYLLA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 358 & 365 (1973) and 28: 453. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21. 1974; López-Palacios, Fl. Venez. Verb. 14, 177, & 646. 1977.

López-Palacios regards this taxon as identical to A. roraimensis Moldenke, but I am yet not convinced.

AEGIPHILA STEYERMARKII var. OBTUSIFOLIA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 358 & 365. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21. 1974; López-Palacios, Fl. Venez. Verb. 163, 165, & 646. 1977.

AEGIPHILA SUFFLAVA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 365—366. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 40. 1976; Soukup, Biota 11: 4. 1976; Moldenke, Phytologia 36: 32. 1977.

López-Palacios (1976) cites Fernández-Pérez 6855 (in the Bogotá herbarium), from Amazonas, Colombia, the first record of this species from Colombia.

AEGIPHILA SUFFLAVA var. KLUGII Moldenke

Additional bibliography: Moldenke, Phytologia 27: 366. 1973; Soukup, Biota 11: 4. 1976.

AEGIPHILA SYLVATICA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 366. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 40. 1976.

In a personal communication to me, López-Palacios says of this species: "Sólo hay el tipo de Puerto Wilches. No confirmada por colecciones posteriores. Moldenke dice que es una especie muy anómala."

AEGIPHILA TERNIFOLIA (H.B.K.) Moldenke

Additional synonymy: Aegiphila ternifolia f. ternifolia [H.B.K.] ex López-Palacios, Pittieria 5: 47. 1973.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 19. 1858; Pittier, Supl. Pl. Usual. Venez. 54. 1939; Moldenke, Phytologia 27: 366—370 (1973), 28: 435, 453, 454, & 460 (1974), and 34: 255. 1976; López-Palacios, Fl. Venez. Verb. 24, 26—30, 169—174, 633, 646, 647, & 649, fig. 38. 1977; Moldenke, Phytologia 40: 345. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [170], fig. 38. 1977.

López-Palacios (1977) cites from Venezuela only the following collections: Aragua: Aristeguieta 2972. Mérida: Bernardi 720. Miranda: Humboldt & Bonpland 703. The last-mentioned is the type collection, deposited in the Paris herbarium.

Jahn 444 is a mixture of the typical form of the species and f.

oppositifolia López-Palacios.

Additional citations: VENEZUELA: Aragua: Jahn 444, in part (W—703726].

AEGIPHILA TERNIFOLIA f. OPPOSITIFOLIA López-Palacios

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 368—370 (1973), 28: 435, 453, 454, & 460 (1974), and 34: 255. 1976; López-Palacios, Fl. Venez. Verb. 173—174, 633, 646, & 651. 1977.

Aristeguieta 2972 is said by López-Palacios to have ternate leaves on the Caracas herbarium specimen, but the specimen in the New York Botanical Garden herbarium has decussate-opposite leaves.

Ruiz-Terán & López-Palacios refer to this plant as an "Árbol erecto, inerme, 8—10 m. Hojas opositidecusadas y 3-verticiladas" and "perennifolio, 6 m." They found it growing at altitudes of 1800—2150 m., fruiting in January and September, and refer to their no. 10179 as a topotype. Jahn 444 is a mixture of this form and the typical form of the species. The label accompanying Macbride's type photograph 28389, cited below, is inscribed "Moritz 896", but the photograph itself shows Moritz's number as "897".

López-Palacios (1977) cites the following collections of this form from Venezuela: Aragua: Allart 426; Aristeguieta & Medina 2964; Fendler 841; Jahn 444; Karsten s.n.; Moritz 897; Pittier 9347; Ruiz-Terán & López-Palacios 10179; Steyermark 86211, 90886; Steyermark, Wurdack, & Prance 95869; Trujillo s.n. Federal District: Lasser 978, 979; Steyermark 55055. Lara: Smith V.3754. Mérida: Bernardi 6087; Little 15572; López-Palacios 3088; Maguire 39437; Ruiz-Terán 1689, 3088. Trujillo: Quintero & Carroz 1105; Ruiz-Terán & López-Palacios 7630; R. F. Smith V.4439. He comments that the label for Steyermark 86211 is inscribed "Dto. Federal", but the collection was actually made in Aragua.

The Bruijn 1431, distributed as A. verrucosa, actually is A. racemosa Vell.

In a personal communication to me, López-Palacios records the vernacular name, "chicharra", for this form and notes that "Seguramente que también se le aplica a la forma típica".

Additional & emended citations: COLOMBIA: Santander: Killip & Smith 19295 (W—1354567). VENEZUELA: Aragua: Allart 426 (W—1230288); Jahn 444 in part (Ve, W—703724, Z—photo); Ruiz-Terán & López-Palacios 10179 (Ld). Trujillo: Ruiz-Terán & López-Palacios 7630 (Ac). MOUNTED CLIPPINGS: Moldenke, Brittonia 1: 258—260. 1934 (W).

AEGIPHILA TRIFIDA Sw.

Additional bibliography: Sweet, Hort. Brit., ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 370 (1973) and 36: 39. 1977.

Both Sweet (1830) and Loudon (1832) list this species as cultivated in British gardens, introduced from Jamaica in 1826. They call it the "trifid-flowered aegiphila". Proctor has encountered it in thickets on serpentine on steep wooded hillsides and in rainforests on steep slopes, at 1750—3000 feet altitude, flowering and fruiting in March and September, and describes it as a straggling shrub, 2—3 m. tall, with pale-yellow or yellow corollas.

Additional citations: JAMAICA: Proctor 23352 (Ld), 29990 (Ld), 33526 (W—2777947, Z).

AEGIPHILA TRUNCATA Moldenke

This taxon is now reduced to synonymy under A. grandis Moldenke and all previously published notes should be transferred to that taxon.

AEGIPHILA UMBRACULIFORMIS Moldenke

Additional bibliography: Moldenke, Phytologia 27: 371 (1973), 28: 437 (1974), and 40: 215. 1978.

The corollas are said to have been "pinkish-white" on Mathias & Taylor 5995 and these collectors describe the plant as a shrub, 1 m. tall, with steel-blue fruit, and found it growing in woods, flowering and fruiting in July. Schunke Vigo describes it as a shrub, 4—5 m. tall, and encountered it in high dry tropical forests at 300—400 m. altitude, in immature [green] fruit in December. Other recent collectors refer to the plant as an unbranched shrub, 1—2 m. tall, growing in wet and secondary forests, the rachis and pedicels dull red-purple, the calyx pale-brown, the corolla-tubes cream, the limb dull-pink abaxially and whitish adaxially, and the fruit green (in January). They have found it at 1380 m. altitude, flowering in April.

Material has been misidentified and distributed in some herbaria as "A. cuneata var. cuneata".

Additional citations: PERU: Cuzco: Plowman & Davis 4867 (G). Huánuco: Plowman 5902 (G); Schunke Vigo 1337 (N, W—2750812), 1374 (W—2750813). San Martín: Mathias & Taylor 5995 (F—1728081).

AEGIPHILA VALERII Standl.

Additional bibliography: Moldenke, Phytologia 27: 371. 1973.

Additional citations: COSTA RICA: Guanacaste: Jiménez M. 1344 (W—2751890).

AEGIPHILA VALLENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 27: 371—372. 1973.

Barclay and his associates describe this plant as a shrub, 2 m. tall, with arching branches, and encountered it in the open sun on streambanks, at 1625 m. altitude, flowering and fruiting in August.

Additional citations: COLOMBIA: Cundinamarca: Barclay, Juajibioy, & Gama 3642 (W—2777243).

AEGIPHILA VELUTINOSA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 372. 1973; Soukup, Biota 11: 4. 1976.

AEGIPHILA VENEZUELENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 27: 358 & 372 (1973) and 28: 436. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21. 1974; López-Palacios in Steyerm. & Brewer-Carías, Bol. Soc. Venez. Cienc. Nat. 132/133: 397. 1976; Steyerm. & Brewer-Carías, Bol. Soc. Venez. Cienc. Nat. 132/133: 197, 205, & 207. 1976; López-Palacios, Fl. Venez. Verb. 24, 31, 174—180, & 646, fig. 39. 1977; Moldenke, Phytologia 40: 346. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [175], fig. 39. 1977.

López-Palacios (1974) feels that A. steyermarkii var. macrophylla Moldenke belongs in the synonymy of A. venezuelensis, but of this I am not as yet persuaded.

Recent collectors describe A. venezuelensis as a tree, 2.5 m. tall, the leaves subcoriaceous, dull-green above, paler dull-green beneath, and have found it in flower in February at 1750—1800 m. altitude.

López-Palacios (1977) cites the following collections from Venezuela: Bolívar: Maguire 32940, 33014, 33457; Steyermark 60263, 74964, 75516a, 75664, 75835, 109374, 109539, 109662; Steyermark & Aristeguieta 79; Steyermark, Dunsterville, & Dunsterville 92604; Steyermark & Wurdack 810, 848, 1082, 1089.

Additional citations: VENEZUELA: Bolívar: Steyermark, Carreño Espinoza, & Brewer-Carías 109374 (W—2813839).

AEGIPHILA VENEZUELENSIS var. SERRATA Moldenke

Additional bibliography: Moldenke, Phytologia 27: 372—373 (1973) and 28: 436. 1974; López-Palacios, Fl. Venez. Verb. 24, 31, 178—180, & 646, fig. 40. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [179], fig. 40. 1977.

López-Palacios (1977) reports that this taxon lives at altitudes of 1300—1700 meters. He cites the following collections from Venezuela: Amazonas: Cowan & Wurdack 31298; Maguire & Wurdack 30042; Maguire, Wurdack, & Bunting 36592; Maguire, Wurdack, & Maguire 42582. Aragua: Agostini & Fariñas 107. Bolívar: Steyermark & al. 109209. Yaracuy: Bunting 4272; Steyermark 100249.

AEGIPHILA VERTICILLATA Vell.

Additional synonymy: Aegiphila verticilata Vell. ex Thomazini, Φyton 32: 53, sphalm. 1974.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 373—374. 1973; Thomazini, Φyton 32: 53—60. 1974; Moldenke, Phytologia 31: 392. 1975; Thomazini,

Biol. Abstr. 59: 7457. 1975; López-Palacios, Fl. Venez. Verb. 43 & 646. 1977; Moldenke, Phytologia 40: 317. 1978.

The corollas on Hatschbach 31110 are said to have been "cream"-color when fresh. Davidse & Ramamoorthy refer to the plant as a shrub, only 1 m. tall, with red fruit in February, and found it growing in grassland with scattered low shrubs on hilltops at 1160 m. altitude. Thomazini (1974) has found mycorrhiza in the roots of this species resembling those seen in the roots of Paris.

Additional citations: BRAZIL: Minas Gerais: Davidse & Ramamoorthy 10851 (Ld, N); Langsdorff s.n. (W—1573974). Paraná: Hatschbach 31110 (W—2706091).

AEGIPHILA VILLOSA (Aubl.) Gmel.

Additional synonymy: Aegiphila villosa Aubl. apud J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 259. 1789.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 374—375. 1973.

Specimens of this species in some herbaria have been misidentified as Cordia sp.

Additional citations: FRENCH GUIANA: Aublet s.n. [F. G. Meyer photo 4069] (Gz—photo of type); Sagot 196 (P).

AEGIPHILA VITELLINIFLORA Klotzsch

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 9. 1858; Moldenke, Phytologia 27: 355 & 375—376. 1973; Hocking, Excerpt. Bot. A.23: 291. 1974; Moldenke, Phytologia 40: 232. 1978.

Hatschbach refers to this plant as a vine, the corollas "cream"-color, and encountered it at river margins, flowering in December.

Additional citations: BRAZIL: Mato Grosso: Hatschbach 40614 (Ld). MOUNTED ILLUSTRATIONS: Schau. in Mart., Fl. Bras. 9: pl. 47. 1851 (N, Z).

AEGIPHILA WIGANDIOIDES Lundell

Additional bibliography: Moldenke, Phytologia 27: 376. 1973; Hocking, Excerpt. Bot. A.26: 5. 1975; Moldenke, Phytologia 40: 334. 1978.

Breedlove describes this species as a tree, 65 feet tall, and encountered it on slopes with Liquidambar, Quercus, and Pinus, at 5100 feet altitude, flowering in April, identifying it as "Aegiphila aff. monstrosa Moldenke".

Additional citations: MEXICO: Chiapas: Breedlove 9665 (Ld).

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ADDITIONAL NOTES ON THE GENUS AMASONIA. VII

Harold N. Moldenke

AMASONIA L. f.

Additional synonymy: Diphistema Neck. apud Dalla Torre & Harms, Gen. Siphonog., imp. 1, 431. 1904. Diplostema [Neck.] apud López-Palacios, Fl. Venez. Verb. 648, in syn. 1977.

Additional & emended bibliography: Batsch, Tabl. Aff. Reg. Veg. 193. 1802; Sweet, Hort. Brit., ed. 1, 324 (1826) and ed. 2, 417. 1830; G. Don in Loud., Hort. Brit., ed. 1, 245. 1830; Endl., Gen. Pl. 637. 1838; Sweet, Hort. Brit., ed. 3, 552. 1839; Spach, Hist. Nat. Veg. Phan. 9: 227. 1840; Schau. in A. DC., Prodr. 11: 524—525, 628, & 677—678. 1847; Schnitzl., Iconogr. Fam. Nat. 2: 137 Verbenac. [3]. 1856; Buek, Gen. Spec. Syn. Candoll. 3: 19 & 469. 1858; Kuntze, Rev. Gen. Pl. 2: 502 & 509. 1891; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 43 (1904) and imp. 2, 431. 1963; J. Hutchins., Evol. & Phylog. Flow. Pl. 469 & 667. 1969; Rouleau, Guide Ind. Kew. 11. 1970; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 50, 371, 374, 534, 1126, & 1128. 1973; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Moldenke, Phytologia 29: 21—37 (1974), 29: 505, 507, 508, & 512 (1975), 30: 505 (1975), and 31: 382 & 396. 1975; Asher, Guide Bot. Period. 2: 59. 1975; Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Biol. Abstr. 60: 67. 1975; Follmann-Schrag, Excerpt. Bot. A.26: 502. 1976; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 41. 1976; Moldenke, Phytologia 34: 271 & 498. 1976; Soukup, Biota 11: 2, 6, & 14. 1976; López-Palacios, Fl. Venez. Verb. 9, 11, 20, 185—205, 646, 646, 648, 649, & 653. 1977; Moldenke, Phytologia 40: 228 & 232. 1978.

The Endlicher (1838) reference cited above is often cited as "1836-1856", but the pages involved here were issued in 1838.

It is of interest to note that Spach (1840) still regarded the genus Taligalea Aubl. as distinct from the genus Amasonia.

AMASONIA ANGUSTIFOLIA Mart. & Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 19. 1858; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Moldenke, Phytologia 29: 24. 1974; Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Biol. Abstr. 60: 67. 1975.

AMASONIA ARBOREA H.B.K.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 19. 1858; Moldenke, Phytologia 29: 24—25, 32, & 37. 1974; Moldenke, Biol. Abstr. 60: 67. 1975; López-Palacios, Fl. Venez. Verb. 187—191 & 646, fig. 42. 1977.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [188], fig. 42. 1977.

López-Palacios (1977) cites the following collections from Venezuela: Amazonas: Brewer 20; Cardona 166; Foldats 3627, 3718, 3864; Holt & Blake 471, 483, 729; Holt & Gehriger 273; Maguire, Cowan, & Wurdack 29458, 29960; Maguire & Politi 28055; Maguire, Wurdack, & Bunting 36787; Medina 316, 340; Rutkis 218; Steyermark & Bunting 102910, 103090; Tate 393; Ll. Williams 13981, 15175, 16076, 16112. Bolívar: Bernardi 1488, 1503; Cardona 1637, 2213; Maguire 33214; Steyermark 75388, 90207; Wurdack & Monachino 41047.

The Philipson, Idrobo, & Fernández 1488 and Ruiz-Terán & López-Palacios 11583, distributed as A. arborea, actually are A. lasiocaulos Mart. & Schau.

Additional citations: VENEZUELA: Amazonas: Foldats 248a (N); Steyermark & Bunting 103090 (Mu).

AMASONIA CALYCINA Hook. f.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 324 (1826) and ed. 2, 417. 1830; Loud., Hort. Brit., ed. 2, 552. 1832; Sweet, Hort. Brit., ed. 3, 552. 1839; Moldenke, Phytologia 29: 25-29 & 32. 1974; Moldenke, Biol. Abstr. 60: 67. 1975.

Both Sweet (1830) and Loudon (1832) list this taxon among the species cultivated in British gardens and aver that it was introduced from Trinidad in 1823. They call it the "puniceous amasonia".

AMASONIA CAMPESTRIS (Aubl.) Moldenke

Additional synonymy: Amasonia campestris Moldenke, Phytologia 34: 271, in syn. 1976.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 324. 1826; G. Don in Loud., Hort. Brit., ed. 1, 245. 1830; Sweet, Hort. Brit., ed. 2, 417. 1830; Loud., Hort. Brit., ed. 2, 552. 1832; Sweet, Hort. Brit., ed. 3, 552. 1839; Schau. in A. DC., Prodr. 11: 677—678. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 19 & 469. 1858; Moldenke, Phytologia 29: 23, 25, 27—33, & 35—37. 1974; Moldenke, Biol. Abstr. 60: 67. 1975; Moldenke, Phytologia 34: 271. 1976; Soukup, Biota 11: 6. 1976; López-Palacios, Fl. Venez. Verb. 185—187, 191--196, 646, & 653, fig. 43. 1977; Moldenke, Phytologia 40: 228 & 232. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [193], fig. 43. 1977.

Recent collectors describe this plant as a perennial herb or subshrub, 30 cm. to 1 m. tall, usually less than 1 m. tall, the stems slightly woody, single, straight, unbranched, deep-purple, the leaves rather dull-green with the midrib purplish beneath,, the inflorescence red and orange, the bracts red or crimson, or merely red on the upper surface, the sepals yellowish-green, and have found it growing in white sand of open savannas, "in natural lithosol campo, thin stony soil on top of bedrock sandstone pavement", "along small streams with marsh on white sand and surrounding cerrado on sandstone rock exposures", "on top part of stony ground costaneira slope covered with cerrado scrub", and "in moist ground, black humic soil, in clearings in low forests", at 350 m. altitude, flowering from January to March and in September,

fruiting in March. The corollas are said to have been "yellow" on Bolten s.n.; on Harley & al. 16707 they were "pale creamy-fawn with red veining within and on the inner side of the limb", while the Eitens say "greenish-yellow, the tube flesh-color and tinged with pink".

López-Palacios (1977) cites the following collections from Venezuela: Anzoátegui: Garroni 75; A. Hernández 38; Pittier 15089. Bolívar: Grosourdy s.n.; Maguire, Wurdack, & Bunting 35955; Pannier 822; Steyermark 86561, 88488; Trujillo 2486; Ll. Williams 13420. Delta Amacuro: Ramia 2151. Falcón: Moritz 623. Guárico: Aristeguieta 2317, 4206, 4246, 5651, 5669; Blydenstein 273; E. Castellanos 61; Lasser 123; Montaldo 3922; Ramia 2583; Tamayo 4115; Trujillo 8608; Vareschi 7389. Monagas: L. Cárdenas 1012; Ijjasz 550; Pittier 14379; Tamayo 3488. Sucre: Funck 134; Lasser & Vareschi 3883. State undetermined: Chaffanjon 147 (P). In a personal communication to me he records "cola de gallo" and "varita de San José" as vernacular names.

Material of A. campestris has been distributed in some herbaria as "Scrophulariaceae".

Additional citations: TRINIDAD AND TOBAGO: Trinidad: Carrick 932 (Kl—3932), 1117a (Kl—7117a), 1117b (Kl—7117b). GUYANA: Bolten s.n. [Mori & Bolten 8304] (Ld, N); Goodland 209 (N). FRENCH GUIANA: Hallé 44 (N), 136 (N). BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16707 (Ld); Irwin, Grear, Souza, & Reis dos Santos 14681 (N); Irwin, Harley, & Smith 30808 (W—2759080). Goiás: Irwin, Maxwell, & Wasshausen 21390 (N, N). Maranhão: Eiten & Eiten 10356 (W—2757754), 10375 (W—2729349), 10491 (W—2757728). Pará: W. R. Anderson 10530 (N). Piauí: Lützelburg 403 (Mu, Mu).

AMASONIA CAMPESTRIS var. SURINAMENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 29: 33. 1974; Moldenke, Biol. Abstr. 60: 67. 1975.

AMASONIA HIRTA Benth.

Additional bibliography: Schau. in A. DC., Prodr. 11: 678. 1847; Baek, Gen. Spec. Syn. Candoll. 3: 19. 1858; Moldenke, Phytologia 29: 32—35. 1974; Moldenke, Biol. Abstr. 60: 67. 1975.

Pereira describes this plant as an "erva lenhosa, de flores com corola alba-amarelada e cálice e brácteas amarelo coccineo. Héringer refers to it as 30 cm. tall, the "flores clavas com bracteas roseas", flowering in March. Anderson describes it as a suffrutescent perennial herb, 60 cm. tall, the bracts and calyx red, corollas white, and fruit green, and encountered it among rocks "on level grassy campo with scattered shrubs and trees probably recently burned, the soil red", at 1500 m. altitude, in flower and fruit in March.

Additional citations: BRAZIL: Amapá: Sick s.n. [Herb. Brad.

37765] (N). Distrito Federal: Irwin, Souza, & Reis dos Santos 11389 (N, W—2752701); E. Pereiro 8998 (Mu). Goiás: W. R. Anderson 6238 (N), 7013 (N); Héringer 13170 (N); Irwin, Anderson, Stieber, & Lee 34750 (Ld); Irwin, Grear, Souza, & Reis dos Santos 12305 (N), 14296 (N); Irwin, Maxwell, & Wasshausen 18824 (N, N), 18840 (N, N).

AMASONIA LASIOCAULOS Mart. & Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 19. 1858; Kuntze, Rev. Gen. Pl. 2: 509. 1891; Moldenke, Phytologia 29: 25, 32, & 35—37 (1974) and 31: 382. 1975; Moldenke, Biol. Abstr. 60: 67. 1975; Soukup, Biota 11: 6. 1976; López-Palacios, Fl. Venez. Verb. 187, 197—200, & 646, fig. 44. 1977.

Illustrations: Schau. in Mart., Fl. Bras. 9: pl. 48. 1851; López-Palacios, Fl. Venez. Verb. [198], fig. 44. 1977.

Recent collectors refer to this plant as an herb, subshrub, shrublet, or unbranched shrub, 1 m. tall, the bracts red, bright-red, or crimson, the filaments white or light-green, the style light-green, and the anthers brown. They have found it growing in open marshy places, woodlands, and forest shade, as well as in "light-brown sand with carrasco vegetation — a dense secondary scrub formed from arboreal xeromorphic woodland containing mostly Combretum leprosum with some Connarus and Stryphnodendron" at altitudes of 150—433 meters, flowering in January, July, and September.

The corollas are said to have been "cream-color" on Plowman & al. 4242 and "light-green or cream, the upper surface of the limb with red veins" on Eiten & Eiten 10390.

Ruiz-Terán & López-Palacios describe the species as "Sufrútice erecto o recostadizo, 80—120 cm. Tallos unas veces verde intensos, otras veces rojo purpúreos. Hojas opositidecusadas, verde intensas por la haz, algo más claras hasta completamente rojo purpúreas por el envés. Brácteas grandes, foliáceas, viscosas, las proximales de color verde, las restantes rojo escarlatas. Corolas amarillo pálidas cremosas, con vison verdósulos. Planta escasa, muy ornamental." In his 1977 work López-Palacios cites only the following collections from Venezuela: Amazonas: Pannier & Schwabe 936. Bolívar: Ruiz-Terán & López-Palacios 11583.

The Sick s.n. [Herb. Brad. 37765], distributed as A. lasiocaulos, actually is A. hirta Benth.

Additional citations: COLOMBIA: Meta: Philipson, Idrobo, & Fernández 1488 (N); Plowman, Davis, & Jacobs 4242 (Ld). VENEZUELA: Bolívar: Ruiz-Terán & López-Palacios 11583 (Ld). BRAZIL: Maranhão: Eiten & Eiten 10390 (W—2757758).

AMASONIA OBOVATA Gleason

Additional bibliography: Moldenke, Phytologia 29: 37. 1974; Moldenke, Biol. Abstr. 60: 67. 1975; López-Palacios, Fl. Venez. Verb. 187, 200—201, & 646. 1977.

López-Palacios (1977) cites from Venezuela only the following collections: Amazonas: Steyermark 57871, 57980; Tate 902.

Additional citations: VENEZUELA: Amazonas: H. M. Curran 174 (Ld, N).

AMASONIA SPRUCEANA Moldenke

Additional bibliography: Moldenke, Phytologia 29: 29 & 37. 1974; Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Biol. Abstr. 60: 67. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 41. 1976; López-Palacios, Fl. Venez. Verb. 186, 201--204, & 646, fig. 45. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [202], fig. 45. 1977.

López-Palacios (1975) comments that "Me parece importante repetir lo dicho hace algún tiempo....de que no encuentra muy convincentes las características de esta especie: abundancia de discos en el envés e infloresencias ramificadas, pues ambas características se ven en otras Amasonias." In his 1977 work he cites on the following collections from Venezuela: Amazonas: Lichi 8; Spruce 3288.

Additional citations: VENEZUELA: Amazonas: H. M. Curran 246 (Ld, N).

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ADDITIONAL NOTES ON THE GENUS AVICENNIA. XII

Harold N. Moldenke

AVICENNIA L.

Additional & emended bibliography: Hook., Comp. Bot. Mag. 1: 349. 1836; Hook. & Arn., Bot. Beech. Voy. 94, 306, & 449. 1838; Wight, Icon. Pl. Ind. 4 (3): 12 & 16, pl. 1481 & 1482. 1849; Linden & Planch., Pl. Columb., imp. 1, xxxiii. 1863; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Perad. Man. Bot. 2:] 70 & 153. 1911; Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 268, 270, & 613, fig. 271. 1936; Scholander, Hammel, Hemmingsen, & Garey, Pl. Physiol. 37: 722. 1962; Malaviya, Proc. Indian Acad. Sci. B.58: 45—50 & 351. 1963; Lombardo, Fl. Arb. & Arbores. Urug., ed. 2, 120. 1964; Snow, Trans. Roy. Soc. Trop. Med. Hyg. 64: 477. 1970; Snow, Biores. Ind. 7: 331. 1971; Hook, Brown, & Wetmore, Bot. Gaz. 133: 445--446. 1972; Rodin in Amiran & Wils., Coastal Deserts 157. 1973; Shimony, Fahn, & Reinhhold, New Phytol. 27: 36, pl. 1-7. 1973; "H. B.", Biol. Abstr. 57: 760. 1974; Hocking, Excerpt. Bot. A.25: 378 & 379. 1975; Meylan & Butterfield, New Zeal. Journ. Bot. 13: 4. 1975; De Granville, Cah. O. R. S. T. D. M., Ser. Biol. 11: 3--22. 1976; Epstein in Lüttge & Pitman, Transp.

Pl. 2 (B): 76. 1976; A. E. & B. S. Hill in Lüttge & Pitman, Transp. Pl. 2 (B): 228, 234, & 235. 1976; Hocking, Excerpt. Bot. A.28: 170, 171, 259, & 260. 1976; Jeschke in Lüttge & Pitman, Transp. Pl. 2 (B): 173. 1976; Rogerson & Becker, Bull. Torrey Bot. Club 103: 145, 192, & 277. 1976; Bond in Newton, Postgate, & Rodriguez-Barrueco, Rec. Devel. Nit. Fix. xx. 1977; Butler, Depers, McKillup, & Thomas, Biol. Abstr. 64: 3117. 1977; Butler, Depers, McKillup, & Thomas, Trans. Roy. Soc. S. Austr. 101: 35—44. 1977; Collins, Berkelhamer, & Mesler, Brenesia 10/11: 18 & 22. 1977; Das, Indian Forest. 103 (7): front cover. 1977; Fahn & Shimony, Biol. Abstr. 64: 5202—5203. 1977; Fahn & Shimony, Bot. Journ. Linn. Soc. Lond. 74: 37—46, fig. 1 & 2, pl. 1—3. 1977; Linden & Planch., Pl. Columb., imp. 2, xxxiii. 1977; Little, Atlas U. S. Trees 4: 5. 1977; Menninger, Edible Nuts 114 & 172. 1977; Moldenke, Biol. Abstr. 64: 4787. 1977; Moldenke, Phytologia 36: 439—450, 501, & 511. 1977; Briggs, Austr. Journ. Ecol. 2: 369—374. 1977; Flowers, Troke, & Yeo, Ann. Rev. Pl. Physiol. 28: 92, 98, 99, 104, 105, & 114. 1977; Powell, Econ. Bot. 31: 417, 421, & 429. 1977; Rogerson, Becker, & Prince, Bull. Torrey Bot. Club 104: 410. 1977; "J. W. S.", Biol. Abstr. 63: 4940. 1977; W. D. P. Stewart in Newton, Postgate, & Rodriguez-Barrueco, Rec. Devel. Nit. Fix. 307. 1977; A. E. Wight, TANE 23: 17. 1977; Briggs, Biol. Abstr. 65: 4428. 1978; Genelle & Fleming, Castanea 43: 49. 1978; Moldenke, Biol. Abstr. 65: 71. 1978; Moldenke, Phytologia 38: 256—257 & 504. 1978; Rogerson, Becker, & Prince, Bull. Torrey Bot. Club 105: 84. 1978.

The Hills (1976), as well as Genelle & Fleming (1978), are among the many botanists who now accept the Avicenniaceae as a family.

The Sumithraarachchi & Sumithraarachchi DBS.1032, distributed as Avicennia sp., is not anything avicenniaceous nor verbenaceous.

AVICENNIA AFRICANA P. Beauv.

Additional bibliography: Moldenke, Phytologia 36: 409 & 441. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

AVICENNIA ALBA Blume

Additional & emended bibliography: Hook., Comp. Bot. Mag. 1: 349. 1836; Wight, Icon. Pl. Ind. 4 (3): 16, pl. 1482. 1849; Gaussen, Legris, Meher-Homji, Fontale, Pascal, Chandrah., Delacourt, & Troy, Trav. Sect. Scient. Techn. Inst. Franç. Pond. Hors Ser. 14: 37 & 82. 1975; Moldenke, Phytologia 36: 409—410, 443, & 444. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

Emended illustrations: Wight, Icon. Pl. Ind. 4 (3): pl. 1482. 1849.

The Arbor indica, fructu conoide, cortice pulvinato, nucleum unicum nullo ossicula tecto claudente Ray, often cited as a synonym of Avicennia alba, actually is a synonym of A. officinalis instead, as can be seen from the statement by Ray that it is from Cochinchina and has oblong-rotund leaves and racemose flowers.

The Backer 11004, distributed as A. alba, actually is A. marina (Forsk.) Vierh.

Additional citations: THAILAND: Shimizu, Koyama, & Fukuoka T. 7575 (Ac). GREATER SUNDA ISLANDS: Sabah: Elmer 21250 (Mi).

AVICENNIA ALBA var. LATIFOLIA Moldenke

Additional bibliography: Moldenke, Phytologia 36: 410. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

Recent collectors have encountered this plant in the mangrove formation, fruiting in August. Its characteristically narrow-elongated fruits indicate its close affinity with A. alba Blume rather than with A. marina whose leaves it sometimes approximates. Material has been distributed in many herbaria as A. marina var. alba (Blume) Bakh.

Additional citations: THAILAND: Shimizu, Koyama, & Fukuoka T. 7573 (Ac). MARIANAS ISLANDS: Guam: Moore 852 (W—2876223).

AVICENNIA BICOLOR Standl.

Additional bibliography: Moldenke, Phytologia 36: 410, 439, & 446. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

AVICENNIA ELLIPTICA Holm

Additional bibliography: Hocking, Excerpt. Bot. A.28: 170. 1976; Moldenke, Phytologia 36: 410—411, 441, & 449. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

AVICENNIA ELLIPTICA var. MARTII Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.28: 170. 1976; Moldenke, Phytologia 36: 411 & 441. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

AVICENNIA EOCENICA Berry

Additional bibliography: Moldenke, Phytologia 36: 411. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

AVICENNIA EUCALYPTIFOLIA Zipp.

Additional bibliography: Moldenke, Phytologia 36: 411. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

AVICENNIA GERMINANS (L.) L.

Additional & emended bibliography: Hook. & Arn., Bot. Beech. Voy. 94, 306, & 449. 1838; Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2 (1): 270—271, fig. 271. 1936; Scholander, Hammel, Hemmingsen, & Garey, Pl. Physiol. 37: 722. 1962; Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 448—449, fig. 309. 1963; Hook, Brown, & Wetmore, Bot. Gaz. 133: 445—446. 1972; Shimony, Fahn, & Reinhold, New Phytol. 72: 27. 1973; "H. R.", Biol. Abstr. 57: 760. 1974; De Granville, Cah. O.R.S.T.O.M. Ser. Biol. 11: 3—22. 1976; Hocking, Excerpt. Bot. A.28: 170. 1976; Collins, Berkelhamer, & Mesler, Brenesia 10/11: 18 & 22. 1977; Fahn & Shimony, Bot. Journ. Linn. Soc. Lond. 74: 45. 1977; Little, Atlas U. S. Trees 4: 5. 1977; Moldenke, Phytologia 36: 439—441, 443, 444,

& 446—450. 1977; Powell, Econ. Bot. 31: 417, 421, & 429. 1977; "J. W. S.", Biol. Abstr. 63: 4940. 1977; Genelle & Fleming, Castanea 43: 49. 1978; Moldenke, Biol. Abstr. 65: 71. 1978.

The questionable record of "A. tomentosa" from the Sandwich [Hawaiian] Islands given by Hooker & Arnott (1838) is almost certainly a case of mixed labels, as has happened in several other cases of the Beechey Voyage plants, e.g., Callicarpa parvifolia and C. subpubescens recorded as from Mexico when actually the type specimens referred to were collected in the Bonin Islands. It seems most probable that the so-called "Hawaiian" specimen was really collected in Mexico, from which area the authors also report the species and without a question.

It is worth noting here that Burman (1768) under Bontia germinans L. included the following as synonyms: Bontia foliis subtus tomentosus Jacq., Bontia foliis integris oblongis oppositis, petiolatis crassis brevissimis subamplexicaulibus, floribus racemosis Browne, Avicennia L., Mangle laurocerasi foliis, flore albo tetrapetalo Sloane, Anacardium Bauhin, Arbor indica, fructu conoide, cortice pulvinato, nucleum unicum nullo ossiculo tecto claudente Ray, Oepata Rheede, and the Javanese vernacular "Caju cantekka", and says that it "Habitat in utrisque Indiis". Of these, however, Anacardium Bauhin is a synonym of Avicennia alba Blume, Arbor indica, fructu conoide, cortice pulvinato, nucleum unicum nullo ossiculo tecta claudente Ray and Oepata Rheede are synonyms of A. officinalis L. The Javanese name probably also applies to A. officinalis.

It should be pointed out here again that many of the populations from northern and northwestern South America are very puzzling. It is very possible that the very large-leaved forms cited under A. germinans var. guayaquilensis may actually belong with A. tonduzii or even A. africana P. Beauv, while the small pointed-leaved forms may represent the southernmost extension of the true A. germinans of the West Indies. The Wiggins 18310 (from the Galápagos Islands) and Steyermark & Manara 110316 (from Falcón, Venezuela) have the small leaves usually seen in typical West Indian A. germinans and are therefore cited here below.

In the Galápagos, according to Wiggins, this plant is called "negrita" and grows in close association with Rhizophora mangle.

The corollas are said to have been "yellowish" on Spellman & Stoddart 2297, "cream-white" on their no. 2419, "cream with pale-orange throat" on Conrad & al. 2927, and "white" on Norris & Taranto 13329b.

Cuatrecasas 14368, Gentry 10091, and Steyermark & Manara 110340, distributed as typical A. germinans, seem, at least tentatively, better placed as var. guayaquilensis (H.B.K.) Moldenke, while Prance & Prance 20207 seems definitely to be A. schaneriana f. candicans Moldenke and Liesner 2203 certainly is A. tonduzii Moldenke.

Additional & emended citations: FLORIDA: Saint Johns Co.: Godfrey 70653 (Au—299217, Ld). TEXAS: Cameron Co.: Clover 715 (Au—120825); D. S. Correll 32372 (Ld); Crutchfield 2985 (Ld); Parks 1724 (Au—120823); R. Runyon 4031 (Au—120824), 5897 (Au—269369, Ld); Traverse 1812 (Ld); Winters PI.3 (Au—303292). Nueces Co.: Tharp 253 (Au—120827). Harbor Island: Whitehouse s.n. [April 16, 1933] (Au—120829). MEXICO: Chiapas: Breedlove & Thorne 20806 (Mi). Nayarit: Norris & Taranto 13329b (Mi). Sonora: Holguín s. n. [25/V/1966] (Ld). Tabasco: Conrad, Conrad, & González O. 2927 (W—2788953). Veracruz: Ventura A. 5226 (Au). BELIZE: Dwyer 12385 (N). GULF OF HONDURAS ISLANDS: Frank's Cay: Spellman & Stoddart 2419 (W—2777447). Jack's Cay: Fosberg & Spellman 54433 (W—2777448). Spot Cay: Spellman & Stoddart 2297 (W—2777450). CAYMAN ISLANDS: Little Cayman: Proctor 28073 (Ld). JAMAICA: Crosby & Anderson 1192 (Ld); Crosby, Hespenheide, & Anderson 803 (Ld); Proctor 24214 (Ld). PUERTO RICO: Quick s.n. [16 February 1936] (Mi), s.n. (Mi). VENEZUELA: Falcón: Steyermark & Manara 110316 (W—2813927). GALAPAGOS ISLANDS: Indefatigable: I. L. Wiggins 18310 (W—2818168).

AVICENNIA GERMINANS var. CUMANENSIS (H.B.K.) Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.28: 170. 1976; Moldenke, Phytologia 36: 439, 440, & 446. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

AVICENNIA GERMINANS var. GUAYAQUILENSIS (H.B.K.) Moldenke

Additional bibliography: Moldenke, Phytologia 36: 440—441, 444, 446, & 450. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

Recent collectors describe this plant as having a "flattened crown".

Additional citations: COLOMBIA: Valle del Cauca: Breteler 5178 (N); Cuatrecasas 14368 (W—2772769). VENEZUELA: Falcón: Steyermark & Manara 110340 (N). Sucre: Breteler 4673 (N), 4677 (N). ECUADOR: Guayas: A. Gentry 10091 (W—2788967). GALAPAGOS ISLANDS: James: Howell 9689 (W—2814489); Wiggins & Porter 287 (W—2813288), Narborough: F. R. Fosberg 44703 (W—2828125).

AVICENNIA LANATA Ridl.

Additional bibliography: Hocking, Excerpt. Bot. A.28: 260. 1976; Moldenke, Phytologia 36: 441. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

AVICENNIA MARINA (Forsk.) Vierh.

Additional bibliography: Scholander, Hammel, Hemmingsen, & Garey, Pl. Physiol. 37: 722. 1962; Shimony, Fahn, & Reinhold, New Phytol. 72: 27—36, pl. 1—7. 1973; Epstein in Lüttge & Pitman, Transp. Pl. 2 (B): 76. 1976; A. E. & B. S. Hill in Lüttge & Pitman, Transp. Pl. 2 (B): 234. 1976; Läuchli in Lüttge & Pitman, Transp. Pl. 2 (B): 376. 1976; Briggs, Austr. Journ. Ecol. 2: 369—374. 1977; Butler,

Depers, McKillup, & Thomas, Biol. Abstr. 64: 3117. 1977; Butler, Depers, McKillup, & Thomas, Trans. Roy. Soc. S. Austr. 101: 35—44. 1977; Fahn & Shimony, Biol. Abstr. 64: 5202—5203. 1977; Fahn & Shimony, Journ. Linn. Soc. Lond. Bot. 74: 37—46, fig. 1 & 2, pl. 1—3. 1977; Flowers, Troke, & Yeo, Ann. Rev. Pl. Physiol. 28: 92, 98, 99, 104, 105, & 113. 1977; Moldenke, Phytologia 36: 441—444. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

Additional illustrations: Shimony, Fahn, & Reinhold, New Phytol. 72: pl. 1—7. 1973.

Waas describes this plant as a treelet, 3 m. tall, the corollas yellow, and the fruits silvery-green and pubescent, and found it in the mangrove formation. Fahn & Shimony (1977) report the course of development of the glandular and the non-glandular hairs is the same up to the 3-celled stage. Further cell division of the two types differ in their orientation. In the non-glandular type the cells continue to divide transversely, whereas in the glandular type the uppermost of the 3 cells divides longitudinally. In mature hairs of both types the peripheral wall of the cell just above the basal cell cell is heavily cutinized. There are narrow canals in the cuticle of the secretory cells of the glandular hairs. The two types of hair are phylogenetically related and homologous.

Additional citations: ARABIA: Yemen: Forskål s.n. [Mo. Bot. Gard. photos 1830] (W—photo of type). SRI LANKA: Bernardi 15299 (N); Fosberg & Jayasuriya 52773 (Ld); Waas 1648 (N, W—2769617). THAILAND: Shimizu, Koyama, & Fukuoka T.7567 (Ac). PHILIPPINE ISLANDS: Luzon: Ahern's collector 140 (Mi). GREATER SUNDA ISLANDS: Java: Backer 15324 [11004] (Ac, Mu). MOUNTED CLIPPINGS: E. H. Walker, Fl. Okin. & South. Ryuk. 895. 1976 (W).

AVICENNIA MARINA var. ACUTISSIMA Stapf & Moldenke

Additional bibliography: Moldenke, Phytologia 36: 443. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

AVICENNIA MARINA var. RESINIFERA (Forst. f.) Bakh.

Additional bibliography: Meylan & Butterfield, N. Zeal. Journ. Bot. 13: 4. 1975; Menninger, Edible Nuts 114. 1977; Moldenke, Phytologia 36: 443. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

Meylan & Butterfield (1975) report that the wood of this plant has only simple perforation plates. The data given by Menninger (1977) for this variety are erroneously credited by him as applying to A. officinalis.

AVICENNIA MARINA var. RUMPHIANA (H. Hallier) Bakh.

Additional bibliography: Moldenke, Phytologia 36: 444. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

AVICENNIA OFFICINALIS L.

Additional synonymy: Arbor indica, fructu conoide, cortice pulvinato nucleum unicum, nullo ossiculo tectum claudente Ray, Hist. Pl. 1566—1567. 1693. Arbor indica, fructu conoide, cortice

pulvinato, nucleum unicum nullo ossiculo tecto claudente Ray apud Burm. f., Fl. Ind. 138, in syn. 1768. Avicennia officinalis Rodin in Amiran & Wilson, Coastal Deserts 157, sphalm. 1973.

Additional & emended bibliography: Rheede, Hort. Malab. 4: 85, pl. 45. 1683; Ray, Hist. Pl. 2: 1566—1567. 1693; Wight, Icon. Pl. Ind. 4 (3): 16, pl. 1481. 1849; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Perad. Man. Bot. 2:] 70. 1911; Malaviya, Proc. Indian Acad. Sci. B.58: 45—50 & 351. 1963; Rodin in Amiran & Wilson, Coastal Deserts 157. 1973; Das, Indian Forest. 103 (7): front cover. 1977; Menninger, Edible Nuts 114. 1977; Moldenke, Phytologia 36: 440, 443, & 444. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

Additional & emended illustrations: Wight, Icon. Pl. Ind. 4 (3): pl. 1481 [as A. tomentosa]. 1849; Das, Indian Forest. 103 (7): front cover. 1977.

Larivita & Katik describe this plant as a small tree, 5 m. tall, the bole 2 m. tall, 16 cm. in diameter at breast height, the outer bark dark-brown, under bark dark-green, inner bark cream-color, the wood cream-color, the leaves dark-green above, paler beneath, and the flower-buds green. The found it growing in typical mangrove forest association dominated by Rhizophora, Bruguiera, Sonneratia, and Xylocarpus. The information given by Menninger (1977), ostensibly for Avicennia officinalis, applies, instead, to A. marina var. resinifera (Forst. f.) Bakh.

Malaviya (1963) reports the presence of stone-cells without included crystals in A. officinalis.

The Ray polynomial synonym, cited above, is sometimes cited in the synonymy of A. alba Blume, but plainly belongs to that of A. officinalis instead. Ray describes it as from Cochinchina, the leaf-blades oblong-rotund, and cites Rheede's Hort. Malab. 4: 95, pl. 45 of 1683.

Additional citations: NEW GUINEA: Papua: Laravita & Katik LAE. 70516 (Mu).

AVICENNIA SCHAUERIANA Stapf & Leechman

Additional bibliography: Moldenke, Phytologia 36: 440 & 443—450. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

Additional citations: BRAZIL: Pará: Prance 21149 (N).

AVICENNIA SCHAUERIANA f. CANDICANS Moldenke

Additional bibliography: Moldenke, Phytologia 36: 447—450. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

The Prances describe this plant as a shrub, 2 m. tall, with white corollas, and found it in flower in January. Material has been misidentified and distributed in some herbaria as "Combretaceae".

Additional citations: BRAZIL: Pará: Prance & Prance 20207 (N). Paraná: Hatschbach 38583 (Mi).

AVICENNIA TONDUZII Moldenke

Additional bibliography: Moldenke, Phytologia 36: 440 & 450. 1977; Moldenke, Biol. Abstr. 65: 71. 1978.

Liesner describes this species as a tree, 5 m. tall, and found it growing at the edge of the mangrove association.

Additional citations: COSTA RICA: Puntarenas: Liesner 2203 (N).

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ADDITIONAL NOTES ON THE GENUS BAILLONIA. IV

Harold N. Moldenke

BAILLONIA Bocq.

Additional & emended bibliography: Darlington & Wylie, Chrom. Atlas, ed. 2, imp. 1, 323. 1956; J. Hutchins., Evol. & Phylog. Flow. Pl. Dicot. [471] & 670, fig. 416. 1969; Rouleau, Guid. Ind. Kew. 22. 1970; Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Phytologia 30: 180—182, 506, & 508 (1975) and 32: 51. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 32: 507. 1976.

BAILLONIA AMABILIS Bocq.

Additional & emended bibliography: J. Hutchins., Evol. & Phylog. Flow. Pl. Dicot. [471] & 670, fig. 416. 1969; Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Phytologia 30: 182. 1975; Moldenke, Biol. Abstr. 60: 68. 1975.

Additional illustrations: J. Hutchins., Evol. & Phylog. Flow. Pl. Dicot. [471], fig. 416. 1969.

BAILLONIA AMABILIS var. PUBESCENS Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Phytologia 30: 182. 1975; Moldenke, Biol. Abstr. 60: 68. 1975.

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ADDITIONAL NOTES ON THE GENUS BOUCHEA. VI

Harold N. Moldenke

BOUCHEA Cham.

Additional synonymy: Verbena b. Bouchea Endl. apud Schau. in A. DC., Prodr. 11: 557, in syn. 1847. Bouhea Moldenke, Phytologia 30: 184, sphalm. 1975.

Additional & emended bibliography: P. Herm., Paradis. Batav. Prodr., ed. Warton. 1689; L., Sp. Pl., ed. 2, 27—28. 1762; Sweet,

Hort. Brit., ed. 1, 1: 324 (1826), ed. 2, 418 (1830), and ed. 3, 552. 1839; Spach, Hist. Nat. Veg. Phan. 9: 227. 1840; Schnitzl., Iconogr. Fam. Nat. 2: 137 Verbenac. [3]. 1856; Buek, Gen. Spec. Syn. Candoll. 3: 64, 447, 448, 494—496, & 507. 1858; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Perad. Man. Bot. 2:] 68 & 155. 1911; Loes., Verh. Bot. Ver. Brand. 53: 79. 1912; Wangerin in Just, Bot. Jahresber. 46 (1): 717. 1926; Xavier Louis & Monod, Bull. Agence Gén. Colon. Autonom. 27: 605 & 626. 1934; Gunawardena, Gen. Sp. Pl. Zeyl. 146. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 1, 714. 1969; Moldenke, Biol. Abstr. 50: 6948. 1969; G. W. Thomas, Tex. Pl. Ecol. Summ. 77. 1969; Rouleau, Guide Ind. Kew. 28. 1970; J. Mukherjee, Trans. Bose Res. Inst. 35: 37—42, pl. 1 & 2. 1972; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 2, 714. 1974; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; H. D. Gibbs, Chemotax. Flow. Pl. 3: 1753—1755 (1974) and 4: 2058. 1974; Hocking, Excerpt. Bot. A.23: 290. 1974; León & Alain, Fl. Cuba, imp. 2, 2: 279 & 294--295, fig. 127. 1974; Asher, Guide Bot. Period. 2: 59. 1975; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 40. 1975; Hocking, Excerpt. Bot. A.26: 6. 1975; Kooiman, Act. Bot. Neerl. 24: 463 & 465. 1975; Moldenke, Biol. Abstr. 60: 67 & 68. 1975; Moldenke, Phytologia 30: 182—186, 201—204, 206, 208, 506, 507, & 509 (1975), 31: 122, 124, 234—236, 378—380, 382, 391, 393, 396, 409, & 412 (1975), 32: 229, & 507 (1976), and 34: 251, 253—255, 258, 269, 272, 278, 279, & 500. 1976; Follman-Schrag, Excerpt. Bot. A.26: 504. 1976; S. R. Hill, Rhodora 78: 33. 1976; Hocking, Excerpt. Bot. A.28: 257. 1976; Soukup, Biota 11: 3, 6—7, & 21. 1976; López-Palacios, Fl. Venez. Verb. 20, 204—215, 505, 646—649, & 651—654. 1977; Moldenke, Phytologia 36: 32, 41, 47, 48, & 501. 1977; Powell, Econ. Bot. 31: 424. 1977; Moldenke, Phytologia 40: 263. 1978; A. L. Moldenke, Phytologia 40: 361. 1978.

Mukherjee (1972) says that "The genus Bouchea of Schauer have [sic] been divided Into [sic] three distinct genera, Chascanum, Svensonia and Bouchea on the basis of gross morphological characters. The habit, range of phytogeographical distribution, etc., also confirm the division. Pollen morphology, also is in accord with this division. The pollen grains of Bouchea are 3-pororate while the pollen of [the] others are [sic] 3-colpate. Differential surface patterns of 3 colpate pollen justify their individual generic status, e.g. pollen of Chascanum is negatively reticulate while those [sic] of Svensonia are finely punctitegillate, tectum beset with supertectal processes."

López-Palacios (1977) says "en Venezuela, aunque en el Brasil se la emplea a veces con lo mismo usos que la Verbena". He also says that in Venezuela members of the genus Bouchea commonly have the vernacular name, "verbena", like members of the genera Stachytarpheta and Verbena; this is true also, he avers, in Colombia and Ecuador for these genera and Hierobotana.

The Endlicher (1838) reference cited in the bibliography of Bouchea is often cited as "1836—1856", but the pages involved

here were actually issued in 1838.

The Stopp M.62, distributed as Bouchea sp., actually is Chascanum dehiscens (L. f.) Moldenke, while Breedlove 10268 and Vierecke 686 are actually Ghinia curassavica (L.) Oken, Harley 15097 is Stachytarpheta lacunosa Schau., and Harley 15136 is S. hispida Nees & Mart.

BOUCHEA AGRESTIS Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 64 & 558. 1858; J. Mukherjee, Trans. Bose Res. Inst. 35: 41. 1972; Moldenke, Phytologia 29: 43. 1974; Hocking, Excerpt. Bot. A.26: 6. 1975.

BOUCHEA BOLIVIANA (Kuntze) Moldenke

Additional bibliography: Moldenke, Phytologia 29: 43. 1974.

Additional citations: BOLIVIA: Santa Cruz: R. F. Steinbach 789 (Ut—328611B).

BOUCHEA BOYACANA Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 183 & 185 (1975) and 34: 255. 1976; Hocking, Excerpt. Bot. A.28: 257. 1976; Soukup, Biota 11: 7. 1976; Moldenke, Phytologia 36: 32. 1977.

López-Palacios & Idrobo refer to this plant as an "hierba erecta de 40—60 cm. de alto. Flor morado claro" or "1—1.20 m. de alto y 1.5 cm. de diámetro" [for their no. 3628], flowering and fruiting in August, Other collectors describe it as a robust herb, 1—1.5 m. tall, "algo pilosos", and encountered it at 1200—1800 m. altitude, flowering in September and November, and fruiting in September. The corollas on López-Palacios 4021 are said to have been "rose-purple" when fresh.

Additional citations: COLOMBIA: Antioquia: López-Palacios 4021 (Ld). Boyacá: Cuatrecasas 1954 (W—2780349). Cundinamarca: López-Palacios 3628 (Ld, N). Valle del Cauca: López-Palacios & Idrobo 3707 (N, Z).

BOUCHEA BOYACANA var. GLABRATA Moldenke

Additional bibliography: Moldenke, Phytologia 29: 44 & 48. 1974; Soukup, Biota 11: 7. 1976.

Additional citations: PERU: Piura: Hutchison & Wright 6592 (Mu—isotype, N—isotype).

BOUCHEA DISSECTA S. Wats.

Additional bibliography: Moldenke, Phytologia 29: 44—45. 1974; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 40. 1975.

BOUCHEA FLUMINENSIS (Vell.) Moldenke

Additional synonymy: Bouhea fluminensis Moldenke, Phytologia

30: 184, sphalm. 1975.

Additional & emended bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 64, 494, 495, 557, & 572. 1858; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 1, 714. 1969; J. Mukherjee, Trans. Bose Res. Inst. 35: 41. 1972; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 2, 714. 1974; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 183—184. 1975; Soukup, Biota 11: 7. 1976; López-Palacios, Fl. Venez. Verb. [204], 206, 646, & 654. 1977; Moldenke, Phytologia 36: 41 (1977) and 40: 263. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [204], fig. 46. 1977.

Recent collectors describe this plant as a shrub, 1.3—1.5 m. tall, and found it growing on riverbanks and along trails at forest margins, from sealevel to 3840 feet altitude, in flower in January and February, and in fruit in February. The corollas are said to have been "blue" on Gentry 10063, "light blue-violet" on Plowman & Davis 4872, "lilac" on Hatschbach 38535, and "dark-lilac" on Hatschbach 37871. The corollas and leaves are especially large on Hatschbach 37871.

Curiously, material of B. fluminensis has been misidentified and distributed in some herbaria as Pitraea cuneato-ovata (Cav.) Caro.

Additional citations: ECUADOR: Guayas: A. Gentry 10063 (W—2788432). PERU: Cuzco: Plowman & Davis 4872 (Ld). BRAZIL: Minas Gerais: Irwin 2239 (Au—173160). Paraná: Hatschbach 37871 (Ld), 38535 (Ld). ARGENTINA: Salta: Figueroa, Legname, Schiavone, & Cuezzo 11648c (Ld).

BOUCHEA FLUMINENSIS var. PILOSA Moldenke

Synonymy: Bouhea fluminensis var. pilosa Moldenke, Phytologia 30: 184, sphalm. 1975.

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 183 & 184 (1975) and 36: 41. 1977.

Hatschbach describes this plant as a shrub, 1.5—1.7 m. tall, and found it growing at the edges of streams, flowering in January, fruiting in January and October. The corollas on both his collections cited below are said to have been "lilac".

Additional citations: BRAZIL: Paraná: Hatschbach 35179 (Ld), 35674 (Ld).

BOUCHEA INOPINATA Moldenke

Additional bibliography: Moldenke, Phytologia 29: 49 (1974) and 34: 272. 1976.

BOUCHEA LINIFOLIA A. Gray

Additional bibliography: G. W. Thomas, Tex. Pl. Ecolog. Summ. 77. 1969; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 184. 1975.

Recent collectors describe this plant as a perennial, bush, or common, small, rounded, beautiful shrub, to 1 m. tall, with large flowers, and found it on northeast-facing slopes and in "matorral submontano vegetation on dry hillsides above a canyon waterhole in very thin calcareous soil in crevices of limestone rock, growing with Agave lechuguilla, Acacia rigidula, and Fraxinus greggii", at 5000 feet altitude, flowering from May to August, fruiting in August. They refer to the plant as "infrequent" in Brewster County, Texas and as "infrequent here [Val Verde County] but quite common on some of the limestone ridgetops". Thomas (1969) calls it the "groovestem bouchea".

The corollas are said to have been "blue-lavender" on Chiang, Wendt, & Johnston 7511, "bright-reddish" on Gentry & Engard 23233, "lavender" on Correll & Hanson 29885, "purplish" on Warnock, Turner, & Parks 1177, and "purple" on Smith & Butterwick 186.

Additional citations: TEXAS: Brewster Co.: Warnock, Turner, & Parks 1177 (Ld, Ld). Pecos Co.: Correll & Hanson 29885 (Ld, Ld). Val Verde Co.: Smith & Butterwick 186 (Ld). MEXICO: Coahuila: Chiang, Wendt, & Johnston 7511 (Ld); Gentry & Engard 23233 (W—2815781); Hinckley s.n. [20-VIII-1968] (Te—67084); Johnston & Muller 342 (Mi).

BOUCHEA NELSONII Grenz.

Additional bibliography: Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 40. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Molina R., Ceiba 19: 95. 1975; Moldenke, Phytologia 30: 184 (1975) and 34: 269. 1976.

Colaris encountered this plant growing along roadsides, flowering and fruiting in September. The corollas are said to have been "lilac" on Colaris 1484.

Material of B. nelsonii has been misidentified and distributed in some herbaria as Verbena delicatula Mart.

Additional citations: MEXICO: Oaxaca: Colaris 1484 (Ut—328618B). CULTIVATED: Germany: Herb. Zuccarini s.n. [Hort. Bot. Monac. 1834] (Mu—306).

BOUCHEA PRISMATICA (L.) Kuntze

Additional synonymy: Verbena americana annua, folio ocymi P. Herm., Parad. Batav. Prodr. ed Warton. 1689. Verbena diandra, spicis laxis, calycibus alternis prismaticis truncatis aristatis, foliis ovatis obtusis L., Sp. Pl., ed. 2, 27, in syn. 1762. Verbena, scutellariae s. cassidae folio, dispermos mericana Pluk. ex L., Sp. Pl., ed. 2, 28, in syn. 1762. Zapania prismatica Poir. apud Schau. in A. DC., Prodr. 11: 558, in syn. 1847. Bouchea prisantia (L.) Kuntze ex Moldenke, Phytologia 34: 272, in syn. 1976. Denisea prismatica [(L.) Kuntze] apud López-Palacios, Fl. Venez. Verb. 648, in syn. 1977.

Additional & emended bibliography: Breyn., Prodr. Fasc. Rar.

Pl., ed. 1, 2: 104. 1688; P. Herm., Paradis. Batav. Prodr. ed Warton. 1689; Breyn., Prodr. Fasc. Rar. Pl., ed. 2, 2: 104. 1739; L., Sp. Pl., ed. 2, 27—28. 1762; Sweet, Hort. Brit., ed. 1, 1: 324 (1826), ed. 2, 418 (1830), and ed. 3, 552. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 64, 447, 448, 495, 507, 558, & 572. 1858; Kuntze, Rev. Gen. Pl. 2: 502. 1891; Loes., Verh. Bot. Ver. Brand. 53: 79. 1912; G. W. Thomas, Tex. Fl. Ecolog. Summ. 77. 1969; J. Mukherjee, Trans. Bose Res. Inst. 35: 38—39 & 41, text fig. 1, & pl. 1, fig. 1—5. 1972; León & Alain, Fl. Cuba, imp. 2, 2: 294—295, fig. 127. 1974; Hinton & Rzedowski, Anal. Esc. Nat. Cienc. Biol. 21: 40. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 183—186 (1975) and 31: 378—380, 382, 391, 393, 396, 409, 410, & 412. 1975; Molina R., Ceiba 19: 95. 1975; S. R. Hill, Rhodora 78: 33. 1976; Moldenke, Phytologia 34: 253—255, 272, 278, & 279 (1976) and 36: 48. 1977; López-Palacios, Fl. Venez. Verb. 206—215, 646—649, 653, & 654, fig. 47 & 48. 1977; Powell, Econ. Bot. 31: 424. 1977.

Additional illustrations: J. Mukherjee, Trans. Bose Res. Inst. 35: 38, text fig. 1 & pl. 1, fig. 1—5. 1972; León & Alain, Fl. Cuba, imp. 2, 2: 294, fig. 127. 1974; López-Palacios, Fl. Venez. Verb. [208] & [214], fig. 47 & 48 (1—4). 1977.

Mukherjee (1972) describes the pollen-grains of this species on the basis of Pringle s.n. [Hills & plains near Chihuahua; August-September, 1895] in the Central National Herbarium at Calcutta, as: "3-pororate, pore lalongate, about 5.5 mu x 11.0 mu (range 4.0 mu — 7.5 mu x 9.0 mu — 12.5 mu), provided with thick annulus, devoid of any pattern. Ora lalongate, about 4.0 mu x 10.0 mu (range 2.5 mu — 7.0 mu x 8.5 mu — 12.0 mu) with thin margin. Mean interpororal distance ± 4.2 mu. Prolate, P/E about 122.0 mu x 86.0 mu (range 112.0 mu — 145.0 mu x 75.0 mu — 96.0 mu). Exine ± 6.0 mu thick. Sexine ± 4.5 mu thick, punctitegillate, puncta at polar regions are sparsely distributed and larger in size whereas at equatorial region they are smaller and sometimes form channels by merging. Bacula sparsely distributed but instead of standing over nexine, they are supported by a common irregular sexinal mass. Nexine ± 1.5 mu thick. NPC classification 346."

Recent collectors describe this plant as an "infrequent annual" or as a "weed", 20—70 cm. tall, and report it "common in cornfields" or "growing with Kallstroemia, Argemone, grasses, composites, etc.", at altitudes of 800—1200 m., flowering in October. The vernacular name, "verbena", is reported for it. Hill (1976) cites Hill 2213 from Long Island, Bahamas.

The corollas are said to have been "purple" on Molina R. 27186, "dark-pink" on Poole & Watson 1111, and "violet" on López-Palacios 3613.

Sweet (1826) calls this species the "Germander-leaved stachytarpheta" and asserts that it was introduced into English gardens from the West Indies in 1699. The Contreras 5669, cited below, was previously cited by me as var. brevirostra Grenz. — the fruit is too immature to observe its diagnostic characters, but the propor-

tionately large-sized leaves on the specimen cited here seems to point to typical B. prismatica rather than var. brevirostra.

The López-Palacios 3628, distributed as B. prismatica, seems to me to be better regarded as representing B. boyacana Moldenke, while Heyde & Lux 2966, Torke, Dunn, & Ellis 346, and Weberling 961 are B. prismatica var. brevirostra Grenz., Herb. Kummer s.n. [Hortus bot. Monacensis 1826] is xStachytarpheta adulterina Urb. & Ekm., Herb. Schreber s.n., Herb. Zuccarini s.n., & Herb. Univ. Ludov. Maximil. s.n. are S. cayennensis (L. C. Rich.) Vahl, and Herb. Kummer s.n. [Hort. Bot. Monac.] and Herb. Reg. Monac. s.n. are S. urticaefolia (Salisb.) Sims.

López-Palacios (1977) cites the following collections from Venezuela: Anzoátegui: Peñaloza 4902. Aragua: Benítez de Rojas 48, 81; Fendler 853; Fernández 480, 575; Lasser 847, 931; Montaldo 3739; Pittier 5830, 5832; Vogl 311. Barinas: López-Palacios 3095. Carabobo: Asplund 15104; Saer 887. Federal District: Bailey & Bailey 784; Eggers 13069; Fendler 853; Goldmers s.n.; Grosourdy Cat. 13 s.n.; Kuntze 1345; Moldenke & Moldenke 91564; Moritz 293b; Otto 797; E. Pittier 72; H. Pittier 7837, 9720; Vargas 48; Wagner 44. Guárico: Velasco 55. Lara: Burkart 16621; Trujillo 6509, 6585, 6600, 6688. Mérida: Vareschi & Pannier 1546. Miranda: L. Cárdenas 215. Sucre: Torres 1869, 1910. Táchira: Steyermark 10029. Trujillo: Reed 1069. He also cites Ginés 4031, G. L. 22, 209, and Miller & Johnston 205 from Margarita Island. In a personal communication to me he lists the following vernacular names: "arrocillo", "cebada de monte", "rabo de zorro", "verbena de Castilla", and "verbena negra".

Additional citations: MEXICO: Yucatán: Lundell & Lundell 7876 (Au—192586). GUATEMALA: El Petén: Contreras 1523 (Au—228073), 3311 (Au—228064), 5669 (Ld). HONDURAS: Copán: Poole & Watson 1111 (Ld). Morazán: Molina R. 27186 (W—2735811). BAHAMA ISLANDS: Deadman's: D. S. Correll 44919 (N). JAMAICA: Crosby, Hespenheide, & Anderson 132 (Ld). HISPANIOLA: Dominican Republic: Ekman H.12504 (Ld). PUERTO RICO: Sintenis 2117 (Ac); I. Vélez 509 (Lv). COLOMBIA: Santander: López-Palacios 3613 (Ld, N). Valle del Cauca: Cuatrecasas 22128 (W—2817217), 22696 (W—2817223).

BOUCHEA PRISMATICA var. BREVIROSTRA Grenz.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 447. 1858; G. W. Thomas, Tex. Pl. Ecolog. Summ. 17. 1969; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 40. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 185—186 (1975) and 34: 254. 1976; López-Palacios, Fl. Venez. Verb. 207, 212—[214], 647, 649, 651, & 654, fig. 48 (9—12). 1977.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [214], fig. 48 (9—12). 1977.

Recent collectors have encountered this plant at altitudes of 300—1830 meters, growing in shrubby secondgrowth and in

"areas of giant tree cacti in Acacia thorn forest where the main crop in the area is sugarcane", flowering and fruiting in January, June, August, September, and November. The corollas on Breedlove 27654 are said to have been "lavender" when fresh, while on Contreras 8731 they were "carmine-lilac", on Colaris 1538 "lilac-blue", on López-Palacios 4026 "rose", and on Fosberg 54067 "rose-pink". Fosberg refers to the plant as a "pleasantly aromatic herb", growing on open ground in dry brush vegetation on steep slopes. López-Palacios describes it as 10—60 cm. tall. In his 1977 work he cites the following collections from Venezuela: Aragua: Burkart 16914; L. Cárdenas 93; Trujillo 1565.

Material of this variety has been misidentified and distributed in some herbaria as Stachytarpheta mutabilis (Jacq.) Vahl as as "Acanthaceae". On the other hand, Contreras 5669, previously cited by me as B. prismatica var. brevirostra, seems, on re-examination, better placed as typical B. prismatica (L.) Kuntze; its fruits are too immature to exhibit their diagnostic characters, but the large size of the leaves seems to point to the typical form of the species rather than to the present variety.

Additional citations: MEXICO: Aguascalientes: R. McVaugh 16633 (Au—236054). Chiapas: Breedlove 12080 (Ld), 27654 (N). Hidalgo: González Q. 2637 (Ld). Jalisco: R. McVaugh 16313 (Au—236151). Nayarit: Feddema 595 (Au—263619). Oaxaca: Colaris 1538 (Ut—328620B). Puebla: Torke, Dunn, & Ellis 346 (Ld, N). GUATEMALA: El Petén: Contreras 8731 (W—2795350). Santa Rosa: Heyde & Lux 2966 (Mu—1781). EL SALVADOR: Chalatenango: Weberling 961 (Mu). VIRGIN ISLANDS: St. Croix: F. R. Fosberg 54067 (W—2775062). COLOMBIA: Nariño: López-Palacios 4026 [=4036] (Ld).

BOUCHEA PRISMATICA var. LACINIATA Grenz.

Additional bibliography: Moldenke, Phytologia 29: 62. 1974; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 40. 1975.

BOUCHEA PRISMATICA var. LONGIROSTRA Grenz.

Additional bibliography: León & Alain, Fl. Cuba, imp. 2, 2: 295. 1974; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 40. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 183 & 186. 1975; Molina R., Ceiba 19: 95. 1975; López-Palacios, Fl. Venez. Verb. 207, 213—[214], & 647, fig. 48 (5—8). 1977.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [214], fig. 48 (5—8). 1977.

Recent collectors describe this plant as erect, with spreading branches, the "estilo a veces algo persistente", and have found it growing in vacant lots and waste areas and on open rocky slopes on coppice-covered hills, at 100—800 m. altitude, flowering and fruiting in March and November. The corollas are said to have been "blue" on Correll 46213 and López-Palacios 2564 and "pink" on Correll 49113 and on Correll & Correll 42376.

López-Palacios (1977) cites the following collections from Venezuela: Bolívar: Holt & Gehriger 174; N. G. S. 274. Federal District: Alston 5438; Moritz 293; Pittier 7887; Vogl 559. Mérida: Breteler 4066; López-Palacios 2564; E. Reed 587; Ruiz-Terán & López-Figueiras 9289; Ruiz-Terán & López-Palacios 6177. He comments that Moritz 293 is plainly this variety, but that the label on the specimen in the "ABSM" [Moss Herbarium, American Bryological Society, Durham, North Carolina] is inscribed "Stachytarpheta umbrosa".

Additional citations: BAHAMA ISLANDS: Cat: D. S. Correll 46213 (N). Little Exuma: Correll & Correll 42376 (Ld). Long: D. S. Correll 49113 (N). JAMAICA: C. D. Adams 5511 (Mu). VENEZUELA: Federal District: Oberwinkler & Oberwinkler 14529 (Mu). Mérida: López-Palacios 2564 (Mu).

BOUCHEA PSEUDOCHASCANUM (Walp.) Grenz.

Additional synonymy: Bouchea lactevirens Mukherjee, Trans. Bose Res. Inst. 35: 41, sphalm. 1972.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 64, 448, & 557—558. 1858; J. Mukherjee, Trans. Bose Res. Inst. 35: 41. 1972; R. D. Gibbs, Chemotax. Flow. Pl. 4: 1753, 1754, & 2058. 1974; Moldenke, Phytologia 29: 63—64. 1974; Kooiman, Act. Bot. Neerl. 24: 463 & 465. 1975; Moldenke, Phytologia 34: 258. 1976.

Gibbs (1974) reports cyanogenesis and leucoanthocyanin absent from the leaves of this species and syringin absent from the stems; the Ehrlich test gives a positive (lilac-blue) reaction in the leaves, but the Juglone test gives negative results in the leaves and bark and the HCl methanol test is also negative.

Hatschbach & Kummrow describe the plant an an herb, 70 cm. tall, with lilac-colored corollas, and found it growing in capoeira vegetation, flowering in March.

Additional citations: BRAZIL: Maranhão: Hatschbach & Kummrow 38461 (Ld).

BOUCHEA RUSBYI Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 186 & 208. 1975; Hocking, Excerpt. Bot. A. 28: 257. 1976.

BOUCHEA SPATHULATA Torr.

Additional bibliography: G. W. Thomas, Tex. Pl. Ecolog. Summ. 77. 1969; Moldenke, Phytologia 29: 64—65. 1974; Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Phytologia 34: 251. 1976.

Recent collectors have found this plant growing in flat "bajada with a few eolian coppice mounds, the soil gypseous and saline, pale, fine-textured, desert, associated with Atriplex, Nama, and Allenrolfea", in "matorral inerme" vegetation on gently sloping limestone hillsides in calcareous gravelly soil, in "izotal" vegetation on steep limestone slopes, in deep calcareous clay-loam, in massive bedded limestone in "crasirosulifolios espinosos y izotal"

vegetation, on steep slopes of gypsum and limestone, in calcareous gravel or almost pure crumbly gypsum soil (higher up with patches of chaparral), in thin, whitish, calcareous, gravelly loam on south-facing limestone hillsides, and in limestone gravel on limestone slopes, at altitudes of 500—2100 m., flowering from April to July and in September and November. They describe it as a shrub to 1 m. tall and have found it growing in association with Yucca carnerosana, Koeberlinia spinosa, Agave lecheguilla, Celtis pallida, Zizyphus obtusifolia, Yucca torreyi, Leucaena retusa, Acacia neovernicosa, Parthenium incanum, Viguiera stenoloba, Ephedra sp., Acacia spp., Larrea sp., Dasylirion sp., Opuntia sp., Quercus sp., Cercis sp., Condalia sp., Hechtia sp., Vauquelinia sp., Cercocarpus, Pinus, and Berberis. Henrickson refers to it as "scattered" on open limestone slopes, while Johnston and his associates report it "common locally on limestone south-facing hillsides on sides of arroyos in deep pale calcareous desert loam, associated with Berberis trifoliolata."

The corollas are said to have been "violet" on Johnston & al. 7604 and Wendt & al. 10107, "red-purple" on Henrickson 11462, and "mostly rose-violet but some scattered white" on Chiang & al. 7607b. Thomas (1969) calls the species the "spoonleaf bouchea".

The Henrickson 12973, distributed as typical B. spathulata, actually represents var. longiflora Moldenke.

Additional citations: MEXICO: Coahuila: Chiang, Wendt, & Johnston 7607b (Ld), 7610 (Ld, Te—69953), 7728 (Ld), 9250 (Ld); Henrickson 11462 (Ld); Johnston, Chiang, & Wendt 7604 (Ld); Johnston, Chiang, Wendt, & Riskind 11844 (Ld); Johnston, Wendt, & Chiang 10589 1/2 (Ld), 11264 (Ld); Wendt, Chiang, & Johnston 10107 (Ld).

BOUCHEA SPATHULATA var. LONGIFLORA Moldenke

Additional bibliography: Moldenke, Phytologia 29: 65. 1974; Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Phytologia 34: 251. 1976.

Recent collectors refer to this plant as a "frequent perennial" or as an "infrequent shrub" on southwest-facing canyons in limestone soil, on limestone hillsides, on limestone in canyons, and "in mostly izotal vegetation with chaparral higher up on limestone hills with occasional patches of anhydrite, in mostly limestone gravel with local patches of pure gypsum", associated with Agave lecheguilla, A. asperrima, A. falcata, Fraxinus greggii, Rhus virens, Yucca carnerosana, Y. thompsoniana, Fouquieria spp., Cercocarpus, Mimosa, Acacia, Dasylirion, Larrea, Opuntia, Leucophyllum, Viguieria, and grasses. They describe it as a shrub about 1 1/2 feet tall and have encountered it at altitudes of 4100—6200 feet, flowering in August and September. The corollas are said to have been "violet" on Johnston & al. 12130, "light-violet" on Hendrickson 12213, "lavender-purple" on Hendrickson 14244, and "bluish-purple or purple-blue" on Henrickson 12920.

Additional citations: MEXICO: Chihuahua: Henrickson 12920 (Ld), 12973 (Ld). Coahuila: Henrickson 12213 (Ld), 14244 (Ld); Johnston, Chiang, Wendt, & Henrickson 12130 (Ld).

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ADDITIONAL NOTES ON THE GENUS BURROUGHSIA. II

Harold N. Moldenke

BURROUGHSIA Moldenke

Additional bibliography: Rouleau, Guide Ind. Kew. 31. 1970; Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 186—189. 1975.

BURROUGHSIA APPENDICULATA (Robinson & Greenm.) Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 187—188. 1975.

Henrickson refers to this plant as an infrequent aromatic perennial and found it growing on flats and on slopes around lakes, at altitudes of 1030—1115 m., in association with Atriplex obovata, A. stewartii, Suaeda suffrutescens, Bouteloua, Croton, Dyssodia, Euphorbia, Gilia, Sporobolus, and many perennial herbs. He found it flowering in September. On his no. 14254 the corollas are said to have been "white-yellow, turning red in the center".

Additional citations: MEXICO: Coahuila: Henrickson 14254 (Ld), 14273b (Ld). San Luis Potosí: Pringle 4625 (Mu—1814—isotype).

BURROUGHSIA FASTIGIATA (T. S. Brandeg.) Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.26: 6. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 188—189. 1975.

A letter to me from Dr. George M. Hocking, dated February 11, 1976, informs me that "the true 'damiana'" of Mexico in the pharmaceutical trade is Turnera diffusa, not Burroughsia. Numerous collectors, have reported "damiana" as the name applied to Burroughsia fastigiata in Mexico by natives in localities where it grows.

Gentry & Cech encountered this plant on the margins of a dry lake in the Yucca-cardon-Fouquieria plant association, at an altitude of 500—600 feet, flowering in March.

Additional citations: MEXICO: Baja California: Gentry & Cech 8809 (Sd—86505, W—2811074); Wiggins 15086 (Au—200386).

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ADDITIONAL MATERIAL TOWARD A MONOGRAPH OF THE GENUS CALLICARPA. XXVII

Harold N. Moldenke

CALLICARPA L.

Additional synonymy: Callicarpa Willd. ex Moon, Cat. Indig. & Exot. Pl. Ceyl. 1: 10. 1824.

Additional & emended bibliography: Jacq., Select. Stirp. Amer. Hist. 18: 1788; R. Br., Prodr. Fl. Nov. Holl., imp. 1, 511—512 (1810) and imp. 2, [Isis 1819:] 153—154. 1819; Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Schau. in A. DC., Prodr. 11: 627, 640—647, 649, 654, & 682. 1847; Wight, Icon. Pl. Ind. 4 (3): 15, pl. 1480. 1849; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Teijsm. & Binn., Natuurk. Tijdschr. Nederl. Ind. 25: 409—410. 1863; Engl., Syllab. Pflanzenfam., ed. 2, 178 (1898), ed. 3, 188 (1903), ed. 5, 192 (1907), and ed. 6, 198. 1909; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Perad. Man. Bot. 2:] 69 & 153. 1911; Gilg in Engl., Syllab. Pflanzenfam., ed. 7, 314 (1912) and ed. 8, 319. 1919; Fedde & Schust. in Just, Bot. Jahresber. 44: 253 & 254. 1922; Gilg in Engl., Syllab. Pflanzenfam., ed. 9 & 10, 339. 1924; Fedde in Just, Bot. Jahresber. 45 (1): 501. 1923; Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 148. 1923; Fedde in Just, Bot. Jahresber. 44: 1383. 1927; Burkill, Dict. Econ. Prod. Malay Penins., imp. 1, 1: 403—405. 1935; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 1, 3: 1921—1922. 1935; Diels in Engl., Syllab. Pflanzenfam., ed. 11, 339. 1936; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 1, 189 & 236. 1938; Sastri, Wealth of India Raw Mat. 2 (R): 14. 1950; Razi, Journ. Univ. Poona 1 (2): Biol. 47. 1952; Estores Anzaldo, Marañon, & Ancheta, Philip. Journ. Sci. 86: 236. 1958; Banerji, Rec. Bot. Surv. India 19 (2): 74. 1966; Barriga-Bonilla, Hernández-Camacho, Jaramillo-T., Jaramilla-Mejía, Mora-Osejo, Pinto-Escobar, & Ruiz-Carranza, Isla San Andrés 59. 1969; Rouleau, Guide Ind. Kew. 32. 1970; Anon., Agricult. Ind. 35: 174. 1971; Bojarczuk & Bojarczuk, Arbor. Kornick. 18: [237]. 1973; Williamson, Sunset West. Gard. Book, imp. 11, 207. 1973; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 2, 3: 1921—1922. 1975; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Kunkel, Excerpt. Bot. A. 26: 129. 1975; Stalter, Castanea 40: 13. 1975; Zimmerm. & Ziegler in Zimmerm. & Milburn, Transp. Pl. 1 [Pirson & Zimmerm., Encycl. Pl. Physiol., ser. 2, 1]: 502. 1975; Anon., Biol. Abstr. 61: AC1. 569. 1976; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 2, 189 & 236. 1976; Follmann-Schrag, Excerpt. Bot. A.26: 504. 1976; Gillis, Phytologia 35: 94 & 99. 1976; Grubb & Tanner, Journ. Arnold Arb. 57: 329. 1976; Hocking, Excerpt. Bot. A.28: 259 & 260. 1976; Lakela, Long, Fleming, & Genelle, Pl. Tampa Bay, ed. 3 [Bot. Lab. Univ. S. Fla. Contrib. 73:] 115, 150, & 152. 1976; Long & Lakela, Fl. Trop.

Fla., ed. 2, 733, 736—737, & 944. 1976; Mohlenbrock, Castanea 41: 310 & 318. 1976; Moldenke, Phytologia 34: 153—166, 247—249, 252-255, 262, 264, 266, 267, 272, & 500. 1976; Nixon & Raines, Tex. Journ. Sci. 27: [443], 447, & 448. 1976; Rogerson & Becker, Bull. Torrey Bot. Club 103, 145, & 235. 1976; Saxena & Khotele, Journ. Bomb. Nat. Hist. Soc. 73: 28. 1976; Soukup, Biota 11: 3, 7—8, & 21. 1976; Walker & Guppy, Austral. Journ. Ecol. 1: 205. 1976; A-non., Biol. Abstr. 63: 6129. 1977; Lelong, Sida 7: 140. 1977; López-Palacios. Fl. Venez. Verb. 9—11, 14, 22, 24, 25, 215—220, 646, 647, 649, 652, & 653, fig. 49. 1977; Meher-Homji, Feddes Repert. 88: 119. 1977; [Moldenke], Biol. Abstr. 64: 6962. 1977; Moldenke, Phytologia 35: 507 (1977) and 36: 28, 30, 38, 39, 41, 502, & 510. 1977; Musselman, Nickrent, & Levy, Rhodora 79: 264. 1977; Ono, Mem. Nat. Sci. Mus. 10: 65. 1977; K. E. Rogers, Sida 7: 78. 1977; Rogerson, Becker, & Prince, Bull. Torrey Bot. Club 104: 82. 1977; Subramanian & Kalyani, Indian Forest. 103: 113 & 117. 1977; Troth & Nicolson, Phytologia 35: 225 & 227. 1977; Yoshida & Tannawa, Notes Waimea Arbor. 3 (2): 10. 1977; Genelle & Fleming, Castanea 43: 49. 1978; Moldenke, Phytologia 39: 424 & 506. 1978; A. L. Moldenke, Phytologia 40: 361. 1978; Weaver, Arnoldia 38: 100 & 101. 1978.

Walker & Guppy (1976) list Callicarpa as a constituent part of their so-called "floristic group 5112".

The Ebalo 1189, distributed as Callicarpa sp., actually is Geunsia pentandra (Roxb.) Merr.

CALLICARPA ACULEOLATA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Hocking, Excerpt. Bot. A.28: 260. 1976; Moldenke, Phytologia 33: 377—378. 1976.

CALLICARPA ACUMINATA H.B.K.

Additional synonymy: Callicarpa acuminata L. ex Moldenke, Phytologia 36: 41, in syn. 1977. Calicarpa acuminata H.B.K., in herb.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Barriga-Bonilla, Hernández-Camacho, Jaramillo-T., Jaramillo-Mejía, Mora-Osejo, Pinto-Escobar, & Ruiz-Carranza, Isla San Andrés 59. 1969; Soukup, Biota 11: 8. 1976; Moldenke, Phytologia 34: 154, 252, & 255 (1976) and 36: 41. 1977; López-Palacios, Fl. Venez. Verb. 216—220, 646, & 647, fig. 49. 1977; A. L. Moldenke, Phytologia 40: 361. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [218], fig. 49. 1977.

Recent collectors describe this plant as a shrub or small tree, 3—6 m. tall, the trunk to 10 cm. in diameter at the base, the stems often growing as a clump from a sawed-ff base, the fruit "wine-red to blackish", "becoming reddish-violet", or "various shades of purple", juicy, and have found it growing along roadsides, in forests on limestone outcrops, disturbed primary forests, and brushy-weedy pastures along streams, "on limestone in

quebradas with clay soil and mixed tropical vegetation", on slopes and steep ravines with Seasonal Evergreen Forest of Belotia, Talauma, Pinus, and Quercus", often also growing in close association with Heliconia, Croton, and Erythrina, at 900—1900 m. altitude, flowering in February, May, June, August, and November, fruiting in January and September. Some refer to it as "frequent", but others as "infrequent". They report the vernacular name, "uva".

The corollas are said to have been "white" on Contreras 11154, Croat 22219, 23445, & 23593, Duke 12515, Liesner 2081, Lundell & Lundell 16402, Martínez-Calderón 192, and Poole & Watson 1035, and "yellow" on Dwyer 12760.

López-Palacios (1977) cited from Venezuela only the following collections: Lara: Badillo 472. Trujillo: Steyermark 56771.

Material has been misidentified and distributed in some herbaria as C. roigii Britton. On the other hand, the Contreras 2213, previously cited by me as typical C. acuminata, actually represented the more recently described var. argutedentata Moldenke.

Additional citations: MEXICO: Chiapas: Breedlove 27942 (N); Ton 1396. Oaxaca: Martínez-Calderón 192 (N); J. V. Santos 2624 (Au—263544). San Luis Potosí: Dunn, Harmon, & Enright 17515 (Ws). Tamaulipas: Martínez-Ojeda 50 (N). Veracruz: J.V.Santos 2651 (Au--263545); Ventura A. 4624 (Au), 5393 (Au). GUATEMALA: El Petén: Contreras 3339 (Au—228051), 5856 (Ld), 5128 (Ld); C. L. Lundell 16402 (Au—228037). Izabal: Contreras 11154 (W—2795346). BELIZE: Croat 23445 (N), 23593 (N); Dwyer 12760 (N). HONDURAS: Comayagua: Molina R. 8470 (Ld), 13016 (Ld), 13023 (Ld). Copán: Poole & Watson 1035 (Ld, Ld). Lempira: Molina R. 12959 (Ld). Olancho: Molina R. 13238 (Ld). NICARAGUA: Bluefields: Proctor, Jones, & Facey 27272 (Ld). COSTA RICA: Puntarenas: Liesner 2081 (N). PANAMA: Chiriquí: Croat 22219 (N). Colón: M. Nee 6991 (N, W—2787291, W—2812519). PEARL ISLANDS: San José: Duke 12515 (W—2788350). COLOMBIA: Valle del Cauca: Cuatrecasas 22883 (W—2817327). PERU: San Martín: Belshaw 3148 (Ld); Woytkowski 8368 (W—2786475).

CALLICARPA ACUMINATA var. ARGUTEDENTATA Moldenke

Additional bibliography: Moldenke, Phytologia 33: 379—382 (1976) and 34: 252. 1976.

Recent collectors describe this plant as a tree, 4 m. tall, the trunk 2 inches in diameter, and have found it in flower in April. The corollas on Contreras 2213, a collection previously erroneously reported by me as typical C. acuminata (before the present variety was recognized), are said to have been "white".

Additional & emended citations: MEXICO: San Luis Potosí: R. McVaugh 10489 (Au—236043, Ld). GUATEMALA: El Petén: Contreras

2213 (Au—228055, Ld, S).

CALLICARPA ACUMINATA var. PRINGLEI (Briq.) Moldenke
Additional bibliography: Moldenke, Phytologia 33: 379—382, 404, & 504. 1976; A. L. Moldenke, Phytologia 40: 361. 1978.

CALLICARPA ACUTIDENS Schau.
Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 33: 382. 1976.

CALLICARPA ALBIDO-TOMENTELLA Merr.
Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 148. 1923; Moldenke, Phytologia 33: 383. 1976.

CALLICARPA AMERICANA L.
Additional & emended bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Hook., Comp. Bot. Mag. 1: 176 & 349. 1836; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 1, 189. 1938; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Stalter, Castanea 40: 13. 1975; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 2, 189. 1976; Hocking, Excerpt. Bot. A.28: 260. 1976; Lakela, Long, Fleming, & Genelle, Pl. Tampa Bay, ed. 3 [Bot. Lab. Univ. S. Fla. Contrib. 73:] 115, 150, & 152. 1976; Long & Lakela, Fl. Trop. Fla., ed. 2, 737 & 944. 1976; Mohlenbrock, Castanea 41: 310 & 318. 1976; Nixon & Raines, Tex. Journ. Sci. 27: [443], 447, & 448. 1976; Soukup, Biota 11: 7. 1976; Moldenke, Phytologia 33: 481 (1976), 34: 247—249 & 272 (1976), and 36: 28 & 30. 1977; Anon., Biol. Abstr. 63: 6129. 1977; Lelong, Sida 7: 140. 1977; López-Palacios, Fl. Venez. Verb. 215, 340, & 647. 1977; Musselman, Nickrent, & Levy, Rhodora 79: 264. 1977; K. E. Rogers, Sida 7: 78. 1977; Genelle & Fleming, Castanea 43: 49. 1978; A. L. Moldenke, Phytologia 40: 361. 1978.

According to Lakela and her associates (1976) this species inhabits "coastal strand, swamp forest, [and] pine flatwoods", flowering in the spring. Mohlenbrock (1976) asserts that it inhabits moist or dry hammocks in the Ocala National Forest, Florida, occurring there "under Magnolia grandiflora which is dominant in moist hammocks".

Both Sweet (1830) and Loudon (1832) assert that this species was in cultivation in British gardens in their time and was introduced from "Carolina" in 1724. They call it the "American callicarpa".

Recent collectors describe the species as a loose shrub, 2—3 m. tall, arching and sprawling, sometimes weakly upright, the stems brittle, to 4 cm. in diameter, and have found it "in open woods above backswamp, in much cracked dark-brown silty clay in dominant complex of Fraxinus-Gleditsia-Liquidambar-Pinus taeda" and "in association with Solidago, Desmodium, Lespedeza, Heterotheca, and Helianthus in dry, poor, sandy soil", fruiting in November. The

corollas are said to have been "pale-lavender" on Shacklette 7115, "light-lavender" on Montgomery & Blake 179, "lavender" on Blake & Montgomery 217, and "pink-purple" on Duncan 20155.

Lelong (1977) reports the species "common" in open woods and thickets in Mobile County, Alabama, and Rogers (1977) found it "common" on the upper slopes of ravines and in upland woods in Forrest and Perry Counties, Mississippi. Stalter (1975) lists it from the Isle of Palms, Charleston County, South Carolina. Blake & Montgomery refer to it as a 5-foot shrub in open marginal areas at the edge of granite outcrops in the Piedmont Province of Georgia. Some of the leaves on Tharp s.n. [May 28, 1971] measure 19 cm. long and 12 cm. wide!

Additional citations: NORTH CAROLINA: Bladen Co.: Biltmore Herb. 1720c [Herb. Kent Sci. Mus. 43964] (Mi). Greene Co.: Radford 36434 (Ld). Harnett Co.: Foust & Foust s.n. [June 29, 1938] (Au—120926); Radford & Stewart 630 (Au—120925). Hattaras Island: F. R. Fosberg 17839 (Mi). SOUTH CAROLINA: Cherokee Co.: Ahles 34395 (Au—179480). GEORGIA: Jeff Davis Co.: Shacklette 7115 (Mi). Mc Intosh Co.: D. S. Correll 5442 (Mi). Oglethorpe Co.: Blake & Montgomery 217 (N); Montgomery & Blake 179 (N). Rabun Co.: Wood & Boufford 1826 (N). Sapelo Island: Duncan 20155 (Au—167517, Mi). FLORIDA: Alachua Co.: D'Arcy 2202 (Ld). Broward Co.: Stimson 865 (Au—245287, Au—277805). Columbia Co.: West & Arnold s.n. [2 Oct. 1946] (Au—120915). Dade Co.: Correll, Correll, & Popenoe 47049 (Ld); Moebold 27611 (Mu); A. Schwartz s.n. [29 July 1951] (Mi). Leon Co.: N. C. Henderson 63-1074 (Au—222923). Putnam Co.: Moldenke & Moldenke 29819 (Ld). Seminole Co.: P. A. Schallert 64 (Mu, Mu). Key Largo: A. Schwartz s.n. [27 July 1951] (Mi); Stern, Bailey, Hayden, & Palmer 3417 (W—2825496). Sanibel Island: Brumbach 8678 (Mi, W—2773124). MISSISSIPPI: Hancock Co.: Demaree 29574 (Au—120931). Jackson Co.: Demaree 32091 (Au—120919, 32845 (Au—120922); Seymour & Earle 111 (Au—180337). Lauderdale Co.: Jones & Jones 15313 (Au—260976). Stone Co.: Demaree 32553 (Au—120920). ARKANSAS: Columbia Co.: Barclay & Thompson 1039 (Ld). Garland Co.: R. Runyon 1203 (Au—291329), 1461 (Au), 5651 (Au—290904). Independence Co.: Demaree 27183 (Au—120911), 27736 (Au—120909); Thomas & Bio Class 8916 (Lc). Perry Co.: Demaree 27055 (Au—120910). Stone Co.: Demaree 27864 (Au—120942. Union Co.: McArdle 406 (Lc). LOUISIANA: Lafayette Par.: Thieret 17976 (Au—242658, Ld). Ouachita Par.: Erwin 78 (Lc). Union Par.: Gaines s. n. [6-23-50] (Au—120913). OKLAHOMA: Latimer Co.: Fink 70 (Au—120916). Marshall Co.: Taylor & Taylor 16028 (Ld); Waterfall 12299 (Au—120923). McCurtain Co.: Nelson, Nelson, & Goodman 5402 (Au—120921). TEXAS: Anderson Co.: Marsh 139 (Au—120901). Aransas Co.: M. C. Johnston 53253.27 (Au—120902); K. Peterson 37 (Au—230341).

Austin Co.: W. M. Jones WMJ.133 (Mu); Tharp s.n. [May 28, 1961] (Au—191745). Bastrop Co.: Bunte 15 (Au—244209, Ld); Duval 17 (Au—291211). Bell Co.: York & York 54475 (Au—120877). Blanco Co.: E. J. Palmer 12862 (Au—120876). Bowie Co.: D. S. Correll 15251 (Ld). Brazoria Co.: Killip 40552 (Au—120870). Brazos Co.: H. B. Parks s.n. [6-5-47] (Au—120854). Caldwell Co.: J. A. Mears 678 (Au—255106). Chambers Co.: Traverse 823 (Au—168056, Ld, Mu). Dallas Co.: C. L. Lundell 13930 (Ld, Ld). Fayette Co.: Ripple 51-748 (Au—120907). Freestone Co.: Lundell & Lundell 12939 (Ld). Gonzales Co.: D. S. Correll 20462 (Ld). Grayson Co.: H. Gentry 51-408 (Au—120906). Hardin Co.: Lundell & Lundell 11537 (Ld). Harris Co.: J. A. Mears 708 (Au—255496). Hays Co.: J. C. Johnson 412 (Au—120859). Jackson Co.: Turner & Tharp 53-421 (Au—120879). Jasper Co.: D. S. Correll 28580 (Ld); Correll & Correll 12536 (Mi). Lamar Co.: Rochat 117 (Au—201801, Au). Lavaca Co.: Tharp, Rogers, & York 49201 (Au—120905). McLennan Co.: L. D. Smith 89 (Au—120855), 615 (Au—120856). Polk Co.: Tharp, Turner, & Johnston 54713 (Au—120878). Robertson Co.: Massey 226 (Ld). Rusk Co.: C. E. Porter 51-1900 (Au—120904). Travis Co.: Lynch s.n. [July 5, 1954] (Au—208099); J. L. White 4693 (Au—120892). Tyler Co.: Crockett 1258 (Ld); Tharp, Gimbrede, & Yang 51-1465 (Au—120860). Walker Co.: N. C. Henderson 63-1023 (Au—225882).

CALLICARPA AMERICANA f. LACTEA (F. J. Muller) Rehd.

Additional bibliography: Moldenke, Phytologia 33: 387—388 (1976) and 34: 272. 1976.

As seems currently to be the more accepted practice in the naming of flower- or fruit-color variants, the accepted name for this taxon is now relegated to form, rather than varietal, rank.

Additional citations: TEXAS: Hardin Co.: Cory 54928 (Ld). Jasper Co.: D. S. Correll 28581 (Au—226248, Ld).

CALLICARPA AMPLA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 33: 388. 1976.

CALLICARPA ANGUSTA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 33: 388. 1976.

CALLICARPA ANGUSTIFOLIA King & Gamble

Additional bibliography: Moldenke, Phytologia 33: 388—389 (1976) and 34: 266. 1976.

CALLICARPA ARBOREA Roxb.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 73.

1858; Krishna & Ramaswami, Indian Forest. Bull., ser. 2, 79: 13. 1932; Sastri, Wealth of India Raw Mat. 2 (R): 14. 1950; Banerji, Rec. Bot. Surv. India 19 (2): 74. 1966; Zimmerm. & Ziegler in [Pirson & Zimmerm., Encyl. Pl. Physiol., ser. 2, 1:] Zimmerm. & Milburn, Transp. Pl. 1: 502. 1975; Moldenke, Phytologia 34: 154 & 164 (1976) and 36: 39. 1977; Meher-Homji, Feddes Repert. 88: 119. 1977.

Both Sweet (1830) and Loudon (1832) list this species as being cultivated in British gardens in their time, introduced from Nepal in 1822. They call it the "tree callicarpa". Banerji (1966) describes it as a "Tree with a thick trunk. Leaves ovate to oblong, tomentose beneath. Flower pale-purple. Common [in Nepal]". He cites Banerji 459. Sastri (1950) records the vernacular name, "khoja", and says of the species: "A moderate-sized tree, with trunk often crooked, attaining a height of 10—15 feet and girth [of] 1 1/2 — 3 ft. It is distributed in the sub-Himalayan tract from Kumaon to Bengal, upper Gangetic plain, Rajmahal and Chota Negpur hills, Assam and northern Circars of the Deccan peninsula. The wood (wt., 35—38 lb./c.ft.; sp. gr., 0.59; cal. val., 5164 cals., 9296 B.t.u.) is moderately soft and liable to insect attack. It is used only as firewood and for the production of charcoal."

Recent collectors refer to the species as a small spreading tree, to 30 feet tall, the trunk to 8 inches in diameter at breast height, and the bark smooth and light-gray, and have found it growing in deciduous and Bombax-Trewia riverine forests, at 250—900 m. altitude, flowering in May, September, and December. The corollas are said to have been "blue" on F. Brown 1276 and "rose-purple" on Troth 721.

The Meebold 26638, distributed as C. arborea, actually is C. pedunculata R. Br., while Jenkins s.n. [Assam] is a mixture with something non-verbenaceous.

Additional citations: NEPAL: Troth 721 (W—2826484). INDIA: Assam: Jenkins s.n. [Assam] (Mu—949, Mu); Masters s.n. [Assam] (Mu—950); Prazer s.n. [Looshai Hills, 1890] (Mu—3734). Khasi States: Hooker & Thomson s.n. [Mont. Khasia, 0-4000 ped.] (Mu—947); Native collectors s.n. [Khasia hills] (Mu—948). BANGLADESH: Griffith 6037 (Mu—952). BURMA: Tenasserim: Falconer 505 (Mu—954); Helfer 6037 (Mu—953). THAILAND: Charoenphol, Larsen, & Warncke 3497 (N); Hosseus 618 (Mu—4173); Shimizu, Koyama, & Hutch T.10427 (Ac). CULTIVATED: Hawaiian Islands: Haughs s.n. [F. Brown 1276] (Mu).

CALLICARPA ARBOREA var. PSILOCALYX (H. J. Lam) Moldenke

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 33: 391. 1976.

The Rothdauscher s.n. [Manilla, 1879], distributed as C. magna

Schau., actually is Premna odorata Blanco.
Additional citations: PHILIPPINE ISLANDS: Luzon: M. Ramos 395 (Mu—4175—cotype).

CALLICARPA AUSTRALIS Koidz.
Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 44: 253. 1922; Moldenke, Phytologia 33: 392 (1976) and 36: 38. 1977.

CALLICARPA BASILANENSIS Merr.
Additional bibliography: Moldenke, Phytologia 33: 392. 1976.
Rbalo describes this species as a tree, 5 m. tall, the trunk 3 inches in diameter, and the corollas purple, and found it in flower in January. He reports the vernacular name, "tabog".
Additional citations: PHILIPPINE ISLANDS: Basilan: Ebalo 865 (Mi).

CALLICARPA BICOLOR A. L. Juss.
Additional & emended bibliography: Schau. in A. DC., Prodr. 11: 642—643. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 33: 392—393 & 398. 1976.
Additional citations: PHILIPPINE ISLANDS: Luzon: Rothdauscher s.n. [Manilla, 1879] (Mu—1653, Mu—1654). Mindanao: M. S. Clemens 271 (Mu—4095). Negros: E. D. Merrill 207 (Mu—4170, Z).

CALLICARPA BODINIERI Léveillé
Additional bibliography: Williamson, Sunset West. Gard. Book, imp. 11, 207. 1973; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Moldenke, Phytologia 33: 393—395. 1976.

CALLICARPA BODINIERI var. GIRALDII (Hesse) Rehd.
Additional synonymy: Callicarpa bodinieri var. giraldii R. ex Kooiman, Act. Bot. Neerl. 24: 462. 1975.
Additional bibliography: Kooiman, Act. Bot. Neerl. 24: 462. 1975; Moldenke, Phytologia 33: 393—395. 1976.
The Hutchison collection cited below, grown from seed secured from Poland, was widely distributed in herbaria as C. japonica Thunb., but seems better placed as C. bodinieri var. giraldii.
Additional & emended citations: CULTIVATED: California: P. C. Hutchison s.n. [Herb. Univ. Calif. Bot. Gard. 38.533-S1] (Au—244420, Ba, Mi, Mu).

CALLICARPA BREVIPES (Benth.) Hance
Additional bibliography: Moldenke, Phytologia 33: 395—396. 1976.
Additional citations: CHINESE COASTAL ISLANDS: Hainan: Liang 62467 (Mu, Z).

CALLICARPA BREVIPETIOLATA Merr.

Additional bibliography: Moldenke, Phytologia 34: 154, 158, 262, 264, & 267. 1976.

CALLICARPA CANDICANS (Burm. f.) Hochr.

Emended synonymy: Callicarpa adenanthera R. Br., Prodr. Fl. Nov. Holl., imp. 1. 512. 1810.

Additional & emended bibliography: R. Br., Prodr. Fl. Nov., imp. 1, 512 (1810) and imp. 2 [Isis 1819:] 154, 1819; Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858: Quisumbing, Philip. Journ. Sci. 77: 172. 1947; Sastri, Wealth of India Raw Mat. 2 (R): 14. 1950; Moldenke, Phytologia 33: 381, 387, 396—399, 403, & 490. 1976.

Both Sweet (1830) and Loudon (1832) list this species as cultivated in British gardens, introduced from the East Indies in 1799. They call it the "hoary callicarpa".

Sastri (1950) records the vernacular name, "arusha", and says of the species: "a shrub about 4 ft. high, occurring in Chittagong and yielding a weak fibre. The leaves are used as a remedy for abdominal troubles, for poulticing wounds and boils, and as fish poison".

Additional & emended citations: MASCARENE ISLANDS: Mauritius: Herb. Sieber 16 (Mu—956, Z). CULTIVATED: France: Herb. Kummer s.n. [ex horto Paris 1834] (Mu—1429). Germany: Herb. Kummer s. n. [Hort. bot. Monac. 1826] (Mu—1430); Herb. Schwaegrichen s.n. [Hort. Lipsiensis] (Mu—1428).

CALLICARPA CANDICANS var. SUMATRANA (Miq.) Moldenke

Additional bibliography: Moldenke, Phytologia 33: 397—399. 1976.

The corollas are said to have been "pink" on Liang 66541 and "lavender" on Squires 791. Recent collectors describe the plant as a subshrub, 1 m. tall, or a bush, 6—8 feet tall, the flowers slightly odorous, and have encountered it in open waste places and open sandy forests.

Additional citations: CHINESE COASTAL ISLANDS: Hainan: Liang 66541 (Mu). INDOCHINA: Annam: Squires 791 (Mu).

CALLICARPA CATHAYANA Chang

Additional bibliography: Moldenke, Phytologia 33: 399. 1976

Additional citations: CHINA: Anhwei: Chow 28 (Ac, Z).

CALLICARPA CAUDATA Maxim.

Additional bibliography: E. D. Merr. & Merritt, Philip. Journ. Bot. 5: 380, 381, & 554. 1910; Moldenke, Phytologia 33: 399 & 406. 1976.

Recent collectors describe this species as a shrub, 10 feet tall, the stems to 2 inches in diameter, the succulent fruit bright-purple in February, and have found it growing in forests at 7000—8000 feet altitude.

Additional citations: PHILIPPINE ISLANDS: Luzon: Stern & Rojo 2335 (Mi).

CALLICARPA CAULIFLORA Merr.

Additional bibliography: Moldenke, Phytologia 33: 399. 1976.

Ebalo describes this plant as a shrub, 3 m. tall, the stems 4 inches in diameter, the corollas violet, found it in flower in December, and records the vernacular name, "limayap".

Additional citations: PHILIPPINE ISLANDS: Mindanao: Ebalo 792 (Mi).

CALLICARPA DICHOTOMA (Lour.) K. Koch

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Bojarczuk & Bojarczuk, Arbor. Kornick. 18: [237]. 1973; Williamson, Sunset West. Gard. Book, imp. 11, 207. 1973; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Moldenke, Phytologia 34: 154—155 & 266 (1976) and 36: 39. 1977.

Both Sweet (1830) and Loudon (1832) list this species as cultivated in British gardens at their time, introduced from China in 1822. They call it the "purple-flowered callicarpa". Walker (1976) calls it the "small callicarpa", a translation of the Japanese name, "ko-murasaki". He cites Fosberg 38552 from Ikema Island, Miyako.

Additional citations: CULTIVATED: North Carolina: Biltmore Herb. 4189 [August 2nd, 1897; Herb. Kent Sci. Mus. 43965] (Mi), 4189 [September 20th, 1897; Herb. Kent Sci. Mus. 43965] (Mi). MOUNTED CLIPPINGS: E. H. Walker, Fl. Okin. & South. Ryuk. 888—889. 1976 (W).

CALLICARPA DOLICHOPHYLLA Merr.

Additional bibliography: Moldenke, Phytologia 33: 402. 1976.

Additional citations: PHILIPPINE ISLANDS: Luzon: Cuming 1330 —isotype, Z—isotype).

CALLICARPA ELEGANS Hayek

Additional bibliography: Moldenke, Phytologia 33, 402. 1976.

Additional citations: PHILIPPINE ISLANDS: Luzon: Loher 4446 (Mu—3926), 12965 (Mu—4337).

CALLICARPA ERIOCLONA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 33: 397, 398, & 402—404 (1976) and 34: 266 & 267. 1976.

Recent collectors have encountered this species in evergreen forests near sealevel, fruiting in August.

Additional citations: THAILAND: Murata, Fukuoka, & Phengklai T.17417 (Ac). PHILIPPINE ISLANDS: Luzon: Cuming 911 (Mu—1432—isotype); Elmer 15124 (Mi); Loher 6681 (Mu—4171), 7287 (Mu—4172); Stearn 2172 (Mi). Mindanao: Wenzel 3389 (Mu); Zwickey 14

(Mi).

CALLICARPA ERIOCLONA var. PAUCINERVIA (Merr.) Moldenke

Additional bibliography: Moldenke, Phytologia 33: 397, 398, & 403--404 (1976) and 34: 266 & 267. 1976.

Additional citations: MARIANA ISLANDS: Guam: E. H. Bryan Jr. 1218 (Mu).

CALLICARPA FERRUGINEA Sw.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Grubb & Tanner, Journ. Arnold Arb. 57: 329. 1976; Moldenke, Phytologia 33: 382 & 404. 1976.

Both Sweet (1830) and Loudon (1832) list this species as cultivated in British gardens in their time, introduced from Jamaica in 1794. They call it the "rusty callicarpa".

CALLICARPA FORMOSANA Rolfe

Additional bibliography: Estores Anzaldo, Marañon, & Ancheta, Philip. Journ. Sci. 86: 236. 1958; Moldenke, Phytologia 34: 154 & 155. 1976.

The Huang & Kao collection, cited below, was found growing on a stream bank and is quite poor and unrepresentative of the species. It was distributed as C. japonica var. kotoensis (Hay.) Masam.

Recent collectors describe C. formosana as a shrub, 3 m. tall, found it in flower in June, and record the vernacular name, "apoyó". The corollas on Fox 36 are said to have been "whitish-green".

Walker (1976) calls this the "fairyland callicarpa", a translation of the Japanese "hôrai-murasaki", and cites Kanashiro 41 from Okinawa.

Additional citations: CHINA: Kwangtung: Ting & Shih 931 (Ac). FORMOSA: Huang & Kao 5176 (Ac); Tanaka & Shimada 10988 (Mu). PHILIPPINE ISLANDS: Luzon: Elmer 17611 (Mi); Fox 36 [Philipp. Nat. Herb. 4725] (Mi).

CALLICARPA FORMOSANA f. ANGUSTATA Moldenke

Additional bibliography: Moldenke, Phytologia 33: 405. 1976.

Material of this taxon has been misidentified and distributed in some herbaria as C. blancoi Rolfe, while the Elmer 22211, cited below, was previously (1967) mistakenly cited by me as typical C. formosana.

Additional citations: PHILIPPINE ISLANDS: Luzon: Elmer 22211 (Bz--17293, Ca--7817, Mi, N).

CALLICARPA FURFURACEA Ridl.

Additional bibliography: Hocking, Excerpt. Bot. A.28: 260. 1976;

Moldenke, Phytologia 33: 406. 1976.

CALLICARPA GLABRA Koidz.

Additional bibliography: Anon., Biol. Abstr. 61: ACl.569. 1976; Moldenke, Phytologia 33: 481. 1976; Ono, Mem. Nat. Sci. Mus. 10: 65 & 70. 1977.

Ono (1977) lists this species from Chichijima in the Bonin Islands.

CALLICARPA INAEQUALIS Teijsm. & Binn.

Additional bibliography: Moldenke, Phytologia 33: 482. 1976.

Recent collectors have encountered this species along roadsides at the edge of forests, flowering in September.

Additional citations: GREATER SUNDA ISLANDS: Sumatra: Murara, Dransfield, & Saerudin S.1726 (Ac).

CALLICARPA INTEGERRIMA Champ.

Additional bibliography: Moldenke, Phytologia 33: 482 (1976) and 34: 162 & 164. 1976.

Additional citations: CHINA: Kwangtung: Tsang 21650 (Mu, Z).

CALLICARPA INVOLUCRATA Merr.

Additional bibliography: Moldenke, Phytologia 33: 482--482 (1976) and 34: 267. 1976.

Chai describes this species as a small tree, 20 feet tall, 5 inches in girth, with cauliferous inflorescence, the flower-buds greenish-white, the petals white, and the anthers yellowish. He found it growing in eroded soil on a slope near a stream, at 2100 feet altitude.

Additional citations: GREATER SUNDA ISLANDS: Sabah: Clemens & Clemens 27520 (Mu). Sarawak: Chai S.34032 (W--2801361).

CALLICARPA JAPONICA Thunb.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Bojarczuk & Bojarczuk, Arbor. Kornick. 18: [237]. 1973; Moldenke, Phytologia 34: 154, 155, & 272. 1976; López-Palacios, Fl. Venez. Verb. 126 & 647. 1977; Moldenke, Phytologia 40: 431. 1978.

Walker (1976) calls this the "Japanese beauty berry", a translation of the Japanese name, "murasaki-shikubu", and cites from Iriomote: Herb. Univ. Taihoku 3290 and Masamune & Nakamura s.n.; from Ishigaki: Hatusima 24014 and Masamune & Suzuki s.n.; from Miyako: F. R. Fosberg 38161, 38180, 38312, 38315, 38318, 38407, & 38546 and Okuhara & Sunagawa 92 & 140; and from Okinawa: Field & Lowe 21w and Nakamine 215.

The P. C. Hutchison s.n. [Herb. Univ. Calif. Bot. Gard. 38.533-S1], distributed as C. japonica and so cited by me in a previous publication, seems better placed as C. bodinieri var. giraldii (Hesse) Rehd.

Additional citations: JAPAN: Honshu: Gillis 4642 (Ld); Murata 19185 (Mu). Kiushu: Oldham 621 (Mu—963). Island undetermined: Bürger s.n. [Japonia] (Ac). MOUNTED CLIPPINGS: E. H. Walker, Fl. Okin. & South. Ryuk. 889. 1976 (W).

CALLICARPA JAPONICA f. ALBIBACCA Hara
Additional bibliography: Moldenke, Phytologia 33: 485 (1976) and 34: 272. 1976.

CALLICARPA JAPONICA var. ANGUSTATA Rehd.
Additional bibliography: Moldenke, Phytologia 33: 486 & 492. 1976.
Additional citations: CULTIVATED: Germany: Herb. Hort. Bot. Monac. s.n. [X.1935] (Mu).

CALLICARPA JAPONICA var. LUXURIANS Rehd.
Additional bibliography: Moldenke, Phytologia 34: 155. 1976.
Walker (1976) calls this the "large Callicarpa japonica" and the "Japanese beauty berry", listing also the Japanese names, "omurasaki-shikibu", "mimingâ", and "mindama-gwâ". He cites from Iriomote: Fosberg 37763, SIRI 6507, and Yamazaki s.n.; from Ishigaki: Fosberg 37006, 37857, & 38067 and Masamune & Suzuki s.n.; from Miyako: Fosberg 38298; from Okinawa: Amano 6034, 6360, & 6941, Conover 1019 & 1035, Elliott & Nakamine 658, Kimura & Jurusawa 61, Moran 5076, E. H. Walker 8452, and Wilson 8109; and from Yonaguni: Hatusima 24532.
The Huang & Kao 5176, distributed as C. japonica var. kotoensis, seems to be C. formosana Rolfe instead.
Additional citations: JAPAN: Enoshima: Sawada s.n. [12 June 1927] (Mu). Hokkaido: Maximowicz s.n. [Hakodate, 1861] (Mu—1649, Mu—1650). Kiushu: Nakanishi s.n. [Aug. 9, 1954] (Mu). Island undetermined: Siebold s.n. (Mu—960, Mu—962). RYUKYU ISLAND ARCHIPELAGO: Satsunan Islands: Yakushima: Tagawa & Konta 75 (Mu). MOUNTED CLIPPINGS: E. H. Walker, Fl. Okin. & South. Ryuk. 889. 1976 (W).

CALLICARPA JAPONICA var. RHOMBIFOLIA H. J. Lam
Additional bibliography: Moldenke, Phytologia 33: 488. 1976.
Additional citations: CHINA: Shantung: Zimmermann 210 (Mu—3924).

CALLICARPA KINABALUENSIS Bakh. & Heine
Additional bibliography: Moldenke, Phytologia 33: 488. 1976.
Additional citations: GREATER SUNDA ISLANDS: Sabah: Clemens & Clemens 31348 (Mu—isotype).

CALLICARPA KOCHIANA Mak.
Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 33: 488—489 (1976), 34: 164 & 264 (1976), and 39: 424. 1978.

[to be continued]

INFRASPECIFIC CLASSIFICATION OF NYMPHAEA GIGANTEA (NYMPHAEACEAE)

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Abstract

The purpose of this report is to clarify and differentiate as accurately as possible among the various botanical varieties and forms associated with Nymphaea gigantea. The author, having at his disposal the world's largest assemblage of native Nymphaea, including a complete collection of the various described forms of gigantea, has been repeatedly approached by professional colleagues and interested laymen to make available botanical data which might help clarify much of the confusion associated with N. gigantea and its numerous varieties and forms. The present report is a modest attempt in this direction.

INTRODUCTION

It is generally accepted that the genus Nymphaea (waterlilies) constitute one of the most regal, gorgeous and universally admired group of species in the world. No class of plants can compete with the diversity in color, size, fragrance and habit of these plants. They are responsible, perhaps more than any other genus, for attracting the public to botanical gardens and public parks.

During the last 75 years great accomplishments have been realized in the production of magnificent hybrid varieties among waterlilies. Flowers of great size and richness of color and fragrance have evolved through the efforts of dedicated plant breeders. The universally admired hybrids of Dr. George H. Pring, Bory Latour-Marliac, and others have contributed vastly to the great demand and popularity of these plants. One would assume such horticultural improvements over the native species as a whole would render the latter as practically insignificant, and generally speaking this is correct. However, a proverbial exception lies with a seldom seen or known species indigenous to Australia. This species is the great Australian waterlily, Nymphaea gigantea. Despite the improving efforts of mankind, nature itself reigns supreme with regard to this species. N. gigantea with its varied and diversified forms supersede all other nymphaeas with respect to size and overall beauty. Such magnificently splendid flowers

and plants are yet to be equaled among other native or hybrid forms.

Nymphaea gigantea is found throughout New Guinea, tropical and semi-tropical Australia. It flourishes in seasonal rainpools and in many fresh water creeks which flow into several of the northern coastal rivers. In the more arid portions of Northwestern Australia it may be found in lagoons and backwater pools or billabongs.

In its native habitat Nymphaea gigantea is remarkably varied in appearance and structure. From the very beginning of collection and subsequent culture of these plants, confusion quickly arose concerning their correct nomenclature with respect to the numerous infraspecific variants. Most variants in the species were soon and are now botanically ranked as color or botanical forms. Such classifications are undoubtedly correct in some respects but it is the conclusion of the present author that much improvement in the classifications rendered is needed.

Presently there are in existence approximately 8 known primary variations of Nymphaea gigantea that are seemingly different enough from each other to be individually classified at least as botanical forms.

Through the kind and most appreciated assistance of Mr. Evan H. Williams of Alstonville, N.S.W., Australia and the much appreciated efforts of several American collectors and others the author during the summer of 1976 was fortunate in obtaining researching specimens of all the known primary forms of Nymphaea gigantea. These cultivated forms of prime concern and importance are listed as they are generally known in the following paragraphs with abbreviated taxonomical descriptions, pertinent botanical data and conclusions regarding each as to its classification. The forms 1, 2, neorosea and "Albert De Lestang" having been recently imported from Australia are generally if not totally unknown in American collections. Thusly, the author has included more detailed descriptions of these forms than has heretofore been available.

1. Nymphaea gigantea, Hooker f. var. gigantea (typical blue) Botanical Magazine 78: t. 4647. 1852.

Flowers averaging 16 cm. in diameter. Sepals 4, oval or elliptic, green without, having purplish-black lines and dots, inside of sepals sky blue. Petals longer than sepals, sky blue

shading to royal purple at apex and base without, similar but paler in color within. Stamens 500 average. Leaf (of mature plant), narrowly peltate, elliptic, averaging 45 cm. in diameter, green above, brownish-pink to purplish beneath; margin dentate having short acute teeth. Seedlings variable, often varying in floral coloring and overall plant size.

Nymphaea gigantea forma hudsonii (Anon.) Landon, Comb. nov., based upon N. gigantea var. hudsonii Anonymous, Gardening World 20: 756. 1903.

Flowers averaging 20 cm. in diameter. Sepals 4, green to greenish-yellow having very few purple lines and dots without, white within, being lightly tinged with blue towards base. Petals 25 average, outermost and intermediate nearly white throughout except for apex and base being slightly tinged with blue; petals when contrasted against a pure white background indicate a very slight blue pigmentation throughout which is otherwise practically indistinguishable. Stamens 600 average, anthers bright yellow, filaments filiform. Leaf (of mature plant), peltate, obicular, coriaceous, averaging 60 cm. in diameter, pure green to yellowish-green above, green suffused with purple to purplish-red beneath; margins dentate having short acute teeth spaced approximately 5 cm. apart.

This form (which is probably the same as N. gigantea var. hudsoniana R. & H., 1907) possesses many superior characteristics as compared to other forms of the species. The massive flowers are most delicate and lovely with the plant in general being probably the largest nymphaea in existence. Seedlings are noted to rarely come true to type generally producing sports reduced in overall plant size with flowers possessing fewer floral parts.

2. Nymphaea gigantea var. violacea (Lehmann) Conard
(Not N. gigantea var. violacea Backer)

Flowers averaging 13 cm. in diameter. Sepals 4, elliptic, green having very few small purple dots without, inner surface dark violet. Petals 27 average, outermost dark violet or purple, innermost paler in color. Stamens 500 average. Leaf (of mature plant), peltate, elliptic, slightly ovate, averaging 36 cm. in diameter, pure green above, deep purple beneath; margin dentate having short acute teeth.

Dr. Henry S. Conard (1905) in his monograph "The Waterlilies", concluded, gave evidence and listed this taxon as worthy of varietal rank. In a later publication of L. H. Bailey's "The Standard Cyclopedia of Horticulture", Conrad recognized the taxon as a separate species. Comparative data from growing plants shows the species ranking to be in obvious error. However, I am in complete agreement with Dr. Conard concerning the varietal ranking of this taxon. Self-fertile seed are produced in this variety which produces plants ranging from typical var. gigantea to var. violacea with various intermediates. Flowers of this variety are probably the darkest of the blue or purplish-blue to be found in the gigantea complex. In spite of its presumably mixed heritage as judged by progeny tests, it seems reasonable, horticulturally speaking to recognize the varietal ranking.

3. Nymphaea gigantea var. alba (Benth. & Muller) K. Landon Comb. nov., - based upon n. gigantea f. alba Benth. & Muller, Fl. Austr. 1: 61. 1863.

Flowers averaging 9 to 10 cm. in diameter. Sepals 4, elliptic, pure green without, white within. Petals dazzling white appearing cream colored within and without. Stamens 350 to 500, filaments mostly filiform, anthers bright yellow. Flowers opening 3 to 4 days from approximately 2 hours after sunrise until 1 hour or more after sunset (dark). Leaf (of mature plant), peltate, nearly obicular, averaging 35 cm. in diameter, pure green above and below; margin dentate having short acute teeth.

Comparative evidence shows Nymphaea gigantea f. alba not to be merely a color form as generally accepted. If based on the conclusion that the slight variation such as the absence of coloring pigment in the floral leaves was the only primary taxonomical difference then classification of a color form would remain securely founded. However, there are other important and obvious taxonomic differences suggesting the higher botanical ranking of this taxon. As examples; the white flowers are quite separate in appearance and structure as compared with various Nymphaea gigantea varieties and forms. Not only is there a complete absence of coloring pigment in the flowers but the petals are shaped differently being broader, more convex and nearly acute at the apex. A variation in flowering is evidenced by the fact that flowers after opening the second day usually remain opened both night and day upon and after submerging. Leaves of mature plants tend to resemble those of the N. var. neorosea, but lack any coloring pigmentation above and below.

It should be noted that differences between the variety alba as compared to other Nymphaea gigantea varieties and forms are much more distinct and obvious than differences among Nymphaea capensis and its varieties madagascariensis and zanzibariensis, for example. Self-fertile seedlings produce plants more or less identical to the parent and do not tend to segregate in a multitude of forms such as in the var. violacea.

Nymphaea gigantea var. neorosea K. Landon, var. nov.
Var. gigantea valde affinis sed plantis minoribus, petalis roseis (hereditarie constantibus), foliis intense roseis suffusis non cyaneis vel purpureis.

Holotype (TEX): Grown from stock supplied by Mr. E. H. Williams of Alstonville, N.S.W. Australia from Undulla Creek, Queensland, Australia 23 Nov. 1976, K. C. Landon s.n.

DESCRIPTION---FLOWER---6.5 to 13 cm. in diameter opening 3 days approximately 1 hour after sunrise and closing about sunset or 1/2 to 1 hour after sunset (dark). Faintly odorous to inodorous. BUD---Ovoid, rounded at apex. PEDUNCLE---Terete, pure green at base fading to lighter green towards receptacle; rising 12 to 37 cm. above the water. RECEPTACLE---15 mm. long average; yellow becoming green to green streaked with red with age. SEPALS---4, elliptic, breadth 3.5 cm., length 7 cm. average; persistent in fruit. Anterior (outermost) sepal pure green without, possessing numerous maroon lines and dots. Posterior (innermost) sepal with a broad green area in center of back possessing many maroon lines and dots; a wide border (5 to 7 mm.) of rich rose color around the margins narrowing in width at the apex and base of sepal. The lateral sepals in the bud possessing same color and characteristics in apical portion to the base. Lateral sepals with one margin covered being similar in coloring and characteristics to posterior sepal. Lateral sepals with one margin exposed having same characteristics as anterior sepal. Primary veins 9 to 10 with several smaller veins visible at base of each sepal. Inside of sepals rose colored being darker at margins and apex becoming slightly lighter in color at center and towards point of attachment. PETALS ---25 average; outermost elliptic, long, narrowed at the base, obtuse at apex, deeply concave, becoming longer than sepals and not entirely covered by them after first day of anthesis; deep rose colored without, being darkest at apex becoming lighter towards base, similar in color but slightly paler within; 4 outermost petals between sepals somewhat sepaloid evidenced by a narrow ridge of green with numerous maroon lines and dots in center of back;

breadth 2.3 cm., length 5.5 cm. Intermediate petals long, elliptic to oblanceolate tapering at base but being more acute at apex than outermost petals; similar in coloring to outermost petals being generally paler throughout; breadth 1.7 cm., length 6.5 cm. Innermost petals narrowly oblanceolate, acute at apex; faintly tinged with rose but practically white throughout; breadth 1 cm., length 5.5 cm. All petals thin and fragile, finely 1 to 7 nerved, satiny, crumpled in apical portion; fading in color on later days of opening. STAMENS---412 average, intorse upon first day of anthesis being incurved at the summit through an arc of 45 to 90 degrees, outermost and intermediate stamens becoming retorse upon subsequent days of opening; average length 2.7 cm.; separated from petals by approximately 15 mm. of receptacle and inserted densely on upper portion of ovary; anthers bright yellow; innermost anthers as long as filaments, outermost anthers 1/3 as long as filaments; outermost anthers first to dehisce, innermost being last; innermost filaments pale yellow becoming darker in color towards base; outermost filaments white. CARPELS---19 average; green or yellow, distinct from one another, stigmatic over all their upper surfaces; stigmatic basin deeply concave evidenced by carpellary styles curving upward and rising approximately 15 mm. above axile process; Ovules large; SEED---Large, ellipsoid, dark brown somewhat wrinkled in appearance; approximately 3200 per ovary. SUBMERGED LEAVES (from sprouting tuber)---Entire; green above with faint maroon spots, redish-green beneath. First leaf triangular sagittate, angles rounded; apex retuse, sides practically straight, sinus very broad. Second leaf triangular truncate, rounded at apex and at lobes. LEAF (first floating)---Entire, elliptic with deep open sinus, rounded at apex and lobes, green above with maroon spots, underside green suffused with maroon around the sides. LEAF (of mature plant)---Peltate, nearly obicular, slightly ovate, obtuse at apex; breadth 33 cm.; length 35 cm. average; margin dentate possessing short acute green teeth approximately 2 mm. in length and averaging 3.5 cm. apart. Leaf lying flat on the water with teeth at periphery being slightly elevated and angled upward. Upper surface dark green, shiny, slightly veiny. Underside of leaf glabrous, green slightly tinged with rose around margin; veins prominent; primary nerves 8 to 9. Margins of sinus entire, not overlapping but curving out becoming approximately 9 cm. apart at periphery; angles produced to a fine subulate tooth. PETIOLE---Smooth, terete, olive green with redish pigment visible through and beneath epidermis; average diameter 7 mm.; 2 large air canals within, with 2 smaller ones before and behind these; longest averaging 160 cm. in length. RHIZOME (tuber)---Ovoid, nearly spherical, varying in size from 15 mm. to 35 mm. in diameter, contracted above, the vegetative bud arising from central portion of the apex and surrounded by prominent dead leaf bases, basal portion of tuber smooth; larger rhizomes of rough texture being completely covered with leaf and peduncular scars throughout outer surface.

Rose colored forms of Nymphaea gigantea have previously been and are presently rarely found in American collections. Even in Australia natural occurrences of such plants are extremely rare. Generally the rose forms presently cultivated in America, while being attractive, possess certain characteristics leaving much to be desired in respect to floral continuity. This is evidenced by the plant's inability to produce flowers with permanently established coloring pigment in the floral leaves. As examples: flowers of such plants may be rose-colored with previous or subsequent flowers having more purplish or blue coloring. Also, plants producing predominantly rose colored flowers one season may produce blue or purple colored flowers the next season. Vegetative offsets from the same tuber of such plants may render specimens with flowers of varying colors. Historically such floral inconsistencies are seldom encountered in native nymphaea but several of the commercial hybrids especially a few of the N. flavo-virens hybrids represent excellent examples of the phenomenon. Seedlings produced from such plants are especially unpredictable and are seldom, if indeed ever, identical to parent.

Recently, an isolated colony of Nymphaea gigantea with rose colored flowers was discovered in Western Queensland, Australia. The plants were located in Undulla creek between the towns of Condamine and Meandarra. In February of 1975 field botanist K. A. Williams was able to secure and relay specimens to Mr. Evan H. Williams who in turn relayed material to the author for immediate culture. During the summer of 1976 specimens were planted out doors to flower but due to unforeseen horticultural difficulties the plants soon went into dormancy before producing any flowers. A letter received from Mr. Evan H. Williams indicated that he also had failure in producing flowering plants with the same results experienced with plants supplied for culture to the Royal Botanic Gardens of Kew, England. The author devoting his efforts to the difficulty after much experimentation was successful in rasing a plant to bud stage. The resulting plant flowered for the first time in America August 20, 1976, producing a new flower every third day. At maturity herbarium specimens were taken from this original plant and placed in the Plant Resources Center at the University of Texas, Austin.

It is not known if the original herbarium specimens of Nymphaea gigantea f. rosea described by Bentham and Muller are synonymous with the newly discovered specimens of Undulla creek. Plants with rose colored flowers collected by Bentham and Muller since 1875 have been and are presently regarded as a color form of Nymphaea gigantea. The accompanying detailed taxonomical data of

rose colored Undulla creek specimens along with actual comparative evidence clearly shows a classification as merely a color form of Nymphaea gigantea to be incorrect. Marked taxonomical differences clearly distinguish the Undulla creek plants from others of the species.

Distinguishing characteristics are evidenced in that Undulla creek specimens are always true to color. Floral leaves possess a rich rose pigmentation never carrying blue or purplish coloring. Flowers are always consistent in color continuity. Overall plant size is reduced as compared to others of the species with petioles noticeably smaller in relation to leaf size. Mature floating leaves are thinner in texture than in most other gigantea varieties and forms. Self-fertile seed produce seedlings true to type. Probably the most important characteristic of the Undulla creek plants is its mandatory requirement for higher water temperature.

Concerned horticulturists are aware that giganteas in general require more heat than most other tropical nymphaea. Gigantea seed or resting tubers will not commence germination until the required ambient water temperature is achieved and maintained. Young gigantea plants subjected to a sudden abnormal decrease in water temperature after a period of warmth are inevitably prone to cease vegetive growth to form resting perennial tubers.

The author has determined that the rose colored giganteas of Undulla creek are much more sensitive to cool temperatures requiring more heat than any others of the species. Studies indicate that an approximate mean temperature of 30 degrees Centigrade (87 deg. F.) is required to bring plants to flowering size. Highest daytime temperatures of 33 deg. C. (91 deg. F.) with overnight lows of 28 deg. C. (83 deg. F.) produced excellent results. Temperatures falling below 23 deg. C. (75 deg. F.) sent blooming plants into dormancy within a week. The above temperatures were taken at the axis of the plants which in this case were 20 cm. beneath the water's surface. Surface water temperatures ranged an average of 3 to 4 degrees C. or 5 to 7 degrees F. higher.

It should be noted that all giganteas would undoubtedly flourish in the higher water temperatures required by the rose specimens of Undulla creek. However, most if not all of these giganteas are easily capable of sustaining lower water temperatures that would send rose specimens into immediate dormancy. The rose specimens of Undulla creek are thusly restricted to warmer waters

while other giganteas exist elsewhere as is the case. This distinguishing characteristic with the accompanying taxonomical data and the isolated geographical habitat along with the fact that self fertile seedlings produce plants identical to parent, offer sufficient and conclusive evidence that the rose specimens of Undulla creek are indeed a separate and distinct variety of Nymphaeae gigantea.

The following is a copy of Mr. K. A. Williams' field report concerning the var. neorosea of Undulla creek.

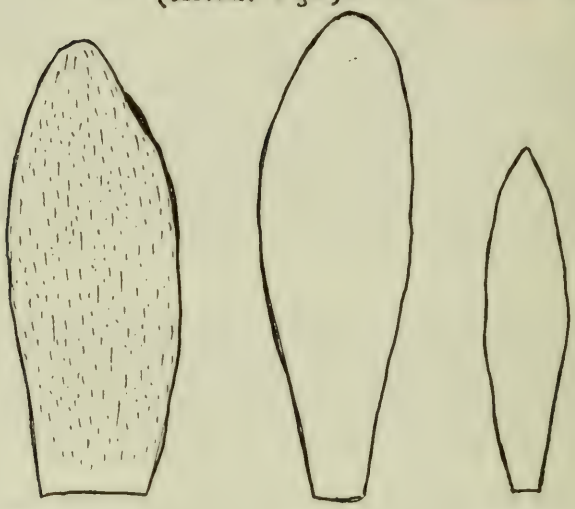
Undulla creek crosses the road between Condamine and Meandarra in South Western Queensland. This creek only flows after rain and then becomes a series of waterholes of varying sizes. Most of the holes appear to have a fair depth -- at least more than two metres. The water is pellucid - slightly murky - owing to suspension of colloidal clay.

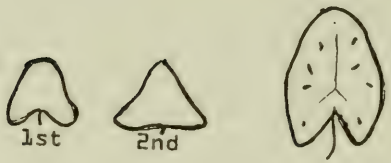
The plants form a population of n. gigantea of normal blue colour and the plants grow in water from only a few centimetres to about two metres in depth. Both plants and flowers appear to be influenced by water depth with larger plants growing in the deeper water. This is only personal observation but no experiment has been performed to confirm this. The soils are deep alluvial muds with the surrounding area being largely of laterites.

This creek holds the only known plants - at least within the district -- where this pink flowering form occurs naturally. One person, Mr. David Gordon of Myall Park, Glenmorgan, maintains a large garden of native plants and has collected from many parts throughout Australia. He has confirmed that he knows of no other occurrence of a pink form of this water lily. He has collected seed from plants in Undulla creek and has introduced them into an artificial dam on his property which is isolated by many kilometres from the nearest influence of other natural plants. The seedlings have come true to form, with nothing but pink flowering plants being obtained. I have seen these plants which over a period of many years have naturally colonised the perimeter of the dam in which the deepest water is nearly 5 metres in depth. The progeny from the original planting have continued to remain true in the pink flowers.

There have also been similar transplants made on other properties by similarly interested people and these plants have also remained true pink. This information has been communicated to me but the plants have not been sighted.

Line tracings of N. gigantea Neorosea
(actual size)





submerged leaves from sprouting tuber

1st floating leaf

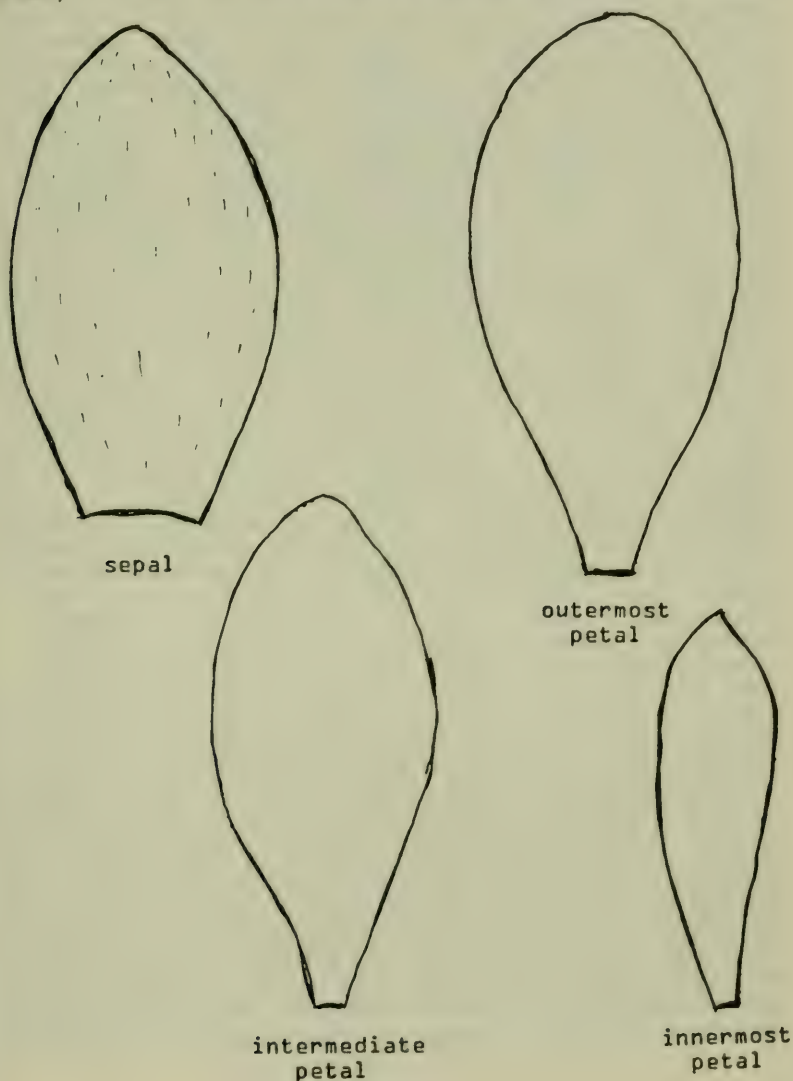
Nymphaea gigantea var. gigantea cultivar Albert De Lestang, Taxonomy:

DESCRIPTION---FLOWER---15 cm. in diameter average, opening 3 days approximately 1 hour after sunrise and closing about sunset. Faintly odorous to inodorous. BUD---Ovoid, elliptic, rounded at apex. PEDUNCLE---Terete, light green rising approximately 40 cm. above the water. RECEPTACLE---10mm. long average, deep red in color becoming redish-green to pure green after submerging. SEPALS---4, elliptic, breadth 4.5 cm., length 8.5 cm. average; persistent in fruit. Anterior (outermost) sepal pure green without, possessing very few purple lines and dots; outer margins tinged with purplish-blue color being lightest at apex becoming darker towards the base. Posterior (innermost) sepal with a broad green area in center of back having very few purple lines and dots; a wide border 1.5 to 2 cm. of purplish-blue being darker at apex and base becoming lighter around the sides and narrowing in width at the apex and base. The lateral sepals in the bud possessing same color in apical portion to the base. Lateral sepals with one margin covered being similar in coloring and characteristics to posterior sepal. Lateral sepals with one margin exposed possessing same coloring and characteristics as anterior sepal. Primary veins 15 average, not easily detected from smaller veins visible at base of each sepal. Inside of sepals white tinged with purplish-blue being slightly darkest at apex and gradually fading in color around margins to the base. PETALS---33 average, outermost petals elliptic tapering towards base, concave; breadth 4.9 cm., length 10 cm.; becoming longer than sepals in length and not entirely covered by them from two days prior to opening; no petals sepaloid; predominantly white in color streaked with purplish-blue without, becoming dark purple at point of attachment; practically white within, tinged with streaks of purplish-blue being darker in color around sides, apex and base; 7 primary veins visible throughout length. Intermediate petals elliptic, more acute at apex than outermost petals; pure white within and without except for purple coloring at point of attachment; breadth 3.8 cm., length 8.5 cm. Innermost petals narrowly oblanceolate; colored as intermediate petals; breadth 1.9 cm., length 7.2 cm. All petals thin and fragile, finely 1 to 7 nerved, satiny, vertically crumpled, wavy or weakly crimped along margins; purplish-blue coloring fading on later days of opening becoming deep rose in color upon submerging. STAMENS---500 average, intorse upon first day of anthesis being incurved at the summit through an arc of 45 to 90 degrees, outermost and intermediate stamens becoming retorse upon subsequent days of

opening; separated from petals by approximately 5 mm. of receptacle and inserted densely on upper portion of ovary; longest averaging 4 cm.; anthers bright yellow, outermost averaging 1.5 cm. in length, innermost averaging 7 mm., outermost anthers first to dehisce, innermost being last; filaments slightly paler yellow than anthers. CARPELS---14 average, yellow, distinct from one another, stigmatic over all their upper surfaces. LEAF (of mature plant) ---Coriaceous; narrowly peltate, obicular ovate or elliptic; retuse at apex; large, average diameter 48 cm., breadth 47 cm., length 49 cm.,margin wavy irregularly elevated; dentate possessing short acute yellow (brown tipped) teeth approximately 2 to 3 mm. in length and an average of 3 cm. apart; upper surface yellowish-green, slightly veiny; underside of leaf glabrous, green slightly tinged with brownish-violet, veins prominently recticulate, primary nerves 10 to 11; margins of sinus entire, overlapping within then curving out becoming approximately 10.5 cm. apart at periphery; angles produced to a fine subulate tooth. PETIOLE---Smooth, terete, dark olive green with dark purplish pigment visible beneath epidermis; 12 mm. in diameter, 1 to 1 1/2 meters long average; 2 large air canals within, with 2 smaller ones before and behind these.

This form, like the form hudsonii, possesses superior characteristics as compared to other forms of n. gigantea. Flowers as a rule are larger possessing more petals being fairly rich in color. Seedlings of this form are seldom identical to the parent, generally producing sports regressive in plant size and richness of floral color.

Line tracings of cultivar Albert De Lestang. (Tracings are actual size.)



Nymphaea gigantea (form 1),

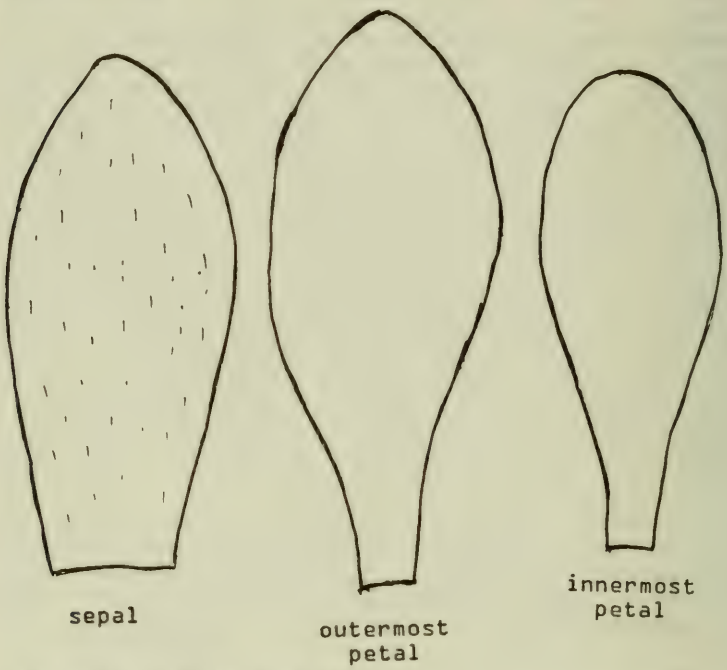
An unnamed form indigenous to Australia designated here as form 1.

DESCRIPTION---FLOWER---6 to 15 cm. in diameter opening 3 days approximately 1 hour after sunrise and closing about sunset. Faintly odorous to inodorous. BUD---Ovoid, elliptic, rounded at apex. PEDUNCLE---Terete, pure light green, rising approximately 60 cm. from axis or 40 cm. above the surface of the water. RECEPTACLE---15 mm. long; yellow turning green with age and after submerging. SEPALS---4, elliptic, breadth 4.2 cm., length 8.2 cm. average; persistent in fruit. Anterior (outermost) sepal pure green without, possessing many purplish-blue short lines and dots. Margins below possessing a fine line of purplish-blue extending from apex to base. Posterior (inner-most) sepal with a broad green area in center of back having many purplish-blue short lines and dots; without, a wide border (5 to 7 mm.) of royal purplish-blue being darkest at apex becoming slightly lighter in color around the sides but narrowing in width at the apex and base of sepal. The lateral sepals in the bud possessing same color in the apical portion to the base. Lateral sepals with one margin covered being similar in coloring to posterior sepal. Lateral sepals with one margin exposed having same characteristics as anterior sepal. Primary veins, 13 to 16, not easily detected from smaller veins visible at base of each sepal. Inside of sepals a rich royal purplish-blue faintly streaked with white, being darkest at apex and around margins, becoming somewhat lighter in color towards center. PETALS---26 average; outermost petals elliptic, tapering towards base, deeply concave being somewhat hooded at the apex; breadth 4.3 cm., length 9 cm.; rich royal purplish-blue without, being darkest at apex; lighter in color within, being somewhat streaked with white and becoming lighter towards the center; 9 primary veins visible at base; becoming longer than sepals and never again entirely covered at the apex by the sepals from two days prior to opening; 4 outermost petals between sepals slightly sepaloid evidenced by green coloring on back near the base. Intermediate petals elliptic having same characteristics as outermost but slightly reduced in size throughout, breadth 4.2 cm., length 8.7 cm.; purplish-blue without, being darkest at apex and purplish streaked at point of attachment; slightly lighter in color within. Innermost petals elliptic, breadth 2.4 cm., length 6.5 cm.; slightly tinted with blue but practically white. All petals thin and fragile, finely 1 to 9 nerved, satiny, smooth and uniform except innermost being slightly crumpled at the apex. STAMENS---520 average, introrse upon first day of anthesis being incurved at the summit through an arc of 45 to 90 degrees, becoming retorse upon subsequent days of opening except for innermost which remain intorse; longest 3.6 cm.; separated from petals by approximately

12 mm. of receptacle and inserted densely upon upper surface of the ovary; anthers bright yellow, outermost being 1/3 as long as filaments; innermost stamens averaging 11 mm. in length with anthers and their filaments being approximately equal in length; filaments slender and paler yellow than anthers; outermost anthers first to dehisce, innermost being last. CARPELS---Distinct from one another; stigmatic over all their upper surfaces; carpellary styles absent; Ovules large. SEED---Approximately 3500 per ovary; ellipsoid, dark olive green. LEAF (of mature plant)---Large; breadth 39 cm., length 42 cm. average; peltate, nearly obicular, slightly ovate; margin flat or slightly wavy, sharply dentate, possessing short acute redish-orange teeth approximately 1 mm. in length, average distance between teeth 2 cm. Upper surface dark green slightly veiny; margin possessing a very fine line approximately .5 mm. in width of redish-orange; undersurface glabrous, suffused violet becoming darker towards the center; veins beneath generally green, prominently recticulate; primary nerves on each side of leaf 8 to 9; margins of sinus entire,completely overlapping to periphery, angles produced to a fine subulate tooth. PETIOLE---Smooth, terete, olive-green without but possessing purplish pigment beneath epidermis; average length 1 to 1 1/2 meters; 1.2 to 1.5 cm. in diameter with 2 large air canals having 2 smaller ones before and behind these.

The distinguishing characteristics of this form are the large rich royal purplish-blue flowers. The flowers being larger than those of the var. violacea but not quite as rich in floral color. Self-fertile seedlings produce plants identical to parent with numerous intermediates toward the var. violacea.

Line tracings of Nymphaea gigantea (form 1). (Tracings are actual size.)



Nymphaea gigantea (form 2),
An unnamed form indigenous to Australia designated here as form 2.

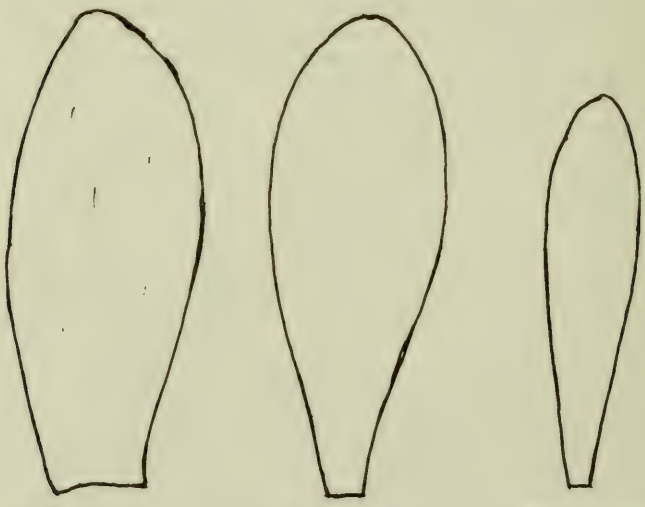
DESCRIPTION---FLOWER---5 to 16 cm. in diameter opening 3 days approximately 1 hour after sunrise and closing about sunset. Faintly odorous to inodorous. BUD---Ovoid, elliptic, rounded at apex. PEDUNCLE---Terete, pure green outside with purple pigment detected beneath epidermis; rising 12 to 40 cm. above the water. RECEPTACLE---15 mm. long, deep red in color becoming redish-green upon submerging. SEPALS---4, elliptic, breadth 4 cm., length 7.5 cm. average; persistent in fruit. Anterior (outermost) sepal pure green without, with very few purple lines and dots. Margins above and below possessing a fine line of purplish-blue color extending

from apex to base. Posterior (innermost) sepal with a broad green area in center of back having very few dots; a wide border (7 to 10 mm.) of purplish-blue being darkest at apex becoming lighter around the sides but narrowing in width at the apex and base of sepal. The lateral sepals in the bud possessing same color in the apical portion to the base. Lateral sepals with one margin covered being similar in coloring and characteristics to posterior sepal. Lateral sepals with one margin exposed possessing same coloring and characteristics as anterior sepal. Primary veins 18 to 20, not easily detected from smaller veins visible at base of each sepal. Inside of sepals white suffused with purplish-blue being darkest at apex and gradually fading in color around margins to the base. Center portion of sepals white within. PETALS---About 27; outermost petals obtuse, oblong, tapering towards the base, deeply concave; breadth 3.5 cm., length 7.5 cm.; being equal to sepals in length but not entirely covered by them after opening. 4 outermost petals between sepals sepaloid evidenced by green coloring on back near the base; remainder of petal streaked with purplish-blue without, becoming darker at point of attachment; practically white within, being tinged with purplish-blue in apical portion; 7 primary veins visible at base. Intermediate petals oblanceolate, elliptic being more acute at apex than outermost petals; pure white within and without except for purplish shadings at point of attachment; breadth 3.2 cm., length 7.5 cm. Innermost petals oblanceolate, elliptic being narrower than intermediate; colored as intermediate; breadth 1.7 cm., length 6 cm. All petals thin and fragile, finely 1 to 7 nerved, satiny, vertically crumpled; purplish-blue coloring fading on later days of opening, becoming deep rose in color upon submerging. STAMENS---500 average, intorse upon first day of anthesis being incurved at the summit through an arc of 45 to 90 degrees, outermost and intermediate stamens becoming retorse upon subsequent days of opening; separated from petals by approximately 4 mm. of receptacle and inserted densely on upper portion of ovary; longest averaging 2.6 cm.; anthers bright yellow possessing minute red dots at base near point of attachment with filament; innermost anthers averaging 7 mm. in length with very short filaments averaging 2 mm. in length; outermost anthers first to dehisce, innermost being last; filaments slightly paler yellow than anthers. CARPELS---14 average, yellow becoming brownish with age; distinct from one another; stigmatic over all their upper surfaces; carpellary styles absent; ovules large. LEAF (of mature plant)---Coriaceous; narrowly peltate, obicular ovate or elliptic, obtuse at apex; large, average diameter 45 cm., breadth 38 cm., length 43 cm. margin wavy irregularly elevated; dentate possessing short acute yellow (brown tipped) teeth approximately 2 to 3 mm. in length and an average of 3.5 cm. apart; upper surface yellowish-

green; slightly veiny; underside of leaf glabrous generally tinged with violet towards the center, veins prominently recticulate; primary nerves 10 to 11; margins of sinus entire, overlapping within then curving out becoming approximately 5.5 cm. apart at periphery; angles produced to a fine subulate tooth. PETIOLE--- Smooth, terete, dark olive green with dark purplish pigment visible beneath epidermis; 1 to 1.3 cm. in diameter with 2 large air canals having 2 smaller ones before and behind these.

Distinguishing characteristics of this form are the large to medium sized flowers which at a distance appear to be totally white but upon closer examination are found to be shaded and streaked with purplish-blue. Self-fertile seed produce plants practically identical to parent with some variants toward var. gigantea.

Line tracings of Nymphaea gigantea (form 2). (Tracings are actual size.)



sepal outermost petal innermost petal

Other variants.

In a given colony of Nymphaea gigantea where various varieties and forms exist, crosses between plants are sure to eventuate with the resulting progeny giving rise to natural hybrids some of which may be individualized enough to warrant separate distinction. However, the vast majority of such hybrids are seldom self-sustaining seed producers and after a short time their identity is soon lost.

The typical blue Nymphaea gigantea, along with several other variaties or forms such as the var. violacea, produce self-fertile seedlings some of which evolve as botanical mutants (sports) creating other distinct varieties and forms. Generally, however, such progenal differences are so slight as to be subordinate to botanical varieties, or even forms with regard to classification, and are best regarded as being nothing more than horticultural strains.

Summarized Botanical Classification of the major types of Nymphaea gigantea:

Nymphaea gigantea var. Hudsonii, a predetermined and varified botanical variety.

Nymphaea gigantea var. violacea, a predetermined and varified botanical variety.

Nymphaea gigantea var. alba, a new varified botanical variety.

Nymphaea gigantea var. rosea, (Undulla Creek), a new varified botanical variety.

Nymphaea gigantea forma Albert De Lestang, a predetermined varified botanical form.

Nymphaea gigantea (form 1), a varified botanical form.

Nymphaea gigantea (form 2), a varified botanical form.

BOOK REVIEWS

Alma L. Moldenke

"THE ILLUSTRATED FLORA OF ILLINOIS — SEDGES — Cyperus to Scleria" by Robert H. Mohlenbrock, xv & 192 pp., 122 b/w line drawings & 85 county distribution maps. Southern Illinois University Press, P. O. Box 3697, Carbondale, Illinois 62901. 1976. $15.00.

This is the sixth volume published in this fine series useful to amateur, student and professional botanists. It includes all the Cyperaceae except Carex which is saved for another volume. For 12 genera and their 85 species, 7 varieties and 3 forms treated herein, there are readily manageable keys, clear-cut line drawings of diagnostic characteristics, habitat, range and Illinois and general distribution notes. An introductory chapter describes and illustrates the characteristic structures of sedges and their role in the various ecological niches (s. l.) throughout the state.

The author is also the writer of the previous volumes and editor of the whole series.

"THE ILLUSTRATED FLORA OF ILLINOIS — FLOWERING PLANTS — Hollies to Loasas" by Robert H. Mohlenbrock, xv & 315 pp., 136 b/w line drawings & 130 county distribution maps. Southern Illinois University Press, P. O. Box 3697, Carbondale, Illinois 62901. 1978. $16.85.

Here comes the seventh section of this fine flora from this highly productive and skilled botanist-author-editor. With the ferns and most of the monocots already treated, this is the first group of dicots considered, including 13 families with 46 genera, 130 species, 10 subspecifics and 7 hybrids. The multi-parted illustrations show the typical growing form of each and the diagnostic features, usually enlarged. Illinois common names, keys, habitats, and ranges, as well as recent changes in scientific names, are recorded. The use of the -aceae ending for all family names, including certain family splits, such as keeping the Araliaceae distinct from the umbellifers, we applaud. However, we like to keep Oxycoccus distinct from Vaccinium because of the very different corolla form, etc. The author's companion book, "Guide to the Vascular Flora of Illinois" (1975) is to be consulted for the keys to these and other families.

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BEGONIA NOMENCLATURE NOTES, 3

Begonia lobata Schott and *Begonia glandulosa* nomen confusum

Jack Golding, 47 Clinton Ave., Kearny, N.J. 07032

The Species of the Begoniaceae, edition 2, 1974, by Fred A. Barkley and Jack Golding is a compendium of the published names and the published synonomy for the species and therefore continues the errors from the literature. I have been reviewing the literature to verify or correct the citations and their synonomy. My determinations will be published in this series, "*Begonia* Nomenclature Notes."

Begonia lobata Schott

The synonomy listed in *The Species of the Begoniaceae* (ed. 2. 70. 1974) for *Begonia lobata* Schott should not include *Begonia cuspidata* C. DC., *Begonia glandulosa* A. DC., *Begonia multinervia* Liebmann, *Begonia nigrovenia* Regel, *Gireoudia multinervia* Klotzsch, and *Wageneria glandulosa* Klotzsch.

Index Kewensis 285. 1895, showed *Begonia lobata* Schott = *Begonia multinervia* Liebmann. This combination apparently originated from the listing by Wm. B. Hemsley (*Biologia centrali-americana, Botany* 1: 498. 1880), which gave *Begonia lobata* Schott as a synonym of *Begonia multinervia* Liebmann.

I have studied the original citation for *Begonia lobata* Schott (in Sprengel, *Systema vegetabilium* ed. 16. 4(app.): 408. 1827), and the original citation for *Begonia multinervia* Liebmann (*Videnskabelige meddeleser fra den naturhistoriske forening i Kjöbenhavn 1852:* 18. 1853). From a comparison of these descriptions and the examination of the photographs of the holotype specimen of *Begonia multinervia* Liebmann collected in Costa Rica by Oersted (Field Museum of Natural History Photo No. 21705) and the specimen of *Begonia lobata* Schott collected by Sellow in Brazil (FMNH Photo No. 20815), it is obvious that they are separate species.

Begonia glandulosa Hooker

Begonia glandulosa Hooker (Bot. Mag. 87: *pl. 5256.* 1861), is a confused name. The plant illustrated and described apparently was the plant received from Linden under the name *Begonia nigrovenia.* But Hooker stated that this plant from Linden was identical to the one in their herbarium called *Begonia glandulosa* by A. De Candolle.

This cannot be correct, because Hooker described and illustrated a rhizomatous plant, with an unequally branched elongated inflorescence and with four pistillate tepals. While the plant labeled *Begonia glandulosa* by A. DC. is a shrubby erect plant, with an evenly branched broad inflorescence and with two pistillate tepals.

Hooker also stated (correctly) that the specimen of A. DC. which was collected by Seemann in Veraguas (Panama) agreed with Liebmann's descritpion of *Begonia multinervia* Liebmann (Kjoeb. Vidensk. Meddel. 1852: 18. 1853) from Costa Rica.

Begonia nigrovenia was described by Regel and illustrated in *Gartenflora* 16: 163-4 and *pl.546.* 1867. Regel's plant came from the garden of Thibaut and Keteler in Paris. His description and the one of Linden's plant are basically the same, except Regel noted that the pistillate flowers had five tepals instead of the four that are typical for the section Gireoudia. I have seen similar variation in the number of tepals in other species in cultivation.

Drs. Smith and Schubert (Fieldiana, Botany 24(1): 178. 1861) noted that the plant illustrated as *pl.5256* was *Begonia pinetorum.* This is also evident by comparing it to the photograph (FMNH No. 24201) of the type of *Begonia pinetorum* collected by Linden in Mexico in 1840.

Hooker's description, excluding the reference to *Begonia glandulosa* sensu A. DC. and *Begonia multinervia* Liebmann, also agrees with the description of *Begonia pinetorum* A. DC. (Ann. Sc. Nat. IV. 11: 131. 1859 and A. DC. Prodromus 15(1): 326. 1864) which is the correct name for this species.

Begonia glandulosa sensu A. DC. non Hooker

The specimen in the hooker herbarium labeled *Begonia glandulosa* A. DC. is described in *Prodromus* 15(1): 339. 1864. This is also a confused name because A. DC. cites as a synonym, Hooker's illustration in *Botanical Magazine pl.5256*. 1861. It is strange that he included this citation; perhaps he did not see the illustration or study Hooker's description.

Excluding these references to *Begonia glandulosa* Hooker and *Begonia nigrovenia* hort. Linden, the species described by A. DC. is the same as the older *Begonia multinervia* Liebmann (Kjoeb. Vidensk. Meddel. 1852: 18. 1853) as noted by Hooker and by Standley (Field Mus. Nat. Hist. Bot. 18: 744. 1937). This is confirmed by the comparison of the specimen for *Begonia glandulosa* sensu A. DC. non Hooker, collected by Hoffman in Costa Rica (FMNH Photo No. 20876) and the holotype specimen of *Begonia multinervia* Liebmann (FMNH Photo No. 21705). The correct name for this species is *Begonia multinervia* Liebmann.

CORRECTED CITATIONS

The following entries on the pages noted in *The Species of the Begoniaceae* ed. 2, 1974, should be corrected:

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Begonia cuspidata C. DC. Bull. Soc. Bot. Belg. 35: 260. 1896. Gireoudia. Costa Rica.
= Begonia multinervia Liebmann. [Standley, Field Mus. Nat. Hist. Botany 18: 744. 1937.]

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Ewaldia ferruginea Klotsch, Begoniaceen 53. 1855. Ewaldia. Brazil.
= Begonia lobata Schott [A. DC. Prodr. 15(1): 372. 1864.]

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Begonia galeottii hort. Berol. ex Klotzsch, Begoniaceen 54. 1855, pro syn. Ewaldia. Brazil.
= Begonia lobata Schott. [A. DC. Prodr. 15(1): 372. 1864.]

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Begonia glandulosa Hooker, Bot. Mag. 87: *pl.5256* 1861, nomen confusum. Gireoudia. Mexico.
= Begonia pinetorum A. DC. [Smith & Schubert, Fieldiana, Bot. 24(1): 178. 1961.]

Begonia glandulosa sensu A. DC. Prodr. 15(1): 399. 1864, non Hooker 1861, nomen confusum. Gireoudia. Costa Rica, Panama.
= Begonia multinervia Liebmann. [Standley, Field Mus. Nat. Hist. Bot. 18: 744. 1937.]

Begonia glandulosa sensu J. D. Smith, Enum. Pl. Guat. 4: 182. 1895, non Hooker 1861, nec A. DC. 1864. Gireoudia. Guatemala.
= Begonia plebeja Liebmann. [Smith & Schubert, Fieldiana Bot. 24 (1): 178. 1961]

Wageneria glandulosa Klotzsch, herb. Berol. ex A. DC. Prodr. 15(1): 389. 1864, pro syn.
= Begonia multinervia Liebmann. [Via *Begonia glandulosa* sensu A. DC. Prodr. 15(1): 339. 1864.]

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Begonia hernandiifolia Seemann, Bot. Voy. Herald 4: 128. 1854, nomen nudum.
= Begonia multineriva Liebmann. [Via *Begonia glandulosa* sensu A. DC. non Hooker, A. DC. Prodr. 15(1): 339. 1865.]

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Begonia lobata Schott in Sprengel, Syst. Veg. ed. 16. 4 (app.): 408. 1827. Ewaldia. Brazil.
[A. DC. Prodr. 15(1): 372. 1864.]

Ewaldia ferruginea Klotzsch 1855.
Ewaldia lobata Klotzsch 1855.

Begonia galeottii hort. Berol. ex Klotzsch 1855.
Begonia velutina hort. Vind. ex Klotzsch 1855, pro syn, non hort. Berol.
Begonia vernicosa hort. Berol. ex Klotzsch 1855.

Ewaldia lobata Klotzsch, Begoniaceen 54. 1855. Schott, Ewaldia. Brazil.
= Begonia lobata Schott. [A. DC. Prodr. 15 (1): 372. 1864.]

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Begonia multinervia Liebmann, Kjoeb. Vidensk. Meddel. 1852: 18. 1853. Gireoudia. Costa Rica.

Begonia hernandiifolia Seeman. 1854. nomen nudum.
Gireoudia multinervia Klotzsch, Monatsb. Berl. Acad. 125. 1854.
Begonia glandulosa sensu A. DC. non Hooker, 1864. nomen confusum.
Wageneria glandulosa Klotzsch, herb. Berol. ex A. DC. 1864.
Begonia cuspidata C. DC. 1896.

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Begonia nigrovenia hort. Linden ex Hooker, Bot. Mag. 87: *pl.5256*. 1861. pro syn. Gireoudia.
= Begonia pinetorum A. DC.

Begonia nigrovenia Regel, Gartenfl. 16: 163. *pl.546*. 1867. = Begonia pinetorum A. DC.

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Begonia pinetorum A. DC. Ann. Sc. Nat. IV. 11: 131. 1859. Gireoudia. Mexico.

Begonia glandulosa Hooker, 1861. nomen confusum.
Begonia nigrovenia hort. Linden ex Hooker, pro syn. 1861.

Begonia nigrovenia Regel. 1867.
Begonia tuerckheimii C. DC. 1895.

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Begonia tuerckheimii C. DC. in J. D. Smith, Bot. Gaz. 20: 542. 1895. Gireoudia. Guatemala.
= Begonia pinetorum A. DC. [Smith & Schubert, Fieldiana Bot. 24 (1): 178. 1961.]

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Begonia velutina hort. Vindob. ex Klotzsch, Begoniaceen 54. 1855, pro syn, non hort. Berol.
= Begonia lobata Schott. [A. DC. Prodr. 15(1): 372. 1864.]

Begonia vernicosa hort. Berol. ex Klotzsch, Begoniaceen 40, 54. 1855, pro syn.
= Begonia lobata Schott. [Via *Ewaldia ferruginea* Klotzsch; A. DC. Prodr. 15(1): 372. 1864.]

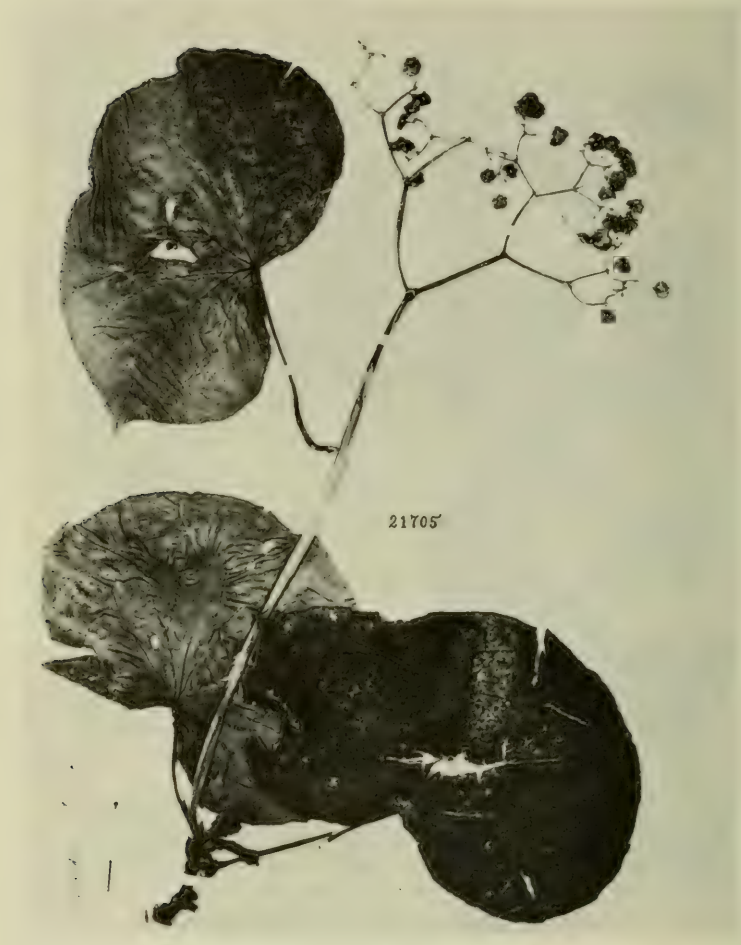
ACKNOWLEDGEMENTS

For the research information we exchanged, and our discussions about these species, I wish to thank Dr. Jan Doorenbos of Wageningen, The Netherlands; Carrie Karegeannes of Annandale, Va.; Dr. Lyman B. Smith of Washington, D.C.; and Mildred Thompson of Southampton, N.Y.

FIELD MUSEUM OF NATURAL HISTORY

Photographs of neotropical types and authentic specimens.

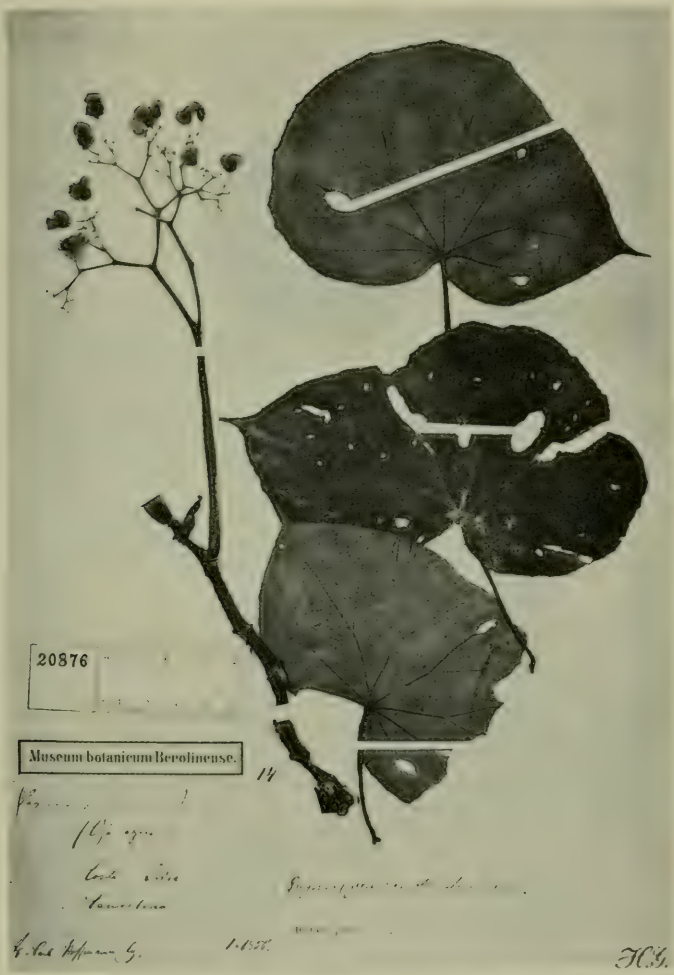
No. 20815 *Begonia lobata* Schott
Brazil Sellow ex Berlin



FIELD MUSEUM OF NATURAL HISTORY

Photographs of neotropical types and authentic specimens.

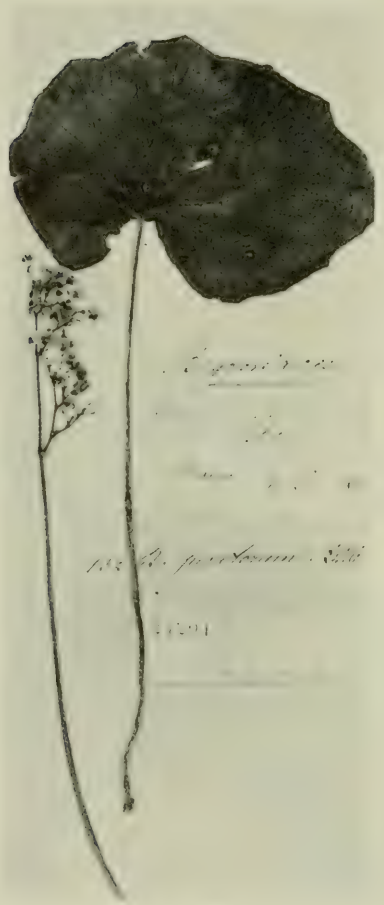
No. 21705 *Begonia multinervia* Liebmann
Costa Rica Oersted ex Copenhagen



FIELD MUSEUM OF NATURAL HISTORY

Photographs of neotropical types and authentic specimens.

No. 20876 *Begonia glandulosa* sensu A. DC.
Costa Rica Hoffman ex Berlin



FIELD MUSEUM OF NATURAL HISTORY

Photographs of neotropical types and authentic specimens.

No. 24201 *Begonia pinetorum* A. DC.
Mexico Linden 1840 ex Delessert Herb.

NEW COMBINATIONS IN ERIOGONUM (POLYGONACEAE)

James L. Reveal

University of Maryland, College Park, MD 20742

and

Smithsonian Institution, Washington, D.C. 20560

The following new combinations are made in *Eriogonum* (Polygonaceae) at this time so that they might be used in various projects dealing with rare and endangered species or checklists of vascular plants of North America north of Mexico.

Eriogonum douglasii Benth. in DC. var. *sublineare* (S. Stokes) Reveal, comb. nov., based on *E. caespitosum* Nutt. var. *sublineare* S. Stokes, Leafl. W. Bot. 2: 72. 1938.

This plant is currently known under the name *Eriogonum douglasii* var. *tenue* (Small) C. L. Hitchc. Unfortunately this name is proceeded by var. *sublineare* at the varietal rank and thus lacks priority.

Eriogonum nervulosum (S. Stokes) Reveal, stat. & comb. nov., based on *E. ursinum* S. Wats. var. *nervulosum* S. Stokes, Gen. Eriog. 114. 1936.

This rare species of Lake and Sonoma counties, California, is a serpentine endemic that is markedly different from the more widespread and common Sierra Nevada element, *Eriogonum ursinum*. The new species differs from the Sierran species by its smaller stature and congested inflorescence, its whitish-red to orangish flowers, and its smaller leaves and spreading habit.

Eriogonum strictum Benth. var. *greenei* (A. Gray) Reveal, comb. nov., based on *E. greenei* A. Gray, Proc. Amer. Acad. Arts 12: 83. 1870.

Eriogonum strictum Benth. var. *proliferum* (Torr. & Gray) Reveal, comb. nov., based on *E. proliferum* Torr. & Gray, Proc. Amer. Acad. Arts 8: 168. 1870.

The var. *greenei* is that phase of the species restricted to the high mountains of northwestern California, and is noted by its dense white tomentum, which is often tinged with brown, its small stature, and often congested inflorescence. The var. *proliferum* is the common phase of the species and is found, in California, to the east of var. *greenei*. I consider both variants, plus var. *anserinum* (Greene) R. J. Davis and var. *glabrum* C. L. Hitchc. variants of ssp. *proliferum* (Torr. & Gray) S. Stokes.

NOTES ON NEW AND NOTEWORTHY PLANTS. CXVII

Harold N. Moldenke

PHYLA NODIFLORA var. ANTILLANA Moldenke, var. nov.

Haec varietas a forma typica speciei recedit laminis foliorum margine argutissime patenteque dentatis, dentibus perconspicuis anguste triangularibus peracutis late divaricatis vel subreflexis.

This variety differs from the typical form and all other named forms and varieties of this species in having the margins of its leaf-blades very conspicuously spreading-dentate, the teeth large, narrowly triangular, sharply acute apically, and widely divaricate or even subreflexed.

The type of the variety was collected by Nathaniel Lord Britton, Elizabeth Gertrude Britton, and James F. Kemp (no. 83) on a hillside at Judith's Fancy, St. Croix, Virgin Islands, between March 17 and 25, 1923, and is deposited in the Britton Herbarium at the New York Botanical Garden.

VERBENA SIMPLEX f. EGGERTI (Moldenke) Moldenke, stat. nov.

Verbena simplex var. eggerti Moldenke, Am. Midl. Nat. 24: 753. 1940.

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ADDITIONAL MATERIALS TOWARD A MONOGRAPH OF THE GENUS CALLICARPA. XXVIII

Harold N. Moldenke

CALLICARPA KOCHIANA f. VILLOSULA Moldenke, Phytologia 39: 424. 1978.

Bibliography: Moldenke, Phytologia 39: 424. 1978.

Citations: CHINA: Fukien: Lae-Kwan 31 (Mi—type).

CALLICARPA LANCIFOLIA Millsp.

Additional bibliography: Gillis, Phytologia 35: 94. 1976; Moldenke, Phytologia 34: 155, 253, 254, & 272. 1976.

Byrne refers to this plant as a "boarhog bush 2 m. tall, not very common, only 2 individuals seen; upper leaf-surface dark-green when fresh; used in local medicine as a tonic." The Corrells describe it as a straggly shrub with white flower-buds and encountered it at the edge of coppices, flowering in August.

Additional citations: BAHAMA ISLANDS: Cat: Byrne 279 (N). Eleuthera: Correll & Correll 48945 (N).

CALLICARPA LONGIFOLIA Lam.

Additional & emended bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Fedde & Schust. in Just, Bot. Jahresber. 44: 253. 1922; Fedde in Just, Bot. Jahresber. 45 (1): 501. 1923; Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 148. 1923; Burkill, Dict. Econ. Prod. Malay Penins., imp. 1, 1: 403—404. 1935; Sastri, Wealth of India Raw Mat. 2 (R): 14. 1950; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Moldenke, Phytologia 33: 491—494 (1976) and 34: 156. 1976; Soukup, Biota 11: 8. 1976.

Maxwell describes this species as a shrub or tree, 2 m. tall, the trunks 3—4 cm. in diameter, the branches somewhat scandent, the "stem and larger branches with opposite spines to 3 cm. long", the inflorescence-axes and calyx greenish, the corolla and filaments whitish-pinkish, the anthers yellow, the fruiting-calyx brownish, and the fruit dull-green and hard, turning white and soft on maturity, and found it growing in partly open areas in evergreen forests, at 350—700 m. altitude, in flower in April and in fruit in September.

Both Sweet (1830) and Loudon (1832) list this species as being cultivated in British gardens in their time, introduced from China in 1822; as C. lanceolaria they list it as introduced from the East Indies in 1816. They call it the "long-leaved callicarpa" and the "lance-leaved callicarpa"

Callicarpa antaoensis Hayata, now usually regarded as conspecific with C. longifolia, is based on Kawakami & Sasaki 38 from Kotosho, Formosa.

Sastri (1950) records the vernacular name, "dieng-soh-kait-lang", and says of C. longifolia: "A shrub occurring in east Bengal, Assam and Burma. The roots, leaves and bark of the shrub are said to be useful in the treatment of sprue. A decoction of leaves is prescribed for colic and fevers, that of roots for diarrhoea and syphilis. The leaves are used as fish poison."

Additional citations: NEPAL: Nicolson 2713 (Mi). INDIA: Assam: Jenkins s.n. [Assam] (Mu—968, Mu—1157); Masters s.n. [Assam] (Mu—969). Khasi States: Hooker & Thomson s.n. [Mont. Khasia] (Mu—965). State undetermined: Griffith s.n. [in India occid.] (Mu—970). BANGLADESH: Griffith 5038 (Mu—971); King's Collector 173 (Mu—3813). BURMA: Tenasserim: Falconer 504 (Mu—1158); Helfer 6038 (Mu—966). ANDAMAN ISLANDS: South Andaman: Prain's Collector 39 (Mu—3930). THAILAND: Maxwell 76-244 (Ac), 76-649 (Ac). GREATER SUNDA ISLANDS: Sabah: Elmer 20102 (Mu—4339), 20402 (Mi, Mu).

CALLICARPA LONGIFOLIA f. FLOCCOSA Schau.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 34: 156 (1976) and 36: 38 & 39. 1977.

The corollas on Ebalo 1142 are said to have been "white" when fresh. Recent collectors have found the plant growing in evergreen

forests, from sealevel to 300 m. altitude, flowering and fruiting in August, referring to the plant as a tree, and recording the vernacular name, "garngit".

Additional citations: THAILAND: Iwatsuki, Murata, Dransfield, & Saerudin S.260 (Ac); Murata, Fukuoka, & Phengklai T.17763 (Ac). CHINESE COASTAL ISLANDS: Hainan: Wang 35399 (Mu). PHILIPPINE ISLANDS: Mindanao: Ebalo 1142 (Mi).

CALLICARPA LONGIPETIOLATA Merr.

Additional bibliography: Moldenke, Phytologia 33: 494—495. 1976.

Additional citations: PHILIPPINE ISLANDS: Luzon: E. D. Merrill 873 (Mu—4174).

CALLICARPA LONGIPETIOLATA var. GLABRESCENS Moldenke

Additional bibliography: Moldenke, Phytologia 33: 495. 1976.

Additional citations: PHILIPPINE ISLANDS: Luzon: Loher 12589 (Mu—4335).

CALLICARPA LONGISSIMA (Hemsl.) Merr.

Additional bibliography: Fedde in Just, Bot. Jahresber. 45 (1): 501. 1923; Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 148. 1923; Moldenke, Phytologia 33: 495. 1976.

CALLICARPA MACROPHYLLA Vahl

Additional & emended bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Schau. in A. DC., Prodr. 11: 640 & 644. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 1, 3: 1922. 1935; Sastri, Wealth of India Raw Mat. 2 (R): 14. 1950; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 2, 3: 1922. 1975; Anon., Biol. Abstr. 61: AC1.569. 1976; Saxena & Khotele, Journ. Bomb. Nat. Hist. Soc. 73: 28. 1976; Moldenke, Phytologia 34: 156, 164, & 264 (1976) and 36: 39. 1977; [Moldenke], Biol. Abstr. 64: 6962. 1977; Troth & Nicolson, Phytologia 35: 225 & 227. 1977.

Troth & Nicolson (1977) cite Troth 887 & 892 from Nepal and assert that the species is at time of flowering a "moderately low shrub, [1—2 m. tall], common in Bombax-Trewia [riverine] forest; young growth extremely villous, hairs stellate", the corolla being "rose-violet" in color. They found it as 250 m. altitude, in anthesis in July.

Both Sweet (1830) and Loudon (1832) list this species as cultivated in British gardens in their time, introduced from the East Indies in 1808; as C. incana they assert that it was introduced from the East Indies in 1816. They call it the "large-leaves callicarpa" and the "white-leaved callicarpa". Sastri (1950) records the vernacular names. "daya", "mathara", and "mattraiya", and says of the species: "An erect shrub 4—6 ft. high, occurring in the sub-Himalayan tracts from Hazara eastwards to Assam and Burma. The root yields an aromatic oil used in the treatment of stomach dis-

orders. The leaves are warmed and applied to rheumatic joints to relieve pain". Nicolson refers to the plant as an "occasional shrub", to 7 feet tall, the corollas mauve, and the drupes white. He found it growing in forests at 1300 m. altitude, in flower and fruit in November. Saxena & Khotele (1976) cite Khotele 6077 & 8027, Saxena 1252, and Singh 6652.

Additional citations: MASCARENE ISLANDS: Mauritius: Sieber Fl. Maurit. Suppl. 16 (Mu--955). NEPAL: Troth 887 (W--2826482), 892 (W--2826483). INDIA: Assam: Jenkins s.n. [Assam] (Mu--976); Masters s.n. [Assam] (Mu--977, Mu--978, Mu--1163). East Punjab: T. Thomson s.n. [Panjab, 1--3000 ped.] (Mu--980). West Bengal: T. Thomson s.n. [Plan. Ganget. Inf.] (Mu--974), s.n. [Plan. Ganet. Sup.] (Mu--981). State undetermined: Falconer 748 (Mu--1184, Mu--1688); Hügel s.n. [Ind. or. 1839] (Mu--979). BANGLADESH: Griffith 6040 (Mu--975). BURMA: Upper Burma: Khalil s.n. [S. S. S. Taungyi, 1893] (Mu--3811), s.n. [Shan States, 1895] (Mu--3812). THAILAND: Larsen, Santisuk, & Warncke 2774 (Ld). CULTIVATED: Germany: Herb. Hort. Monac. s.n. (Mu). LOCALITY OF COLLECTION UNDETERMINED: Hiendlmayr s.n. (Mu--1443); Herb. Schreber s.n. (Mu--973).

CALLICARPA MACROPHYLLA var. GRIFFITHII C. B. Clarke

Additional bibliography: Moldenke, Phytologia 33: 497 (1976) and 34: 264. 1976.

CALLICARPA MAINGAYI King & Gamble

Additional synonymy: Callicarpa maingayi King ex Moldenke, Phytologia 36: 41, in syn. 1977.

Additional bibliography: Moldenke, Phytologia 34: 156 (1976) and 36: 41. 1977.

The Larsens describe this species as a small tree and encountered it in evergreen forests.

Additional citations: THAILAND: Larsen & Larsen 33247 (Ac), 33432 (Ld).

CALLICARPA MEGALANTHA Merr.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 44: 253. 1922; Moldenke, Phytologia 33: 498. 1976.

CALLICARPA MERRILLII Moldenke

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 44: 253. 1922; Moldenke, Phytologia 33: 490 & 498. 1976.

CALLICARPA MOLLIS Sieb. & Zucc.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 34: 156. 1976; Weaver, Arnoldia 38: 101. 1978.

Material of C. mollis has been misidentified and distributed in some herbaria as C. lasiantha Lemaire.

Additional citations: JAPAN: Honshu: Kanai 731172 [Fl. Jap. Ex-

sicc. 256] (Mu); Maximowicz s.n. [Yokohama, 1862] (Mu—1651). Kiushu: Maximowicz s.n. [Nagasaki, 1863] (Mu—1652); Oldham 620 (Mu—985). Island undetermined: Siebold s.n. [C. lasiantha] (Mu—1983), s.n. (Mu—984—isotype, Z—isotype).

CALLICARPA MOLLIS var. MICROPHYLLA Sieb. & Zucc.
Additional bibliography: Moldenke, Phytologia 33: 499. 1976.
Additional citations: JAPAN: Island undetermined: Siebold s.n. (Mu—982—isotype).

CALLICARPA NUDIFLORA Hook. & Arn.
Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 33: 491 & 500—501. 1976.
Sumithraarachchi describes this species as a tree, 20 feet tall, with "brownish-grayish, cracked bark", opposite leaves, and purple corollas.
Additional citations: CHINESE COASTAL ISLANDS: Hainan: Liang 62117 (Mu). HONG KONG: Fortune 84 (Mu—990). CULTIVATED: India: Herb. Hort. Bot. Calcutt. s.n. (Mu—989). Sri Lanka: D. B. Sumithraarachchi DBS.377 (Lc).

CALLICARPA OSHIMENSIS Hayata
Additional bibliography: Moldenke, Phytologia 34: 154 & 156—157. 1976.
Walker (1976) lists the vernacular name, "oshima-murasaki", which he translates as the "Amami-oshima callicarpa".
Additional citations: MOUNTED CLIPPINGS: Walker, Fl. Okin. & South. Ryuk. 887—888. 1976 (W, Z).

CALLICARPA OSHIMENSIS var. IRIOMOTENSIS (Masam.) Hatus.
Additional bibliography: Moldenke, Phytologia 34: 157. 1976.
Walker (1976) cites the following collections: RYUKYU ISLAND ARCHIPELAGO: Iriomote: Hatusima 18600; Itô s.n.; Kawagoe s.n.; Koidzumi s.n.; Masamune & Suzuki s.n. Ishigaki: Fosberg 37191, 37289, 38054; Hatusima 22899, 23006; Masamune s.n.; Masamune & Suzuki s.n. He lists the vernacular name, "Iriomore-murasaki", which he translates as the "Iriomote callicarpa".
Additional citations: MOUNTED CLIPPINGS: Walker, Fl. Okin. & South. Ryuk. 888. 1976 (W, Z).

CALLICARPA OSHIMENSIS var. OKINAWENSIS (Nakai) Hatus.
Additional bibliography: Moldenke, Phytologia 34: 157. 1976.
Walker (1976) cites the following: RYUKYU ISLAND ARCHIPELAGO: Iriomote: Hatusima 18577. Okinawa: Collector undetermined s.n.; Hatusima 18041; Herb. Univ. Taihoku 1770; Koidzumi s.n.; Masamune & Shimabukuro s.n.; Tashiro 2; Walker 8254; Yamazaki s.n. Yonaguni: Hatusima 24357. He notes that Collector undetermined s.n. and Tashiro 2 were originally determined as C. mollis by Matsumu-

ra and bear Nakai's annotation labels and so "one or both may be the type of C. okinawensis Nakai". He lists the vernacular name, "ko-gome-murasaki", which he translates as the "small [broken rice] callicarpa".

Additional citations: MOUNTED CLIPPINGS: Walker, Fl. Okin. & South. Ryuk. 888. 1976 (W, Z).

CALLICARPA PARVIFOLIA Hook. & Arn.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Anon., Biol. Abstr. 61: AC1.569. 1976; Moldenke, Phytologia 33: 502 (1976) and 36: 38. 1977; Oni, Mem. Nat. Sci. Mus. 10: 65. 1977; Yoshida & Tannawa, Notes Waimea Arbor. 3 (2): 10. 1977; Moldenke, Phytologia 40: 409. 1978.

Yoshida & Tannawa (1977) list this among the endangered species of the Ogasawara Islands, noting "Very few plants on Chichijima; rare on Anijima". Oni (1977) also lists it from Anijima in the Bonin Islands.

CALLICARPA PEDUNCULATA R. Br.

Additional synonymy: Callicarpa pendulata R. Br. ex Moldenke, Phytologia 36: 41, in syn. 1977.

Additional & emended bibliography: R. Br., Prodr. Fl. Nov. Holl., imp. 1, 511—512 (1810) and imp. 2, [Isis 1819:] 153—154. 1819; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 33: 502—503 (1976), 36: 41 (1977), and 40: 430. 1978.

Mrs. Clemens refers to this plant as a shrub and found it growing with members of the Sapindaceae at the margins of rainforests, flowering and fruiting in December.

Material of C. pedunculata has been misidentified and distributed in some herbaria as C. arborea Roxb.

Additional citations: AUSTRALIA: New South Wales: Meebold 3306 (Mu). Queensland: M. S. Clemens 43293 (Mi); Meebold 7732 (Mu, Mu). CULTIVATED: Hawaiian Islands: Meebold 26638 (Mu).

CALLICARPA PHANEROPHLEBIA Merr.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 148. 1923; Moldenke, Phytologia 33: 503—504. 1976.

CALLICARPA PILOSISSIMA var. HENRYI Yamamoto

Additional bibliography: Moldenke, Phytologia 33: 504. 1976.

Additional citations: FORMOSA: Tanaka & Shimada 13419 (Mu).

CALLICARPA PLUMOSA Quisumb. & Merr.

Additional bibliography: Moldenke, Phytologia 33: 504. 1976.

Additional citations: PHILIPPINE ISLANDS: Luzon: Loher 12347 (Mu—4338).

CALLICARPA PSILOCALYX C. B. Clarke

Additional bibliography: Moldenke, Phytologia 33: 504—505. 1976.

Material of this species has been misidentified and distributed in some herbaria as C. rubella Lindl.

Additional citations: BURMA: Kurz s.n. (Mu—3810). THAILAND: Larsen, Santisuk, & Warncke 3232 (Ld), 3236 (Ld).

CALLICARPA RAMIFLORA Merr.

Additional bibliography: Moldenke, Phytologia 33: 505. 1976.

Additional citations: PHILIPPINE ISLANDS: Mindanao: M. S. Clemens 1167 (Mu—4096).

CALLICARPA RANDAIENSIS Hayata

Additional bibliography: Moldenke, Phytologia 33: 505. 1976.

Additional citations: FORMOSA: Huang 1812 (Mi).

CALLICARPA RETICULATA Sw.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Hocking, Excerpt. Bot. A.28: 260. 1976; Moldenke, Phytologia 33: 505 (1976) and 36: 39. 1977.

Both Sweet (1830) and Loudon (1832) list this species as cultivated in British gardens in their day, introduced from Jamaica in 1822. They call it "netted-leaved callicarpa". It would be of considerable value to see any specimens that may be preserved of these cultivated plants in order to determine if they match the characters of the very poorly known Jamaican plant or those of the certainly closely related and well-known Cuban C. cubensis Urb.

CALLICARPA ROIGII Britton

Additional bibliography: Moldenke, Phytologia 34: 157. 1976.

The Woytkowski 8368, distributed as C. roigii, actually is C. acuminata H.B.K. instead.

CALLICARPA RUBELLA Lindl.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 34: 154, 158—159, & 264. 1976.

Recent collectors refer to this species as a shrub, 2 or "a few" meters tall, with violet or "bright shiny purple" globose fruit, and have found it growing along roadsides at the edges of dense forests, on shrubby slopes, and in evergreen forests, at 400—1500 m. altitude, fruiting in July, October, and November.

Both Sweet (1830) and Loudon (1832) list this plant as cultivated in British gardens in their time, introduced from China in 1822. They call it the "red-flowered callicarpa".

Additional citations: INDIA: Assam: Prain s.n. [Kohima] (Mu—3733). Khasi States: Herb. Hort. Bot. Calcutt. s.n. [Khasia] (Mu—3809); Hooker & Thomson s.n. [Mont. Khasia] (Mu—992). BANGLADESH:

Griffith 6036 (Mu—994), s.n. [India orientalis] (Mu—993). THAILAND: Beusekom & Charoenpol 1816 (Ac); Larsen & Larsen 34450 (Ld); Murata, Fukuoka, & Phengklai T.16264 (Ac); Shimuzu, Iwatsuki, Fukuoka, Hutch, Chaiglom, & Nalampoon T.11313 (Ac); Tagawa, Koyama, & Hutch T.10526 (Ac).

xCALLICARPA SHIRASAWANA Mak.

Additional bibliography: Bojarczuk & Bojarczuk, Arbor. Kornick. 18: [237]. 1973; Moldenke, Phytologia 34: 160—161. 1976.

CALLICARPA SUBINTEGRA Merr.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 148. 1923; Moldenke, Phytologia 34: 161. 1976.

Additional citations: PHILIPPINE ISLANDS: Luzon: Loher 12312 (Mu—4336, Z).

CALLICARPA SUBINTEGRA var. PARVA Merr.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 148. 1923; Moldenke, Phytologia 34: 161. 1976.

CALLICARPA SUBPUBESCENS Hook. & Arn.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Anon., Biol. Abstr. 61: ACl.569. 1976; Moldenke, Phytologia 34: 162 & 272. 1976; Ono, Mem. Nat. Sci. Mus. 10: 65. 1977; Moldenke, Phytologia 40: 409. 1978.

Ono (1977) lists this rare species only from Chichijima in the Bonin Islands, where Murata and his associates encountered it at 200—300 m. altitude, flowering and fruiting in July.

Additional citations: BONIN ISLANDS: Chichijima: Murata, Tabata, Tsuchiya, & Takada 236 (Ac), 301 (Ac, Z).

CALLICARPA TOMENTOSA (L.) Murr.

Additional & emended bibliography: Moon, Cat. Indig. & Exot. Pl. Ceyl. 1: 10. 1824; Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 550. 1832; Sweet, Hort. Brit., ed. 3, 550. 1839; Wight, Icon. Pl. Ind. 4 (3): 15—16, pl. 1480. 1849; Schau. in A. DC., Prodr. 11: 641, 647, & 682. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Perad. Man. Bot. 2:] 69. 1911; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 1, 3: 1921. 1935; Sastri, Wealth of India Raw Mat. 2 (R): 14. 1950; Razi, Journ. Univ. Poona 1 (2): Biol. 47. 1952; Kirtikar & Basu, Indian Med. Pl., ed. 2, imp. 2, 3: 1921. 1975; Moldenke, Phytologia 34: 162—165 (1976) and 36: 39. 1977; López-Palacios, Fl. Venez. Verb. 216, 647, & 649. 1977; Subramanian & Kalyani, Indian Forest. 103: 113 & 117. 1977.

Both Sweet (1830) and Loudon (1832) list this species as cultivated in British gardens in their time, introduced from the East Indies in 1788, and call it the "woolly callicarpa". Schauer (1847) refers Cornutia corymbosa Lam. to the synonymy of what he calls Premna to-

mentosa [=P. odorata Blanco] rather than to that of Callicarpa tomentosa.

Bernardi, calling his collection Premna tomentosa Willd., says of it "ad viam, sed rara, vidi quide, semel; arbor 6 metralis solaniformis; folia ovata magna subtus cano-lanosa; cymae floribundae floribus parvis violaceisque" and found it flowering in December at 1400 m. altitude. Other Sri Lankan collectors describe the plant as a shrub or small slender tree, 2--10.7 m. tall, with a trunk to 70 cm. in girth, the lower leaf-surface with a white pubescence, the flowers fragrant, the corollas 4-lobed, violet, purple, light-purple, purplish-blue, or pinkish-mauve, the anthers light yellow-orange, and the fruit at first green, then turning black. They have found it growing in secondary montane forests, on steep mountain slopes at the edge of forest and patana grassland, in wet evergreen forests, and in forest shade, at altitudes of 1000--3100 feet, flowering from January to March, as well as in June, October, and November, in fruit in June and October. Cramer reports it "common" on the border of disturbed submontane forests, the outer bark of the trunk fissured, and the flower "panicles" conspicuous.

Sastri (1950) records the vernacular names, "aisar", "ardri", "bastra", "massandari", "nallapompil", "verrilaippattai", and "vettilaippattai", and says of the species: "A shrub or small tree occurring throughout the Deccan peninsula and Ceylon. The wood has good working properties and is suitable for carving. The bark is chewed like betel in Ceylon and in some parts of south India. A decoction of the bark and root is beneficial for fevers, hepatic obstructions and skin diseases. The leaves boiled in milk are used as a wash for aphthae of the mouth."

Additional citations: INDIA: Kerala: Hohenacker 152 (Mu--999); Kostermans 26084 (W--2824050); Stocks, Law, &c. s.n. [Malabar, Concan, &c.] (Mu--998). Tamil Nadu: G. Thomson s.n. [Mont. Nilghiri & Kurg] (Mu--997). State undetermined: Wight 2314 (Mu--1446). SRI LANKA: Bernardi 15983 (N); Cramer 4864 (N); Davidse 7902 (W--2803426), 8338 (W--2807757); F. R. Fosberg 56591 (Ld); Jayasuriya 1525 (W--2803778); Sumithraarachchi DBS.93 (W--2803422), 646 (W--2807770); Sumithraarachchi & Fernando DBS.162 (W--2803417); Waas 267 (W--2803421), 1076 (W--2807849).

CALLICARPA VILLOSA Vahl

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 73. 1858; Moldenke, Phytologia 34: 166. 1976.

CALLICARPA VIRIDIS Domin

Additional bibliography: Moldenke, Phytologia 34: 166. 1976.

Citations: AUSTRALIA: New South Wales: Boorman s.n. [Clarence River, 11.1896] (Mu--4149, Z).

CALLICARPA WEBERI Merr.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 148. 1923; Moldenke, Phytologia 34: 166. 1976.

ADDITIONAL NOTES ON THE GENUS CASSELIA. IV

Harold N. Moldenke

CASSELIA Nees & Mart.

Additional & emended bibliography: Endl., Gen. Pl. 634. 1838; Spach, Hist. Nat. Veg. Phan. 9: 227. 1840; Schau. in A. DC., Prodr. 11: 527--528, 616, & [733]. 1847; Schnitzlein, Iconogr. Fam. Nat. 2: 137 Verbenac. [3]. 1856; Buek, Gen, Spec. Syn. Candoll. 3: 86 & 147. 1858; Hocking, Excerpt. Bot. A.26: 7. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 189--198, 506, & 512 (1975) and 31: 373 & 384. 1975; Follmann-Schrag, Excerpt. Bot. A. 26: 504. 1976; Hocking, Excerpt. Bot. A.28: 258. 1976; Moldenke, Phytologia 36: 34 & 502. 1977.

The Endlicher (1838) reference cited above is often listed as "1836-1856", but the page involved here was actually issued in 1838.

CASSELIA CHAMAEDRYFOLIA Cham.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 86. 1858; Hocking, Excerpt. Bot. A.26: 7. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 191--192. 1975.

The corollas on Hatschbach 38932 are said to have been "lilac" when fresh and this collector encountered the species in rocky soil of cerrado, flowering in October.

Additional citations: BRAZIL: Goiás: Hatschbach 38932 (Ld).

CASSELIA CONFERTIFLORA (Moldenke) Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 192--193 (1975) and 36: 34. 1977.

The corollas on Hatschbach 39039 are said to have been "rose" in color when fresh, while those on Hatschbach 39091 were "dark-rose". This distinguished collector encountered the plant in sandy soil of "campo cerrado", flowering in October.

Additional citations: BRAZIL: Bahia: Hatschbach 39091 (Z). Goiás: Hatschbach 39039 (Ld).

CASSELIA CONFERTIFLORA var. LACINIATA (Moldenke) Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 193. 1975.

Additional citations: BRAZIL: Goiás: N. T. Silva 57733 (W--2454309).

CASSELIA GLAZIOVII (Briq. & Moldenke) Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 193 & 198 (1975) and 31: 373 & 384. 1975; Hocking, Excerpt. Bot. A.28: 258. 1976.

Hocking (1976) implies that C. glaziovii, as a species, was pro-

posed by me as new in 1975, but at the place to which he makes reference I do not propose the species as new, but, rather, its var. serrata Moldenke.

The Macedo 2655, previously cited by me and distributed as C. glaziovii, is now regarded by me as its var. serrata Moldenke.

CASSELIA GLAZIOVII var. SERRATA Moldenke, Phytologia 31: 373. 1975.

Bibliography: Moldenke, Phytologia 31: 373 & 384. 1975; Hocking, Excerpt. Bot. A.28: 258. 1976.

This plant bears striking superficial resemblance in its leaves to C. confertiflora (Moldenke) Moldenke, but its inflorescence characters seem to resemble more closely those of C. glaziovii. Macedo describes the color of its corollas as "roxas" [red], while Hatschbach refers to them as "lila" [lilac]. The plant has been collected in anthesis in October on "campestre da serra" and in rocky soil of "campo cerrado".

The Macbride photograph 24626, cited below, depicts Glaziou 21890, which I regard as typical C. glaziovii, and 13060, which I have previously cited as C. serrata Nees & Mart., but which I now feel is actually C. glaziovii var. serrata. The specimens depicted are deposited in the herbarium of the Conservatoire et Jardin Botaniques in Geneva. The Macedo 2655, also cited below, was previously erroneously cited by me as typical C. glaziovii.

Citations: BRAZIL: Goiás: Hatschbach 38941 (Ld); Hatschbach, Anderson, Barneby, & Gates 36255 (N—isotype, Z—type). Minas Gerais: Glaziou 13060 [Macbride photos 24626 in part] (N—photo, W—photo); Macedo 2655 (N, S, S, S, W—2025585).

CASSELIA HASSLERI Briq.

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 194. 1975.

CASSELIA HYMENOCALYX Briq.

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 194--195. 1975.

CASSELIA INTEGRIFOLIA Nees & Mart.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 86. 1858; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 195--196 (1975) and 31: 384. 1975.

The Martius 29 collection, cited below, was misidentified as a member of the Apocynaceae or Rubiaceae by past herbarium workers and exhibits tubers on the roots.

Additional citations: BRAZIL: State undetermined: Martius 29 (Mu).

CASSELIA INTEGRIFOLIA var. FISCHERI (Mart.) Moldenke

Additional bibliography: Schau. in A. DC., Prodr. 11: 616. 1847; Buek, Gen, Spec. Syn. Candoll. 3: 147. 1858; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 195--196. 1975.

CASSELIA MANSOI Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 86. 1858; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 196--197. 1975.

CASSELIA ROSULARIS Sandw.

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 197. 1975.

Additional citations: BRAZIL: Mato Grosso: Archer & Gehrt 152 [Herb. Nat. Arb. 177226] (W--2666047).

CASSELIA SERRATA Nees & Mart.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 86. 1858; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 193 & 197--198. 1975.

The Glaziou 13060 [Macbride photos 24626 in part], cited by me in a previous installment of these notes and commented on there, seems to me now to depict a specimen of typical C. glaziovii (Briq. & Moldenke) Moldenke and one of C. glaziovii var. serrata Moldenke rather than of C. serrata.

CASSELIA VERONICAEFOLIA Cham.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 86. 1858; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 198. 1975.

Pinheiro describes this species as a plant 50 cm. tall, the corollas "white", and found it in anthesis in April.

Additional citations: BRAZIL: Bahia: Pinheiro 1221 (Z).

CASSELIA ZELOTA (Moldenke) Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.26: 7. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 198. 1975.

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ADDITIONAL NOTES ON THE GENUS CHASCANUM. VIII

Harold N. Moldenke

CHASCANUM E. Mey.

Additional synonymy: Denisea [Neck.] apud López-Palacios, Fl. Venez. Verb. 648, in syn. 1977.

Additional & emended bibliography: Spach, Hist. Nat. Veg. Phan. 9: 227. 1840; Schau. in A. DC., Prodr. 11: 521 & 557--560. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 64 & 343. 1858; Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 432 & 437--438. 1963; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Ament, Journ. E. Afr. Nat. Hist. Soc. & Nat. Mus. 154: 25. 1975; Hocking,

Excerpt. Bot. A.26: 7. 1975; Kooiman, Act. Bot. Neerl. 24: [459]. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 31: 122--127, 234--238, 394, & 396 (1975) and 34: 261, 262, 272, & 501. 1976; Follmann-Schrag, Excerpt. Bot. A.26: 505. 1976; Hocking, Excerpt. Bot. A.28: 257. 1976; López-Palacios, Fl. Venez. Verb. 205, 648, & 652. 1977; Moldenke, Phytologia 40: 414 & 415. 1978; A. L. Moldenke, Phytologia 40: 361. 1978.

López-Palacios (1977) erroneously includes the genera Pleurostigma Hochst. and Plexipus Raf. in the synonymy of Bouchea Cham., but actually they belong in that of Chascanum.

CHASCANUM ADENOSTACHYUM (Schau.) Moldenke

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 64. 1858; Hocking, Excerpt. Bot. A.26: 7. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 31: 122. 1975; Hocking, Excerpt. Bot. A.28: 257. 1976.

This species has been collected in fruit in January.

Additional citations: SOUTH AFRICA: Transvaal: Kinges 166 (Mu, Mu); Stopp M.65 (Mu).

CHASCANUM ANGOLENSE Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 201. 1975.

Additional citations: ANGOLA: Benguela: Gossweiler 3612 [Mo. Bot. Gard. photos A.877] (W--photo of type).

CHASCANUM ARABICUM Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 201--202. 1975.

CHASCANUM CAESPITOSUM (H. H. W. Pearson) Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 202. 1975.

CHASCANUM CERNUUM (L.) E. Mey.

Additional synonymy: Chascanum cerneum (L.) E. Mey. ex Moldenke, Phytologia 34: 272, in syn. 1976.

Additional bibliography: Schau. in A. DC., Prodr. 11: 559. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 64. 1858; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Kooiman, Act. Bot. Neerl. 24: [459]. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 31: 122--123 & 394 (1975) and 34: 272. 1976.

Recent collectors describe this species as an occasional decumbent bush, the leaves bright-green or dark-green and glossy, fleshy, and the corollas as white, and have found it growing at altitudes of 50 to 1200 feet, flowering in June and fruiting in September. Acocks refers to it as "rare on hard sandy flats".

Additional citations: SOUTH AFRICA: Cape Province: Acocks 21119 (Mu), 21555 (Mu); B. E. Martin 358 (Mu); Zeyher 3548 (Mu).

CHASCANUM DEHISCENS (L. f.) Moldenke

Additional synonymy: Chascanum dihiscens Moldenke, Biol. Abstr. 60: 68, sphalm. 1975.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 64 & 343. 1858; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 31: 123 & 396 (1975), 34: 272 (1976), and 40: 415. 1978.

Recent collectors describe this plant as a "shrublet, 1 foot tall", with dark-green leaves, and have found it growing "in grassveld toward larroid scrub in ravines" and "mixed in Euphorbia tirucalli scrub". The corollas are said to have been "white" when fresh on Bayliss BS.7285.

Material of this species has been misidentified in some herbaria as Bouchea sp. and as Chascanum hederaceum (Sond.) Moldenke.

Additional citations: SOUTH AFRICA: Cape Province: Bayliss BS. 7285 (Mu, N); Dyer 2154 (Mu); Stopp M.62 (Mu). Natal: D. Edwards 2778 (Mu).

CHASCANUM GARIPENSE E. Mey.

Additional synonymy: Chascanum gariepense E. Mey. ex Moldenke, Phytologia 34: 272, in syn. 1976.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 64. 1858; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 31: 123 (1975) and 34: 272. 1976.

Recent collectors refer to this plant as a "widely branched annual, 2 feet tall" or a perennial suffrutescent herb, woody shrublet, or strongly woody shrub, with "brown-green" aspect, erect, 36 cm. to 1.3 m. tall, of globular habit, the tubular flowers borne in terminal spikes. They have encountered it on rocky cliffs, among granite boulders, and in sandy semi-deserts, in ironstone boulder koppies, and in sand among stones on riverbanks, at altitudes of 1000—1500 meters, flowering and fruiting from December to June and August to October. Winder found it to be common in dry watercourses; Leistner refers to it as "locally common in sandy leegte flats of ironstone gravel" and "locally common in gullies in banded jasper hills", but Giess says "Nur im ubteren Teil der Bergs vorkommend". Rodin reports that it is "one of the few flowering plants north of Marienthal".

The corollas are mostly described as "white" (as on Compton 24453, Giess 2366, Ihlenfeldt 1781, Kinges 2181, Leistner 1345 & 2350, Merxmüller & Giess 1647 & 2225, Nordenstam 3891, Rodin 8958, Schlieben 8860, Van Bred 1372, and Winter 3172 & 3413), but they are referred to as "pure-white" on Giess, Volk, & Bleissner 5225 and Merxmüller & Giess 28165, "pure-white but lilac when withering" on Giess 3031, "white with yellow throat" on Nordenstam 2158, "lilac" on Giess & Vuuren 777, "very light-lilac" on Merxmüller & Giess 2823, "purplish" on H. Hall 576, and "blue" on Goldblatt 1863.

Kinges refers to the species as "abundant", while Giess, Volk, & Bleissner describe it as "very abundant".

Additional citations: NAMIBIA: Giess 2366 (Mu), 3031 (Mu); Giess,

Volk, & Bleissner 5225 (Mu); Giess & Vuuren 777 (Mu); Goldblatt 1863 (Mu); Ihlenfeldt 1781 (Mu); Kinges 2181 (Mu), 2315 (Mu), 3341 (Mu), 4772 (Mu); Kraüsel 683 (Mu), 840 (Mu); Merxmüller & Giess 1647 (Mu, Mu), 2225 (Mu), 2823 (Mu), 28165 (Mu); U. Meyer 25 (Mu); Nordenstam 2158 (Mu), 3891 (Mu); Rodin 8958 (Mu); Rusch s.n. [Walter & Walter 4578] (Mu); Seydel 36 (Mu), 2005 (Mu); Volk 52 (Mu), 12146 (Mu), 12715a (Mu); Walter & Walter 1296 (Mu); Winter 3172 (Mu), 3413 (Mu); Wiss 1477 (Mu). SOUTH AFRICA: Cape Province: Compton 24453 (Mu); H. Hall 576 (Mu); Leistner 1345 (Mu), 2350 (Mu); Schlieben 8860 (Mu); Van Bred 1372 (Mu).

CHASCANUM GILLETTII Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 202 & 204—205 (1975) and 31: 237 & 238. 1975.

CHASCANUM GÜRKEANUM (Loes.) Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 205 (1975) and 31: 236. 1975.

CHASCANUM HANNINGTONII (Oliv.) Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 205. 1975.

CHASCANUM HEDERACEUM (Sond.) Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 31: 123, 124, & 396. 1975.

Recent collectors have encountered this plant in grasslands and, according to Leistner, "locally frequent in loamy soil on dolomite outcrops".

The Schlieben 7661, 9368, and 9393, distributed as typical C. hederaceum, are actually var. natalense (H. H. W. Pearson) Moldenke, while D. Edwards 2778 is C. dehiscens (L. f.) Moldenke.

Additional citations: SOUTH AFRICA: Cape Province: Leistner 2284 (Mu); Merxmüller 208 (Mu). Transvaal: Junod 726 (Mu).

CHASCANUM HEDERACEUM var. NATALENSE (H. H. W. Pearson) Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 206 & 396. 1975.

Recent collectors describe this plant as a perennial, 30—40 cm. tall, with white flowers, and have found it "abundant" at 1400 meters altitude, flowering and fruiting in February.

Additional citations: SOUTH AFRICA: Transvaal: Merxmüller 521 (Mu); Schlieben 7661 (Mu), 9368 (Mu), 9393 (Mu).

CHASCANUM HILDEBRANDTII (Vatke) Gillett

Additional bibliography: Ament, Journ. E. Afr. Nat. Hist. Soc. & Nat. Mus. 154: 25. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 205 & 207—208 (1975) and 31: 237 & 238. 1975.

Recent collectors describe this species as a perennial herb, 30—

50 cm. tall, with numerous stems from a woody rootstock, "the stems and roots grind bright gray", the flowers borne in dense spikes terminating the stems, only a few blooming at a time. They have encountered it "in Acacia bushland on quartz bubble debris" and "locally common amongst lava boulders on a red sandy loam with Cyperus obtusiflorus, Barleria, Endostemon, and Indigofera spinosa in open Acacia tortilis ssp. spirocarpa-Cordia ovalis-Commiphora bushland", at altitudes of 1220--1550 meters, flowering and fruiting in February, March, and October.

Richards describes the plant as having "ridged" hairy stems and encountered it as scattered bushes in long grass on red gritty clay soil at 4300 feet altitude. The corollas are said to have been "white" on Greenway & Napper 13569, Leippert 5059 & 6408, and M. Richards 25278. Ament (1975) refers to it as a "common herb, 0.5 m. tall", citing Gillett 17017 and Ament 573 from Kenya.

Additional citations: TANZANIA: Tanganyika: Leippert 6408 (Mu); M. Richards 25278 (Mu). KENYA: Greenway & Napper 13569 (Mu); Hildebrandt 2737 (Mu--1537--type); Leippert 5059 (Mu).

CHASCANUM HUMBERTI Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 208. 1975.

CHASCANUM INCISUM (H. H. W. Pearson) Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 31: 123, 236, & 394 (1975) and 34: 261 & 262. 1976.

Winter & Leistner refer to this plant as a small perennial herb with aromatic leaves and found it growing in brown loam with granite boulders and quartz pebbles, flowering and fruiting in April. Zeyher 1373 is a mixture with Lantana rugosa Thunb.

Additional citations: NAMIBIA: Seydel 24 (Mu), s.n. (Mu); Winter & Leistner 5511 (Mu). SOUTH AFRICA: Cape Province: Zeyher 1373 in part (Mu).

CHASCANUM INCISUM var. CANESCENS Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 208 (1975) and 31: 236. 1975.

Recent collectors describe this plant as a subshrub, very woody at the base, 30 cm. tall, and have found it flowering and fruiting in February and June.

Material of this taxon has been misidentified and distributed in some herbaria as C. pinnatifidum (L. f.) E. Mey.

Additional citations: NAMIBIA: Giess 3718 (Mu); Merxmüller 1767 (Mu).

CHASCANUM INSULARE Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.26: 7. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 208. 1975.

CHASCANUM INSULARE var. CANESCENS Moldenke
Additional bibliography: Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 208. 1975.

CHASCANUM INSULARE var. HUMBERTI Moldenke
Additional bibliography: Hocking, Excerpt. Bot. A.26: 7. 1975; Moldenke, Biol. Abstr. 60: 68. 1975; Moldenke, Phytologia 30: 208. 1975.

CHASCANUM KROOKII (Gürke) Moldenke
Additional bibliography: Moldenke, Phytologia 31: 123. 1975.
The corollas are said to have been "white" on Rudatis 1868 and this collector encountered the plant at 800 meters altitude, flowering in January.
Additional citations: SOUTH AFRICA: Natal: Rudatis 1868 (Mu—8296).

CHASCANUM LATIFOLIUM (Harv.) Moldenke
Additional bibliography: Moldenke, Phytologia 31: 123—124. 1975.
The Devenish 937 and Mauve 4408, distributed as C. latifolium, actually represent var. transvaalense Moldenke.

CHASCANUM LATIFOLIUM var. TRANSVAALENSE Moldenke
Additional bibliography: Moldenke, Phytologia 31: 124. 1975.
Recent collectors describe this plant as shrubby, 15—24 inches tall, growing from a woody rootstock, tending to form colonies. The corollas are said to have been "white to pale-mauve" on Devenish 937 and "varying from dark-mauve to white" on Mauve 4408.
Material of this variety has been distributed in some herbaria as typical C. latifolium (Harv.) Moldenke.
Additional citations: SOUTH AFRICA: Transvaal: Devenish 937 (Mu); Mauve 4408 (Mu).

CHASCANUM LIGNOSUM (Dinter) Moldenke
Additional bibliography: Moldenke, Phytologia 31: 124 & 236. 1975.
Additional citations: NAMIBIA: Dinter 5120 (Mu—isotype).

CHASCANUM MARRUBIIFOLIUM Fenzl
Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 64. 1858; Moldenke, Phytologia 31: 124—127. 1975.
Gillett & Newbould refer to this plant as "occasional on riverbanks with Zizyphus, Terminalia, Cordia gharaf and remnant Hyphaene, sand bank by river", flowering and fruiting in June. The corollas are said to have been "white" on Gillett & Newbould 19186.
Additional citations: KENYA: Gillett & Newbould 19186 (Mu).

CHASCANUM NAMAQUANUM (H. Bolus) Moldenke

Additional bibliography: Moldenke, Phytologia 31: 127 & 236. 1975; Hocking, Excerpt. Bot. A.28: 257. 1976.

Goldblatt describes the leaves of this plant as gray and the corollas as "cream". He encountered the plant on granite, flowering in August.

Additional citations: SOUTH AFRICA: Cape Province: Goldblatt 2371a (Mu, Z).

CHASCANUM PINNATIFIDUM (L. f.) E. Mey.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 64. 1858; Moldenke, Phytologia 31: 234--236. 1975; Hocking, Excerpt. Bot. A.28: 257. 1976.

Recent collectors describe this species as a "biennial" or perennial, spreading or spreading-ascending herb, woody at the base, or as a woody shrublet, 15—30 cm. tall, and have found it growing in sand or in sand mixed with lime on flats and low "rantjies" at the foot of mountains in gravelly granite soils, flowering from October to May and in August, fruiting in January, April, May, and December, at altitudes of 1200--1500 meters. Seydel refers to it as "not common" in rocky soil in Namibia, while Therner calls it "frequent between rocks" in the Cape Province. Giess describes it as a "kugeliges, am Grunde leicht verhölztes Kraut bis 20 cm hoch und 30 cm Durchmesser". The corollas are said to have been "white" on Giess 61, 130, & 13668, Merxmüller & Giess 2802b, and Therner 1860 and "cream" on Tölken & Hardy 955 and Winter 2677.

The Seydel 24 & s.n. and Winter & Leistner 5511, distributed as C. pinnatifidum, are actually C. incisum (H. H. W. Pearson) Moldenke, while Giess 3718 and Merxmüller 1767 are C. incisum var. canescens Moldenke.

Additional citations: NAMIBIA: Giess 51 (Mu), 130 (Mu), 13668 (Mu); Giess & Müller 13972 (Mu); Kinges 4602 (Mu), 4774 (Mu); Merxmüller 245 (Mu); Merxmüller & Giess 2802b (Mu); Rehm s.n. [12. 10.39] (Mu); Seydel 2524 (Mu), 2596 (Mu); Tölken & Hardy 955 (Mu); Volk 174 (Mu), 12226 (Mu), 12626 (Mu), 12633 (Mu); Walter & Walter 1/302 (Mu), 2/35 (Mu); Winter 2677 (Mu), 3318 (Mu). SOUTH AFRICA: Cape Province: Marloth 985 (Mu--3838); Merxmüller & Giess 693 (Mu); Schlieben 8713 (Mu); Therner 1860 (Mu). Transvaal: Stopp M.64 (Mu).

CHASCANUM PUMILUM E. Mey.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 64. 1858; Moldenke, Phytologia 31: 235--236. 1975.

Recent collectors describe this plant as a low perennial herb, "herbaceous from a perennial rootstock", or as a rounded bush or low shrublet, 25—50 cm. tall, 45 cm. in diameter, gray-green, the flowers long-tubed, and have encountered it on low pale-red sand dunes, on low sandy flats, and in grassland with low bushes, at altitudes of 3000—4200 feet, flowering from December to March and in May and September, fruiting in February. Leistner refers to it as "occasional", "rare", or "locally common" in South Afri-

ca. The corollas are described as having been "white" on Leistner 1000, 2867, & 3153 and Wild 5044, as "cream-color" of Giess & al. 7001 and Merxmüller & Giess 741, and "white to cream" on Liebenberg 7062. Seydel found it growing "auf rotem Flächenboden nach etwas Regen".

Additional citations: NAMIBIA: Giess, Volk, & Bleissner 7001 (Mu); Merxmüller & Giess 741 (Mu), 1138 (Mu); Rehm s.n. [4.2.1940] (Mu); Seydel 3928 (Mu); Volk 11540 (Mu), 11542a (Mu); Walter & Walter 1315 (Mu). SOUTH AFRICA: Bechuanaland: Leistner 2089 (Mu); H. Wild 5044 (Mu). Cape Province: Leistner 1000 (Mu), 2867 (Mu), 3153 (Mu); Liebenberg 7062 (Mu).

CHASCANUM SCHLECHTERI (Gürke) Moldenke

Additional bibliography: Moldenke, Phytologia 31: 124 & 237. 1975.

Ward describes this plant as "common in sandy soil on north-facing slight slopes" at 800 feet altitude, the flowers white in November.

Additional citations: SWAZILAND: Kemp 538 (W--2781762). SOUTH AFRICA: Natal: C. J. Ward 3306 (Mu).

CHASCANUM SESSILIFOLIUM (Vatke) Moldenke

Additional bibliography: Moldenke, Phytologia 31: 237--238. 1975; Hocking, Excerpt. Bot. A.28: 257. 1976.

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ADDITIONAL NOTES ON THE GENUS CITHAREXYLUM. XII

Harold N. Moldenke

CITHAREXYLUM B. Juss.

Additional synonymy: Chytharexylum Sw. apud López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 356, sphalm. 1975.

Additional & emended bibliography: L., Gen. Pl., ed. 5, imp. 1, 273 & [506]. 1754; Jacq., Enum. Syst. Pl. Carib., imp. 1, 26 & 39 (1760) and imp. 2, 26 & 39. 1762; Jacq., Select. Stirp. Amer. Hist., imp. 1, 185—186, pl. 118. 1763; Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 417. 1830; G. Don in Loud., Hort. Brit., ed. 1, 248 (1830) and ed. 2, 248. 1832; Loud., Hort. Brit., ed. 2, 551. 1832; Hook. & Arn., Bot. Beech. Voy. 306. 1838; G. Don in Loud., Hort. Brit., ed. 3, 248. 1839; Sweet, Hort. Brit., ed. 3, 551. 1839; Spach, Hist. Nat. Vég. 9: 227. 1840; Schau. in A. DC., Prodr. 11: 545, 609--614, 616, 628, & 697--698. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 104--105 & 147. 1858; Coult., Contrib. U. S. Nat. Herb. 2: 326 & 329. 1892; Sessé & Moc., Fl. Mex., ed. 2, 152. 1894; Engl., Syllab. Pflanzenfam., ed. 2, 178 (1898), ed. 3, 187 (1903), ed. 5, 192 (1907), and ed. 6, 198. 1909; Gilg in

Engl., Syllab. Pflanzenfam., ed. 7, 314 (1912) and ed. 8, 318. 1919; Fedde & Schust. in Just, Bot. Jahresber. 44: 253. 1922; Fedde in Just, Bot. Jahresber. 45 (1): 506. 1923; Fedde & Schust. in Just, Bot. Jahresber. 45 (1): 148. 1923; Gilg in Engl., Syllab. Pflanzenfam., ed. 9 & 10, 339. 1924; Fedde in Just, Bot. Jahresber. 46 (2): 571. 1929; Diels in Engl., Syllab. Pflanzenfam., ed. 11, 339. 1936; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 1, 190. 1938; Caro, Revist. Argent. Agron. 23: 22. 1956; L., Gen. Pl., ed. 5, imp. 2 [Cramer & Swann, Hist. Nat. Class. 3:] 273 & [506]. 1960; Lombardo, Fl. Arb. & Arbust. Urug., ed. 2, 122, fig. 191. 1964; Jacq., Enum. Syst. Pl. Carib., imp. 3, 26 & 39. 1967; G. W. Thomas, Tex. Pl. Ecolog. Summ. 77. 1969; Jacq., Select. Stirp. Amer. Hist., imp. 2, 185--186, pl. 118. 1970; R. W. Long, Fla. Sci. 37: 35. 1974; Dod & Fortuna, Bol. Jard. Bot. Moscoso 2 (3): 16. 1975; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 31 & 48. 1975; Hocking, Excerpt. Bot. A.26: 5. 1975; Kooiman, Act. Bot. Neerl. 24: 463. 1975; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: [353]—398. 1975; Rogerson & Becker, Bull. Torrey Bot. Club 102: 421. 1975; Zimmerm. & Ziegler in Zimmerm. & Milburn, Transp. Pl. 1 [Pirson & Zimmerm., Encycl. Pl. Physiol., ser. 2, 1:] 502. 1975; Moldenke, Phytologia 32: 48—74 & 218—240 (1975), 32: 508 (1976), 33: 129 & 508 (1976), and 34: 245, 248, 251—257, 272, 273, & 501. 1976; Anon., Biol. Abstr. 61: ACl.580. 1976; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 2, 190. 1976; Felger & Lowe, Nat. Hist. Mus. Los Angeles Co. Contrib. Sci. 285: 7. 1976; Finol U., Act. Bot. Venez. 11: 24, 45, 48, 49, 54, 55, [58], & [60]. 1976; Grimé, Bot. Black Amer. 97, 209, & 224. 1976; Crowell & Crowell, Nat. Hist. 85 (8): 53. 1976; Grubb & Tanner, Journ. Arnold Arb. 57: 318. 1976; Hocking, Excerpt. Bot. A.28: 170 & 257—259. 1976; Long & Lakela, Fl. Trop. Fla., ed. 2, 733, 738, 934, & 939. 1976; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 41—42. 1976; Rogerson & Becker, Bull. Torrey Bot. Club 103: 145. 1976; Soukup, Biota 11: 3, 8—9, & 21. 1976; Conant, Biol. Abstr. 64: 5416. 1977; Conant, Wilson Bull. 89: 198 & 208. 1977; Jiménez & Liogier, Moscosoa 1 (2): 19. 1977; Liogier, Bol. Jard. Bot. Nac. Raf. Mosc. 4: 5. 1977; López-Palacios, Fl. Venez. Verb. 9, 21, 220—261, 647, 652, & 653. 1977; Moldenke, Biol. Abstr. 64: 2433 & 6574. 1977; Moldenke, Phytologia 35: 276 & 507 (1977) and 36: 31, 33, 34, 36, 37, 39, 41, 164, & 502. 1977; Poppeton, Shuey, & Sweet, Fla. Scient. 40: 384. 1977; Powell, Econ. Bot. 31: 417, 419, & 422. 1977; Dodson & Gentry, Selbyana 4: xiii, 576, 578, 579, & 605, pl. 271B. 1978; Liogier, Moscosoa 1: 37. 1978; Moldenke, Biol. Abstr. 66: 1277. 1978; Moldenke, Phytologia 38: 256, 260, 261, 384, & 505 (1978) and 40: 54 & 339. 1978; R. F. Sm., Act. Bot. Venez. 13: 193, 205, & 264. 1978.

In a personal communication to me, López-Palacios says that "El Dr. Leandro Aristeguieta, Familias y Géneros de los Árboles de Venezuela : 785, agrega para el género, sin referirlos a especie determinada estos otros no citados, 'pendare' y 'totumillo sabanero'. El de 'Salvia', allí citado, más bien parece corresponder a 'salvic', véasa No 101 [C. subflavescens Blake]. Pérez-Arbeláez,

Plantas Útiles de Colombia- Tercera Redacción, 1956, señala el C. fruticosum bajo el nombre de 'teuro', pero ni este taxon ha sido registrado en Colombia, no yo he oído allí ta nombre vulgar. 'Tampoco' aparece e, la edición anterior, la de la Contraloría General de la República, 1947, en donde lo trae bajo 'palo guitarro'."

The Pennington & Sarakhán K. 9533, distributed as Citharexylum sp., actually is Rehdera penninervia Standl. & Moldenke.

An additional excluded species is Citharexylum melanocum Broughton = Petitia domingensis Jacq.

CITHAREXYLUM AFFINE D. Don

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 104. 1858; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 31 & 48. 1975; Moldenke, Phytologia 31: 336—337 & 451 (1975) and 32: 68 & 200. 1975; Hocking, Excerpt. Bot. A.28: 258. 1976.

Recent collectors have found this plant growing in subtropical forests and at the edge of cultivated land, fruiting in August.

The Kerber 258, distributed as C. affine, actually is C. gleasoniamum Moldenke.

Additional citations: MEXICO: Jalisco: Romero A. 16 (Mi). México: Pringle 6647 (Ln--69943); J. Rzedowski 22356 (Ld), 31150 (Mi).

CITHAREXYLUM AFFINE var. GLANDULIFERUM Moldenke

Additional bibliography: Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 31 & 48. 1975; Moldenke, Phytologia 31: 337. 1975.

CITHAREXYLUM ALBICAULE Turcz.

Additional bibliography: López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 355. 1975; Moldenke, Phytologia 31: 338. 1975.

CITHAREXYLUM ALTAMIRANUM Greenm.

Additional bibliography: Moldenke, Phytologia 31: 338 & 378. 1975.

The Davidses describe this species as a shrub, 2 m. tall, the corolla-lobes pink-purple, and the corolla-tube yellowish, and have found it growing in juniper woodland on rocky hillsides with legume shrubs and Opuntia, at 2290 m. altitude, flowering in August.

Material of this species has been misidentified and distributed in some herbaria as C. rosei Greenm.

Additional citations: MEXICO: Zacatecas: Davidse & Davidse 9971 (Ld, N).

CITHAREXYLUM ANDINUM Moldenke

Additional bibliography: Moldenke, Phytologia 31: 338—339 (1975) and 33: 227. 1975.

Additional citations: BOLIVIA: Cochabamba: Troll 978 (Mu). Santa Cruz: J. Steinbach 8572 (Ut--96716).

CITHAREXYLUM ARGUTEDENTATUM Moldenke

Additional bibliography: Moldenke, Phytologia 31: 339. 1975; Soukup, Biota 11: 9. 1976.

CITHAREXYLUM BERLANDIERI B. L. Robinson

Additional & emended bibliography: Coult., Contrib. U. S. Nat. Herb. 2: 330. 1892; G. W. Thomas, Tex. Pl. Ecolog. Summ. 77. 1969; Kooiman, Act. Bot. Neerl. 24: 463. 1975; Moldenke, Phytologia 32: 48. 1975; Hocking, Excerpt. Bot. A.28: 258. 1976.

Webster & Wilbur describe this plant as a bushy shrub, with orange drupes, and found it growing in thickets of Prosopis juliflora, Celtis pallida, Condalia, Malpighia glabra, etc. The corollas on their no. 3067 are said to have been "cream, brownish at base", while those on Moore & Wood 3845 and R. Runyon 6069 were "white. Runyon states that in Cameron County, Texas, the species is "occasional on loams and high clay ground", referring to it as a small or large shrub with white corollas and red fruit. He found it in flower and fruit there in May and reports the vernacular name, "orcajuela".

Material of C. berlandieri has been misidentified and distributed in some herbaria as Vaccinium consanguineum Klotzsch. On the other hand, the Chiang, Wendt, & Johnston 8180, distributed as C. berlandieri, actually is C. rosei Greenm.

Additional citations: TEXAS: Cameron Co.: D. S. Correll 32361 3552 (Ld); Correll & Correll 32148 (Ld); Correll & Wasshausen 27666 (Ld); Crutchfield 1120 (Ld); Lundell & Lundell 10001 (Ld); R. Runyon 486 (Au—269680), 3838 (Au—268812, Au—269669), 4877 (Au—269670), 6069 (Ld, N); Webster & Wilbur 3067 (Mi). County undetermined: Hiway Dept. 10112 [Gulf Coast] (Ld). MEXICO: Hidalgo: Moore & Wood 3845 (Mi). Nuevo León: Gerlach 606 (Au—297416). San Luis Potosí: J. Rzedowski 23142 (Ld). Tamaulipas: González Medrano, Corona, Cortés, & Martínez 3090 (N); Webster, Adams, Miller, & Miller 11307 (Ld). Veracruz: Ventura A. 4062 (Au).

CITHAREXYLUM BRACHYANTHUM (A. Gray) A. Gray

Additional & emended bibliography: Coult., Contrib. U. S. Nat. Herb. 2: 330. 1892; G. W. Thomas, Tex. Pl. Ecolog. Summ. 77. 1969; Moldenke, Phytologia 32: 48 & 196. 1975; Anon., Biol. Abstr. 61: AC1.580. 1976.

Recent collectors describe this species as a divaricately much-branched shrub, to 1.5 m. tall, the corolla-throat congested by trichomes, and the fruit large, spherical, 2-seeded, with a purple cast, and have encountered it "in open Chihuahuan Desert with rocky reddish clay soil", in sandy soil or sandy loam, on "flattish deserts", on sandy plains, "in matorral desertico inerme on hills of dark extrusive igneous rocks in gravelly-sandy alluvium", "in calcareous gravelly soil in Yucca filifera woods on west-sloping calichified alluvial fan", and "in degraded grassland on volcanic

rock hillside in sandy-gravelly loam derived from igneous rocks", at altitudes of 1100--2330 meters, growing in association with Fouquieria splendens, Aloysia gratissima, Larrea tridentata, Flourensia cernua, Opuntia ficus-indica, O. kleiniae, Prosopis laevigata, Jatropha dioica, Acacia neoverniciosa, Buddleia, Hilaria, Lycium, Mimosa spp., Yucca filifera, Y. decipiens, and numerous annual herbs and sparse shrubbery. They have found it in flower in May and July and in fruit in March, August, and September.

Henrickson refers to C. brachyanthum as "frequent" in Chihuahua. The corollas are said to have been "white" on Engard & Gentry 652 and on Johnston & al. 11193 & 11624. A notation on the labels of the Engard & Gentry collection indicates that buds were collected and preserved "in vial no. 8".

In general, the Chihuahuan and Coahuilan collections are very typical, but the San Luis Potosí and Zacatecas ones appear to vary slightly toward C. spathulatum Moldenke & Lundell.

Thomas (1969) calls C. brachyanthum the "littleleaf fiddlewood". Material of the species has been misidentified and distributed in some herbaria as C. spathulatum.

Additional citations: TEXAS: Webb Co.: Benavides 99 (Ld). MEXICO: Chihuahua: Henrickson 7752 (Ld). Coahuila: Chiang, Wendt, & Johnston 9112 (Ld); Henrickson 5959 (Ld); Johnston & Muller 346 (Mi); Johnston, Wendt, & Chiang 11623 (Ld). Durango: Engard & Gentry 652 (Ld). San Luis Potosí: Johnston, Wendt, & Chiang 11193 (Ld). Tamaulipas: González-Medrano 9031 (Mi). Zacatecas: Engard & Gentry 711 (Ld); Johnston, Chiang, & Wendt 10445 (Ld).

CITHAREXYLUM BULLATUM Moldenke

Synonymy: Cytharexylum bullatum Moldenke apud Hocking, Excerpt. Bot. A.26: 5. 1975.

Additional bibliography: Hocking, Excerpt. Bot. A.26: 5. 1975; Moldenke, Phytologia 31: 343 (1975), 32: 220 (1975), and 34: 273. 1976; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 41. 1976.

López-Palacios (1976) refers to this plant as "una característica y bella especie" and cites two additional collections from Cundinamarca, Colombia: Huertas & Camargo 5483 and Huertas & Jaramilla 6086 in the Bogotá herbarium.

CITHAREXYLUM CAUDATUM L.

Additional synonymy: Chytharexylon caudatum Sw. apud López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 356, sphalm. 1975.

Additional & emended bibliography: Lunan, Hort. Jamaic. 1: 291 & 292. 1814; Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 417. 1830; G. Don in Loud., Hort. Brit., ed. 1, 248 (1830) and ed. 2, 248. 1832; Loud., Hort. Brit., ed. 2, 551. 1832; G. Don in Loud., Hort. Brit., ed. 3, 248. 1839; Sweet, Hort. Brit., ed. 3, 551. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 104 & 105. 1858; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: 355--357, 363, 364,

& 375. 1975; Moldenke, Phytologia 32: 48, 50, 51, 53, 61, 200, 219, 221—223, & 226 (1975) and 34: 252, 253, & 272. 1976; Anon., Biol. Abstr. 61: ACl.580. 1976; Grime, Bot. Black Amer. 97, 209, & 224. 1976; Hocking, Excerpt. Bot. A.28: 170. 1976; Soukup, Biota 11: 9. 1976; Grubb & Tanner, Journ. Arnold Arb. 57: 318. 1976; López-Palacios, Fl. Venez. Verb. 228, 248, & 647. 1977; Moldenke, Phytologia 36: 39 & 41 (1977) and 38: 384. 1978; Moldenke, Biol. Abstr. 66: 1277. 1978.

Recent collectors refer to this species as a shrub, 2--2.5 m. tall, or as a small tree, 5—7 m. tall, the leaves leathery, the petioles orangish, the infructescence-rachis orangish, the calyx pale-green, the stamens white, and the fruit at first green or green tinged with orange, then orange, finally red or black, odorless when crushed. They have found it growing on savannas, in open coppices, and at the edge of rainforests, at altitudes from sea-level to 500 meters, flowering in February, May, and June, fruiting in January, February, May, June, and December. Both Lunan and Adams refer to the fruit as "berries", but they are actually drupes. Lunan (1814) reports that they are sometimes eaten by the natives on Jamaica. Fosberg found the species "common but scattered" on Hunting Cay. The corollas are said to have been "white" on Croat 23535 & 23978, Duke 12507, A. Gentry 7608 & 7631, and Spellman & Stoddart 2302, but Kennedy says "corolla-tube green at base, lobes white".

The leaves on some Cuban and Dominican Republic specimens (e.g., Liogier & Liogier 24744) are uniformly remarkably small and apically acute. They may represent f. parvifolium Moldenke. The leaf-blades on Hespenheide & al. and on Proctor 26629 have very conspicuous venation on the upper surface and may represent one of the named hybrids [such as xC. jamaicense Moldenke] rather than the typical form of C. caudatum.

Don (1830), Sweet (1830), and Loudon (1832) all list C. caudatum as cultivated in British gardens, introduced from Jamaica in 1763 and known as the "upright fiddle-wood".

The J. Steinbach 8572, distributed as C. caudatum, actually is C. andinum Moldenke, while J. G. Jack 6874, 7243, & 7255 are C. caudatum f. parvifolium Moldenke, C. D. Adams 10812 and Harris 11065 are xC. jamaicense Moldenke, and Linden 32 in part is C. lucidum Schlecht. & Cham.

Additional citations: BELIZE: Croat 23978 (N); Dwyer 11402 (N); A. Gentry 7608 (N), 7631 (N); Liesner & Dwyer 1548 (W—2787880). GULF OF HONDURAS ISLANDS: Hunting Cay: Spellman & Stoddart 2455 (W—2784892). Sapodilla Cay: Spellman & Stoddart 2302 (W—2777480). NICARAGUA: Chontales: Narvaez S. 2748 (N). COSTA RICA: Alajuela: Lent 1831 (Ws). PANAMA: Panamá: H. Kennedy 2276 (N). PEARL ISLANDS: San José: Duke 12507 (W—2788963). BAHAMA ISLANDS: Eleuthera: Correll & Hill 45337 (N). JAMAICA: C. D. Adams 8467 (Mu);

Crosby, Hespenheide, & Anderson 692 (Ld); Hespenheide, Hespenheide, Calver, & Ricklegs 1278 (Ld); Proctor 26629 (Ld). HISPANIOLA: Dominican Republic: Gastony, Jones, & Norris 427 (N). HAWAIIAN ISLANDS: Oahu: Crosby & Anderson 1342 (Mi); Sohmer 6125 (Lc). CULTIVATED: Cuba: C. F. Baker 23 (Ln—69954).

CITHAREXYLUM CAUDATUM f. ANGUSTIFOLIUM Moldenke, Phytologia 38: 384. 1978.

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

Citations BELIZE: Croat 23535 (Ld—type, N—isotype).

CITHAREXYLUM CAUDATUM f. PARVIFOLIUM Moldenke, Phytologia 38: 384. 1978.

Synonymy: Citharexylum caudatum f. parvifolium Urb. ex Moldenke, Prelim. Alph. List Inv. Names 16, in syn. 1940. Citharexylum caudatum var. parvifolium O. E. Schulz ex Moldenke, Prelim. Alph. List Inv. Names 16, in syn. 1940.

Bibliography: Moldenke, Prelim. Alph. List Inv. Names 16. 1940; Moldenke, Biol. Abstr. 66: 1277. 1978; Moldenke, Phytologia 38: 384 (1978) and 40: 491. 1978.

Collectors have encountered this plant at the edge of woods and on savannas, at 800—1750 meters altitude, flowering in April and from June to August, fruiting in January, June, August, and December, referring to it as a shrub, 8—9 feet tall, or a small tree, to 16 feet tall, "las ramas colgantes", the fruit red, turning black and lustrous. The corollas are said to have been "white" on Howard 5204 and Jack 6874, 7243, & 7436 and "creamy-white" on Jack 7255.

Citations: CUBA: Las Villas: A. Gonzales 190 (N); R. A. Howard (N), 5228 (N); J. G. Jack 6874 (A—isotype, N—type, N—isotype), 7243 (A, B, Ba, F—70254, N, W—1478175), 7255 (A, N, N, N—photo, P, W—1476546, Z—photo), 7436 [April 18] (N), 7436 [July 11] (D—777439, N); León & Clément 6507 (N). Province undetermined: C. Wright 1356 [Herb. Sauvalle 1770] (B, Hv, Pa, T, W—57323). HISPANIOLA: Dominican Republic: Liogier & Liogier 24744 (N). Haiti: Ekman H. 1248 in part (Ld).

CITHAREXYLUM CHARTACEUM Moldenke

Additional bibliography: Moldenke, Phytologia 31: 347. 1975; Soukup, Biota 11: 9. 1976.

CITHAREXYLUM COOPERI Standl.

Additional bibliography: Moldenke, Phytologia 31: 347—348 & 456 (1975), 32: 49 & 226 (1975), and 34: 251. 1976.

Breedlove describes this plant as a shrub, 10 feet tall, or a tree, 40 feet tall.

[to be continued]

STUDIES IN THE SENECIONEAE (ASTERACEAE). IX.

A NEW GENUS, DRESSLEROTHAMNUS.

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In the process of reviewing the Central American species of Pentacalia Cass. material of the recently described Senecio angustiradiatus Barkley of Panama was examined. The species has the habit of Pentacalia and seems to be related, but a number of distinctive characters were noted by Barkley (1975) that discourage inclusion in that genus. The apparently unique filiform almost whiplike ray flowers were the basis for the species name. Also,the species has prominent stipitate stellate hairs on the stems, leaves, inflorescence and involucre. The receptacle is unusual in the tribe by the development of many long setae forming dense chaff. More subtle but significant distinctions are the prominent retrorse projecting cells on the tails of the anthers, the small but distinct apical coma on the tip of the disk style and the more numerous extremely small spines on the pollen. The texture of the involucral bracts is thinner than seen in most memebrs of the Senecioneae including Pentacalia.

One of the most striking features of the Panamanian species is the stipitate stellate hairs. Stellate hairs are of erratic occurence in the Asteraceae being found in many tribes including the Senecioneae. Aequatorium, a genus of the northern Andes recently segregated from Senecio by Nordenstam (1978), is also characterized by stellate hairs, but these have shorter and more irregular branches. The Nordenstam genus is credited with continuous stigmatic surfaces on the style branches, has a more shrubby habit and has the heads in rounded pyramidal terminal inflorescences. These and other details of pubescence and floral structure indicate that there is no close relation to the Barkley species.

The Panamanian species is here regarded as related to but strikingly distinct from Pentacalia. The small apical coma on the style, while one of the least striking distinctions, is nevertheless significant. It represents a separate occurence of the trait in a group that is otherwise notable in the tribe for its absence.

The species is best treated as an isolated undescribed genus from an area whose potential for endemic elements is only recently being appreciated. The genus is named here for the collector of the type specimen, Dr. Robert D. Dressler of the Smithsonian Tropical Research Institute on Barro Colorado Island.

Dresslerothamnus H.Robinson, genus nov. Asteracearum (Senecioneae).

Plantae scandentes in caulibus foliis pedicellis et bracteis involucri stipitate stellate pilosae. Caules carnosi in sicco irregulariter rimosi eburnei. Folia alternata breviter distincte petiolata; laminae ovato-ellipticae vel ellipticae in sicco integrae leniter anguste revolutae, nervis secundariis pinnatis utrinque ca. 4. Inflorescentiae axillares paniculatae. Squamae involucri 8-10 tenuiter papyraceae rubrescentes apice acuminatae; receptacula dense longe setifera. Flores radii ca. 8, limbis filiformibus; flores disci 10-15; corollae flavae, lobis lanceolatis triplo longioribus quam latioribus; filamenta in parte superiore in cellulis inferioribus laxiora; thecae longe caudatae, caudices retrorse papillosi, cellulis endothecialibus elongatis, parietibus verticalibus et transversalibus minute noduliferis; appendices antherarum ovato-oblongae apice rotundatae; rami stylorum in apicem annulate fimbriati centraliter breviter comales, lineis stigmataceis duplicibus; achaenia prismatica glabra ca. 8-costata; carpopodia breviter cylindrica superne leniter delimitata, cellulis plerumque quadratis plerumque 15-35 μ latis; setae pappi ca. 2-seriatae superne 30-40 μ latae apice leniter incrassatae. Grana pollinis ca. 30 μ in diametro perminute spinulosa.

Type species: Senecio angustiradiatus Barkley

At present only the single species is known.

Dresslerothamnus angustiradiatus (Barkley) H.Robinson, comb. nov. Senecio angustiradiatus Barkley, Annal Missouri Botanical Garden 62 (4): 1263. 1975 (1976).

Literature Cited

Barkley, T. M. 1975. Senecioneae in Flora of Panama, Part IX. Family 184. Compositae. Ann. Missouri Bot. Gard. 62 (4): 1244-1272.

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STUDIES IN THE HELIANTHEAE (ASTERACEAE). XIII.

A NEW GENUS, PERYMENIOPSIS.

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The genus Oyadaea is typified by O. verbesinoides DC. from Costa Rica and Panama and the genus is found in the Andes southward to Bolivia. A few species assigned to the genus from farther north in Central America and Mexico are of doubtful relationship and one of these, O. ovalifolia A.Gray of Central Mexico is sufficiently distinct to require recognition as a separate genus. The new genus is apparently related more closely to Perymenium Schrad. and is here given the name Perymeniopsis.

The new genus is like both Oyadaea and Perymenium in having the general characters of the subtribe Ecliptinae. Perymeniopsis is distinguished by the unique pappus form with numerous short deciduous setae in clusters at the outer and inner ends and squamellae along the middle of the sides. The squamellae are inserted at a level above the setae which raises interesting problems regarding the equivalency of the structures. The presence of short deciduous setae is restricted in the Ecliptinae to Melanthera Rohr., Rojasanthe Standl.& Steyerm., and the more closely related pair Perymenium and Steiractinia Blake. Perymeniopsis is distinct from all of these by the presence of the lateral squamellae, but is further distinct from Perymenium by the sterile rays and the numerous stomates on the corolla lobes. The stomates are unusually prominent on the flowers and one has even been seen on an anther appendage. Steiractinia also has sterile rays, but that South American genus has fibers along the veins of the disk corolla throat and has the setae of the pappus born in a complete circle on a raised and expanded callous. The characters of Steiractinia suggest that it might not be as closely related to Perymenium as generally considered.

Perymeniopsis H.Robinson, genus nov. Asteracearum (Heliantheae).

Plantae frutescentes mediocriter ramosae. Folia opposita distincte petiolata; laminae ellipticae

leniter trinervatae base obtusae margine remote serrulatae apice acutae vel breviter acuminatae. Inflorescentiae subcorymboso-paniculatae. Capitula in pedicellis 3-10 cm longis disposita; squamae involucri subimbricatae 3-seriatae late oblongae apice obtusae; receptacula paleacea, paleis superne linearibus apice obtusis. Flores radii steriles; corollae bilobatae vel obscure trilobatae adaxialiter papillosae; flores disci hermaphroditi; corollae breviter 5-lobatae, lobis triangularibus extus scabris et stomatiferis intus inferne leavibus superne et margine papillosis, nervis in faucis non fibrosis; thecae antherarum nigrescentes, cellulis endothecialibus elongatis in parietibus transversalibus 1-2-noduliferis; appendices antherarum ovatae non glanduliferae glabrae vel breviter unisetiferae; rami stylorum abaxialiter superne papillosi apice acuti, lineis stigmataceis duplicibus; canales resiniferi hyalini in stylis abaxiales. Achaenia disci compressa in parietibus nigrescentia non striata; pappus biformis, setis deciduis in partibus polaribus fasciculatis subapice insertis, squamellis in partibus lateralibus medianis apicaliter insertis. Grana pollinis ca. 35μ in diametro.

Type species: Oyedaea ovalifolia A.Gray

The genus contains one known species.

Perymeniopsis ovalifolia (A.Gray) H.Robinson. comb. nov. Oyedaea ovalifolia A.Gray, Proc. Amer. Acad. 5: 183. 1861.

BOOK REVIEWS

Alma L. Moldenke

"BOTANICAL CLASSIFICATIONS. A Comparison of Eight Systems of Angiosperm Classification" by Lloyd H. Swift, xvi & 374 pp., 264 b/w line drawings & 1 frontispiece of botanical systematists. Archon Books, Inc., Hamden, Connecticut 06514. 1974. $15.00.

Herein eight major systems of angiosperm classification are compared and contrasted on an order by order basis for a selection of familiar orders represented in the Central and Northeastern United States using a defined and equated single neutral terminology and nomenclature. These systems were authored by Endlicher 1836 seq., Bentham and Hooker 1862 seq., Eichler 1874 seq., Engler and Prantl 1900 seq., Bessey 1915, Hutchinson 1959 & 1969, Melchior et al. in the Engler Syllabus, edition 12, volume 2, 1964, and Cronquist 1968. The sequence in this book follows Fernald in Gray's eighth edition.

The familiar looking plant illustrations come from the second edition of Britton and Brown. Plant formulas come basically from R. J. Pool. Most herbaria still follow Engler and Prantl. Most modern texts follow Bessey, while most course lectures follow Cronquist.

Perhaps within the next couple of generations of systematic and taxonomic botanists interested in the overall picture there can be closer agreement on whether the Order for the Verbenaceae should be the Polemoniales, Lamiales or Verbenales, on whether the Campanulaceae should remain yolked by order to the composites rather than the present "preponderance of opinion recognizing the Asterales in addition to the Campanulales". This is a fine John the Baptist book of one who comes to prepare the way.

"FLORA OF THE RIO PALENQUE SCIENCE CENTER, LOS RIOS PROVINCE, ECUADOR" by C. H. Dodson & A. H. Gentry, 628 pp., 1 color frontispiece, 22 b/w fig. & 278 b/w plates. Selbyana, Volume 4, nos. 1--6. 1978. Marie Selby Botanical Garden, Sarasota, Florida 33577. 1978. Paperbound.

About 2800 specimens cited are from the authors' collections of a total of 1112 kinds of vascular plants, with the first set deposited at the Marie Selby Botanical Garden, the second set staying at the Rio Palenque Science Center, etc. The greatest use of this publication will probably be right at the station to aid many kinds of scientists and students identify the plants observed or collected by them, all of which have been illustrated and described. The keys should work efficiently and facilely. Families are arranged alphabetically under the pteridophytes,

gymnosperms, monocots and dicots. Local common names, range and distribution notes are provided.

This biological field station is located in tropical rain forest and is slightly south of the equator in the central coastal region of Ecuador not well known botanically but rich in its flora. The detailed introduction describes the center and the vegetation types with examples which are within its hectares. This fine study will help publicize the center's work.

"AN ANNOTATED LIST OF THE HERBARIUM SPECIMENS OF THE MARIA MITCHELL ASSOCIATION" by Larry R. Noblick, ii & 222 pp. Maria Mitchell Association, Inc., Nantucket, Massachusetts 02554. 1977. Paperbound.

Since this herbarium "contains specimens of a large number of the local species, it is hoped that this volume as a catalogue of that herbarium will be a valuable reference for botanists and other natural scientists working on the islands of Nantucket County." Indeed, it should. The collectors are Dr. Mitchell and her friends who "summered" here, her birthplace, after spending the academic year at Vassar College teaching astronomy.

"HAND BOOK OF THE BIRDS OF INDIA AND PAKISTAN — Together with those of Bangladesh, Nepal, Sikkim, Bhutan and Sri Lanka". Volume 8 Warblers and Redstarts, by Salim Ali & S. Dillon Ripley, xvi & 277 pp., color plates 84—91 & ca. 300 b/w fig. & geographic distribution maps. Oxford University Press, Ltd., Bombay 1BR, London W1, & New York 10016. 1973.

This study is sponsored by the Bombay Natural History Society, printed in India and co-authored by the secretary [director] of the Smithsonian Institution, S. Dillon Ripley. The color plates, each with 8 to 15 birds depicted on them, make field recognition easy and indicate careful study of museum skins for details. The text gives scientific and common native names, field characters, habitat, food, voice, breeding, nesting and museum diagnosis. What a valuable ornithological study these volumes will produce when completed!

"MORPHOLOGY OF THE ANGIOSPERMS" by Arthur J. Eames, xiii & 518 pp., 164 b/w fig. Facsimile Edition by Robert E. Krieger Publishing Company, Inc., Huntington P.O. Box 542, New York 11743. 1977. $27.50.

This careful, originally widely used text was first published in 1961 by McGraw Hill Book Company. This book should be available on the library or reading shelves for general biology and botany and for structural botany under its many titles today,

even though the price is high — for a reprint.

I find that I still scan apple trees to find a live example of Figure 97, the proliferated apple fruit.

"AN INTRODUCTION TO PLANT ANATOMY" Second Edition by Arthur J. Eames & Laurence H. MacDaniels, xviii & 427 pp., & 186 b/w fig. Facsimile Edition for Robert E. Krieger Publishing Company, Inc., Huntington P. O. Box 542, New York 11743. 1977. $22.50.

This well prepared and originally widely used text had its first edition published in 1925 and its second in 1947 by McGraw Hill Book Company. Like "Morphology of the Angiosperms" by the first author, this book deserves a space on the library or reading shelves of appropriate botany courses. It is good to have these books available again.

"INSECT MAGIC" Photographs by Kjell B. Sandved & text by Michael G. Emsky, 128 pp. & 83 color plates. A Studio Book. Viking Press, Inc., New York, N. Y. 10022. 1978. $16.95.

So beautiful! So interesting! This book has the excellent reproduction in its gorgeous color plates that is expected in Studio Books of the Viking Press and it has entomologically accurate descriptive, explicative and anecdotal paragraphs collected after the plates, such as: no. 3 "...it is alleged that during the building of the Panama Canal a surgical operation was conducted by beetle light when all other sources had failed", no. 9 a Sunda Island Dendrobium horticulturally introduced into Hawaii had "each flower on this inflorescence....[with a Hawaiian] bee sentenced to be 'hanged by the thorax until dead'" because it was too big to get out, and no. 44 with the clearly condensed account of Smyrna fig fruit setting — Blastophaga wasp agency — caprifig pollination, etc.

"A WAY WITH ANIMALS" by Bruce Buchenholz, 144 pp., 141 b/w photographs. Viking Press, New York, N. Y. 10022. 1978. $12.95.

This is a Studio Book well worth the viewing and the reading, about the man-animal working behavior bond: (1) stunting dolphins and right whales and their trainers in marinelands, (2) the caravan and patrol camels and their Bedouin trainers, (3) drug sniffing and attack dogs and their trainers who must retain a professional attitude, (4) the mounts and the New York City mounted patrolmen, (5) the pet rabbit, Norman, in the coterie in "his" nursery school, (6) elephants and their mahouts in Sri Lanka, (7) peregrine falcon training and Heinz Meng, and (8) the gorilla, Koko, who has been trained to communicate in American Sign language with her Stanford University animal psychologist. That the author

has been impressed by all these very different trainers and trainees is indicated in the type of his photographs and in his statement that "So I say animals can be taught to talk and I say it's not going to stop with primates".

"GERMAN-ENGLISH SCIENCE DICTIONARY" by Louis De Vries. Fourth Edition, updated and expanded by Leon Jacolev, xxxviii & 628 pp., McGraw-Hill Book Co., Inc., New York, N. Y. 10020. 1978. $14.50.

This useful lexicon of almost 65,000 terms including some 7,000 newer ones in the Addendum covers all fields of science reasonably well. The very small print is probably a concomitant of the reasonable price. After the preface there are multi-paged "Suggestions for the Translators" that condense the major letter and/or word changes commonly appearing in German scientific literature for strong, weak and auxiliary verbs, compound words, other parts of speech and word order. All is printed very legibly and helpfully for students and researchers whose German grammar is weak. The appendix includes conversion and atomic tables, thermodynamic symbols, electrical units, measurements and geographic names, all with their equivalents in English.

"FLOW EAST — A Look at Our North Atlantic Rivers", by John M. Kauffmann, vi & 285 pp. & 1 b/w map. McGraw-Hill Book Company, Inc., New York, N. Y. 10020. 1973. $7.95.

The author, with the National Park Service, certainly makes his readers (and let's hope that there are many more) aware of the joys of beautiful clean flowing river water as he describes the past, present and possible futures of the great rivers that flow eastward into the Atlantic Ocean, such as the Housatonic, Hudson, Potomac, Shenandoah, etc. He also shows how "the tradition of riverine sewage and trash disposal goes back to the roots of humanity....when it didn't much matter". People were fewer, cities smaller, materials scarcer. "The use of rivers to carry away wastes was not only customary, it was free" except for the cost of a discharge pipe. At last and "at least we are beginning to understand that it is not, cannot, be free". Who is to pay, how and when, depends upon education of the public, especially the young.

"A YEAR OF THE KANGAROO" by H. D. Williamson, xvi & 187 pp., 12 b/w plates. Charles Scribner's Sons, New York, N. Y. 10017. 1977. $9.95.

I assumed that I would have no trouble enjoying this book because I had recently read with great pleasure the similarly

patterned author's work, "The Year of the Koala". I assumed correctly; the book is a delightful month by month descriptive tale of a group of red bucks, blue flyers and joeys. Their feeding, rare drinking, mating, embryonic diapause of a blastocyst while a previous young joey is still suckling, the birthing of a young one and its journey to a nipple in the pouch, grass fires, conflicts with man and his sheep or cattle over less and less available land — are all reported with the trained eye of a fine field naturalist.

"TREES FOR YOUR GARDEN" by Roy Lancaster, 147 pp., 4 fig., 6 tab., 39 b/w & 197 color photographs & 18 color photographic plates. Charles Scribner's Sons, New York, N. Y. 10017. 1975. $8.95.

The glory of this book is three-fold: first - the bright beauty and clarity of the many color photographs; second - the author's obvious encompassing interest in trees that is as contagious as a spontaneous smile for their esthetic and their practical uses; and third - the blooming, fruiting and growing condition information that comes from the British Isles but is applicable in many other places. This is a gem of a book to have if you possess a garden, or even if you have none.

"THE OUTDOOR GARDEN BUILD-IT BOOK" by Jack Kramer, v & 184 pp., 115 b/w photographs & 55 b/w line diagrams. Charles Scribner's Sons, New York, N. Y. 10017. 1977. $14.95 hardcover & $7.95 paperbound.

The author is well known in all fields of horticulture and landscaping not only as a prolific writer but also as a "do it yourself" person. Very attractive photographs, simple diagrams and deceptively simple directions must make readers plan all the outdoors of their dream castles or real abodes when they put the book down. And so would grow their patios with decks, roofs or overhangs, their fences and paths with outdoor lighting, their gazebos and trellises, their work centers, shelters and cold frames, their garden furniture and its containers, and then even their bird houses and feeders.

"THE LIVING CLOCKS" by Ritchie R. Ward, xxix & 385 pp., 69 b/w illus. Alfred A. Knopf, Inc., New York, N. Y. 10022. 1971. $8.95.

In this interesting book the author describes the questions that prompted the researches and the techniques used to identify and to attempt to locate, alter, understand operationally and indicate any survival value of timing mechanisms within a great range of organisms. Among others he considers such studies as Darwin's sleeping leaves, Hastings' and Sweeney's <u>Gonyaulax</u>,

Von Frisch and Renner's bees, Lindberg's desert pocket mice, Harker's cockroaches, Kramer's solar navigation and Sauers' celestial migration of day and night flying birds, and Aschoff's and Pittendrigh's human reactions. He shows how control of disease in the future by the timing of treatments might prove to be a great boon. He writes with much care and enthusiasm. This book should continue to enlighten many readers with inquiring minds.

"BREEDING PLANTS FOR DISEASE RESISTANCE — Concepts and Applications" edited by R. R. Nelson, xiii & 401 pp., 7 b/w fig., 13 tab. Pennsylvania State University Press, London & University Park, Pennsylvania 16802. 1973. $16.50.

The editor writes the first six chapters that deal with such basic concepts as meaning, detection, stability, pathogen variation and resistant genes. The second part deals with specific considerations for selected crops — rice, wheat, maize, oats, cotton, tobacco, sugarcane, barley, beans, soybeans, cucurbits, crucifers, peas, tomatoes, apples and forest trees — each discussed by an authority in the field. This book is an important contribution for workers and students in the fields of crop pathology control.

"FLOWERS AND PLANTS — An International Lexicon with Biographical Notes" by Robert Shosteck, xx & 329 pp., 393 b/w line drawings. Quadrangle/The New York Times Book Co., Inc., New York, N. Y. 10022. 1974. $9.95.

This is a pleasurable source of information about the derivation of common and scientific names of over a "thousand wild and cultivated plants and alphabetically arranges each plant according to its common name". For the taxonomist the important function of the name is to set that plant apart from all others; but for the plant aficionado these names provide many fascinating stories, honors, uses and origins. Amorphophallus surely does not derive its name from its highly variable tubers but from the spadix for its color and phallic form. The Asclepias syriaca species' name does not mean "resembles one from Syria" but results from a classic case of mixed labeling. This book lends itself to browsing which is enhanced by the recognizable sketches of many of the plants.

"THE COMPLETE BOOK OF GREENHOUSE GARDENING" by Ian G. Walls, x & 447 pp., 81 fig., 31 tab., 152 b/w photographs, & 4 color photographs. Quadrangle/New York Times Book Co., New York, N. Y. 10022. 1975. $14.95.

This is an excellent American adaptation of the excellent Brit-

ish publication prepared by the dean of greenhouse structuring and growing. An historical perspective is given in the first chapter from the Greek gardens or 'forcing houses' of Adonis, the unheat orangeries, the store houses, the giant conservatories built by Paxton to today's many varied forms, with hopefully an "effective balance between heating and ventilation and between light and shade".

The first 18 chapters deal with site, design, construction, operation, soil preparation and other phases of running greenhouses. American sources for the materials are listed. The next 14 chapters deal with the growing of a great variety of plants along with their bedding, pest control, flowering and fruiting.

"GARDENING WITH PERENNIALS — Month by Month" by Joseph Hudak, xvi & 398 pp., 59 b/w photographs & 18 color plates. Quadrangle/New York Times Vook Co., New York, N. Y. 10022. 1976. $12.50.

This really useful book catalogues "the majority of the noticeably attractive and reliable plants for garden use called hardy herbaceous perennials and winter tolerant bulbs which can be grown satisfactorily throughout most of the United States and southern Canada.....[and] the north temperate zones of other parts of the world....The main text is divided chronologically into seven monthly installments, the usual growing span for gardens in the Boston, Massachusetts, area.....Each of the monthly divisions is preceeded by an alphabetized list of the color values of the flowers." The plants are described as to flowering span and color, native habitat and general description. The format makes it so easy to find information quickly.

"DORLAND'S POCKET MEDICAL DICTIONARY" 22nd Edition edited by John P. Friel, xxi & 741 pp., 16 color anatomical plates. W. B. Saunders Company, London, Toronto, & Philadelphia, Pennsylvania 19105. 1977. $10.50.

It is abridged from "Dorland's Illustrated Medical Dictionary", presumable the latest, 25th edition, which was recently and favorably reviewed in this journal. Obsolete terms in earlier editions have been removed and thousands of new ones added reflecting recent advances. Besides the anatomical plates in color there are tables for arteries, bones, chemical elements, metric system, muscles, nerves and veins. I certainly agree with the dictionary editor that this book is "convenient in form, comprehensive in scope, and tailored to the needs of its vast audience in the health sciences". It is also very reasonably priced.

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