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SUPPLEMENTARY NOTES ON THE AMERICAN SPECIES OF STRYCHNOS. XVIII.

B. A. Krukoff

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Since the latest paper of this series (Supplement XVII) was published 93 new collections were examined. The newly examined collection added to our knowledge of several species and extensions of range were noted for eleven. Four species namely S. duckei Krukoff & Monachino, S. krukoffiana Ducke, S. lobelioides Krukoff & Barneby, and S. ecuadoriensis Krukoff & Barneby were collected for the second time. I have been waiting for the second collections of the first two since 1946 and 1947. Other prize collections are of S. malacosperma Ducke & Froes which was previously known for several collections from the type locality and S. pachycarpa -from four collections from the general vicinity of Manaus, Amazonas, Brazil.

3. Strychnos colombiensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 12 (1): 21. 1965.

Dudley 11486 was correctly anotated and cited in Suppl. #11 (Phytologia 22: 236. 1971). Thru a typographical error it was cited in Exsiccatae (Lloydia 35: 263. 1972) as S. asperula.

9. Strychnos araguaensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20 (1): 24. 1969.

Brazil: Piaui: mun. de Sete Cidades, Parque Nac. Cachuera do Riachão, Graziela M. Barroso 212 (RB); Para: São Felix do Xingu, Carlos S. Rosario 60 (MG); Mato Grosso: J. A. Ratter 2346 (UB).

This is the first record of the species from the State of Piaui.

10. Strychnos brachiata Ruiz & Pavón, Fl. Per. 2: 30. 1799.

Venezuela: Barinas: ± 100 m, Steyermark 102071. Brazil: basin of Rio Purus, below Boca do Acre, Prance2558.

This is the first record of this species from Barinas.

11. Strychnos trinervis (Velloso) Martius, Syst. Mat. Med. Bras. 121. 1843.

Brazil: Minas Gerais: Coronel Pacheco, E. P. Heringer 326 (RG); Rio de Janeiro and Guanabara: Herbarium Jard. Bot. Rio 186333 (RG) (Poço das Antas), D. Sucre 7902 (RG) (base da Pedra da Panela).

13. Strychnos tabascana Sprague & Sandwith , Kew Bull. 1927: 128. 1927.

Mexico: Veracruz: Los Tuxtlas, J. Ismael Calzada 1782 (MEXU).

17. Strychnos krukoffiana Ducke, Trop. Woods 90. 27. 1947.

Colombia: Vaupes: Mitu, Rio Vaupes (inundated), James L. Zaruchi 1823 (US).

This is the second collection of the species and the first record from Colombia. It was known previously from several collections from a single plant near Manaus, Brazil.

18. Strychnos medeola Sagot ex Progel in Mart. Fl. Bras. 6 (1): 282. 1868.

Brazil: Para: Tocantins, M. G. Silva 3474 (MG).

19. Strychnos toxifera Robert Schomburgk ex Bentham, Jour. Bot. Hook. 3: 240. 1841.

T. S. Santos 1250 (UB) from Bahia, Brazil was cited thru error as S. toxifera in Suppl. #13 (Phytologia 27: 99. 1973) and in Exsiccatae (Phytologia 33: 321. 1976). After examination of a better specimen it has been described as S. setosa in Suppl. #17 (Phytologia 41: 222. 1979). There is no record of S. toxifera growing in the State of Bahia.

20. Strychnos tomentosa Bentham, Jour. Linn. Soc. 1: 104. 1856.

Surinam: dist. Nickerie, area of Kabalebo Dam Project, N. M. Heyde 199 (U). French Guiana: Saul: M. Hijman 220 (U).

24. Strychnos jobertiana Baillon, Adansonia. 12: 367. 1879.

Venezuela: Terr. Fed. Amazonas: roadside, 3 km E of San Carlos de Rio Neyro, Ronald Liesner 3483 (Nov. 14, 1977).

25. Strychnos pseudo-quina A. St. Hilaire, Mem. Mus. Paris 9: 340. 1822.

Brazil: Distr. Fed.: C. Sastre 1103 (UB), E. P. Heringer 12858 (RG); São Paulo: L. Emygdio de Mello Filho 3727 (R), D. V. de Toledo Filho 5550 (SP) (mun. Itirapina), P. E. Gibbs 4324 (SP).

27. Strychnos amazonica Krukoff, Brittonia 4: 284. 1942.

Brazil: Amazonas: Manaus - Itacoatiara, Adair R. de Oliveira s.n. (28/7-1976) (INPA).

30. Strychnos lobelioides Krukoff & Barneby, Mem. N.Y. Bot. Gard. 12 (1): 44, fig 2. 1965.

Colombia: Amazonas - Vaupes: Rio Apaporis, entre Rios Kananeri y Pacoa, ±250 m, H. Garcia-Barriga 14021 (Dec. 1/15-1950).

This is the first collection with mature leaves and fruit-pedicel from which it is evident that the fruits are small and thin-shelled.

This species was previously known from the type collection with flowers and immature leaves from the basin of Rio Apaporis, Vaupes, Colombia.

31. Strychnos peckii B. L. Robinson, Proc. Amer. Acad. 49: 504. 1913.

Panama: Panama: El Llano - Carthi Road, P. J. M. Maas 1768.

This is the first record of the species from the province of Panama.

32. Strychnos erichsonii Richard Schomburgk, Reisen 3: 1082. 1848, nomen; ex Progel in Mart. Fl. Bras. 6 (1): 274. 1868.

Surinam: CoppenameRiver, National Reserve Raleigh Falls, N. M. Heyde 641 (U), National Reserve Brownsberg, ± 450 m, J. C. Lindeman 76 (U), area of Kabalebo Dam project. J. C. Lindeman 19 (U), 200 (U). Brazil: Amapá: margem do Rio Cupixi, Benedito G. S. Ribeiro 1568; Mato Grosso: Rio Juruena, M. G. Silva 3259 (MG).

32a. Strychnos croatii Krukoff & Barneby, Phytologia 33: 313. 1976.

Panama: Darien: J. P. Folsum 6368 (lowland area between Cerro Pierre and Piji vasal, 300 m); Barry Hammill 1138 (east base of Cerro Sapo, ± 1300 ft).

33. Strychnos gardneri A. DeCandolle in DeCandolle Prodr. 9: 14. 1845.

Brazil: Goias: mun. Luziania, E. P. Heringer 11945 (RG); 14399 (RG).

In Supplement #17 (Phytologia 41: 217. 1979) is stated that this species occurs in the state of Maranhão, Brazil. This is not correct.

35. Strychnos bredemeyeri (Schultes) Sprague & Sandwith, Kew Bull. 1927: 128 1927.

Venezuela: Terr. Fed. Amazonas: Ronald Liesner 3459; 3560; Apuré: Garrit Davidse 12848.

This is the first record of this species from Apure.

36a. Strychnos mitscherlichii Richard Schomburgk, Reisen 2: 451. 1848, var. mitscherlichii.

Guyana: Mazaruni River, 1-5 km NE of Kamarang, P. J. M. Maas 2575 (U). Colombia: border between Depts Antioquia and Bolivar, J. de Bruijn 1531 (WAD). Peru: Loreto: Iquitos, R. Martin 1682 (US).

This is the first evidence that this species is found in Antioquia and Bolivar.

38. Strychnos darienensis Seemann Bot. Voy. Herald 166. 1854.

Costa Rica: Puntarenas: Osa Penninsula, Roy W. Lent 430. Brazil: Para: Rio Cururú, Luiz Emygdio Mello Filho 4343 (R). Peru: Loreto: Maynas, Juan Revilla 2251, 2502, Christopher Davidson 5362.

38a. Strychnos ecuadoriensis Krukoff & Barneby, Phytologia 39: 276. 1978.

Ecuador: Napo: Coca, Puerto Francisco de Orellana, Holguer Lugo S. 2841 (US).

This is the first collection with mature flowers and they are shown on the attached drawing. The specimen has no tendrils or spines.

This species was previously known from the type collection from Napo, 4.2-7.5 kms W of Lago Agrio, from the rainforest.

39. Strychnos guianensis (Aublet) Martius, Syst. Mart. Med. Bras. 121. 1843.

Guiana: Mahaicony River, Butenabu Creek, D. H. Davis 207. Brazil: Rondonia: Herbarium Jard. Bot. Rio 184060 (RG). Colombia: Vaupes: Mitú, James L. Zaruchi 2169 (INPA). Peru: Loreto: Maynas, Al. Gentry 20816, Juan Revilla 2054, 2484.

45. Strychnos duckei Krukoff & Monachino, Lloydia 9: 68. 1946.

Brazil: Acre: Cruzeiro do Sul, L. R. Marinho 285 (MG).

This is the first collection in fruit. Fruits are small (± 1.25 mm in diam), one-seeded, with thin shells and yellow when mature.

This species was previously collected twice from the same plant near Marco (few dozen meters from the Colombian border), Tabatinga, Amazonas, Brazil.

48. Strychnos melinoniana Baillon, Bull. Soc. Linn. Paris 1: 256. 1880.

Guiana: NW District, P. J. M. Maas 2452 (U). Surinam: Brownsberg, P. J. M. Maas 2316 (U).

49. Strychnos parviflora Spruce ex Bentham, Jour. Linn. Soc. 1: 107. 1856.

Brazil: Mato Grosso: Fazenda Cachimbo, terra firme. M. R. Cordeiro 1122 (MG).

This is the first record of this species from Mato Grosso.

52. Strychnos oiapocencis Froes, Bol. Técn. Inst. Agrôn. Norte 36: 143. 1959.

Surinam; Afobaka Road, N. M. Heyde 363 (U).

53. Strychnos fendleri Sprague & Sandwith, Kew Bull. 1927: 129. 1927.

Venezuela: Anzoatequi: Al. Gentry 14849; Sucre: between Puerto La Cruz and Cumana, in scrub forest, G. Davidse 5075.

54. *Strychnos atlantica* Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 61. 1969.

Brazil: Bahia: Porto Seguro, reserva de Ceplac, Luis Emygdio de Mello Filho 2952 (R).

55. *Strychnos rubiginosa* A. DeCandolle in DeCandolle Prodr. 9: 16. 1845.

Brazil: Bahia: Irwin 30675 (Serra do Tombador, ± 22 km W of Morro do Chapéu, alt. ± 1000 m, caatinga). R. M. Harley 19142 (disturbed caatinga); Mato Grosso: Chapada dos Guimaraes, Prance 18882 (MG).

Irwin 30675 thru error was cited under *S. pseudo-quina* in Suppl. #13 (Phytologia 27: 99. 1973) and said to be a new record from Bahia. It is correctly cited under *S. rubiginosa* in the List of Exsiccatae (Phytologia 32: 320. 1976). In checking the card file on specimens of *S. pseudo quina* (135 collections) I find no record of this species from Bahia.

56. *Strychnos parvifolia* A. DeCandolle in DeCandolle Prodr. 9: 16. 1845.

Brazil: Para: Tocantins, M. G. Silva 3497 (MG); Pernambuco: Luis Emygdio de Mello Filho 3777 (R); Bahia: mun. Maracas, S. A. Mori 9924, 9978.

57. *Strychnos fulvotomentosa* Gilg in Engler Bot. Jarb. 25 (Beibl. 60): 40. 1898.

Brazil: Rio de Janeiro and Guanabara: Schwacke 5207 (RG), Mello Filho 98 (R).

57a. *Strychnos recognita* Krukoff &Barneby, Phytologia 27: 103. 1973.

T. S. dos Santos 727 (UB) was cited thru error as *S. fulvotomentosa* in Suppl.#13 (Phytologia 27: 103. 1973) and in Exsiccatae (Phytologia 33: 321. 1976). After examination of a better specimen it has been correctly identified and cited in Suppl. #17 (Phytologia 41: 225. 1979).

59. *Strychnos brasiliensis* (Sprengel) Martius, Flora 24 (Beibl. 2): 84. 1841.

Brazil: Rio de Janeiro: Serra dos Orgaos, J. C. Lindeman 6388 (R); Parana J. C. Lindeman 2286 (U), 2845 (U), E. Pereira 7163 (BM), Herbarium Jard. Bot. Rio 139431 (RG); Rio Grande do Sul: Pabst 6380 (R). Argentina: Corrientes: A. Schinini 11422 (Mexi).

61. *Strychnos pachycarpa* Ducke, Bol. Téch. Inst. Agrôn. Norte 3: 15. 1945.

Surinam: along railway, near Poekti, N. M. Heyde 520 (U).

This is the first record of the species from Surinam.

63. *Strychnos brachistantha* Standley, Field Mus. Publ. Bot. 12: 412. 1936.

Mexico: Tabasco: A. Novelo 44 (BM); Chiapas: D. E. Breedlove 38882 (CAS), 42854 (CAS), Alush Shilom Ton 3783 (CAS). Belize: Cayo, T. B. Croat 23595 (Mexi).

This is the first record of the species from Chiapas.

65. *Strychnos mattogrossensis* S. Moore, Trans. Linn. Soc. II. 4: 392. 1895.

Venezuela: Apuré: San Fernando, north bank of Orinoco, Gerrit Davidse 13187, 13207 (MO).

This is the first record of this species from Apuré.

68. *Strychnos malacosperma* Ducke & Froes, Bol. Técn. Inst. Agrôn. Norte 30: 43, figs 1-8. 1955.

Brazil: Para: Rio Peri (tributory of Rio Xingu), R. L. Froes 32488 (30/11-1956).

This species was previously known from the 5 collections fromthe type locality near Monte Alegre, Colonia de Mulata, Para, Brazil.

70. *Strychnos tarapotensis* Sprague & Sandwith, Kew Bull. 1927: 131. 1927.

Peru: Amazonas: Rio Genepa, 200-250 m, A. Kujikat 67 (MO), 150, Ernesto Ancuash 1002; Tingo Maria - Pucalpa, 1510 m, Herbarium Ellenberg 3852 (US); Loreto: Maynas, ±300 m, Ch. Froehner 61.

List of Exsiccatae

The first list of Exsiccatae covering papers on Strychnos, including Supplement XI, was published in Lloydia 35(3): 262-270. 1972, the second covering Supplements XII, XIII and XIV in Phytologia 33: 319-322. 1976, the third covering Supplements XV and XVI in Phytologia 39: 281-282. 1978. The forth list covering Supplement XVII in Phytologia 41: 237-238. 1979. Only numbered collections and those of which the dates of collection are recorded have been listed. Collections identified with doubt are not listed. If a collector gathered his collection together with others, only his name is cited in this list. Collections with Dr. Prance's numbers are cited under Prance.

Ancuash, Ernesto, 1002 (70).

Barroso, Graziela M., 212 (9).
Breedlove, D. E., 38882 (63), 42854 (63).
Bruijn de, J., 1531 (36a).

Calzada, J. Ismael, 1782 (13).
Cordeiro, M. R., 1122 (49).
Croat, T. B., 23595 (63).

Davidse, Gerrit, 5075 (53), 12848 (35), 13187 (65), 13207 (65).
Davidson, C., 5362 (38).
Davis, D. H., 207 (39).

Ellenberg (Herbarium), 3852 (70).

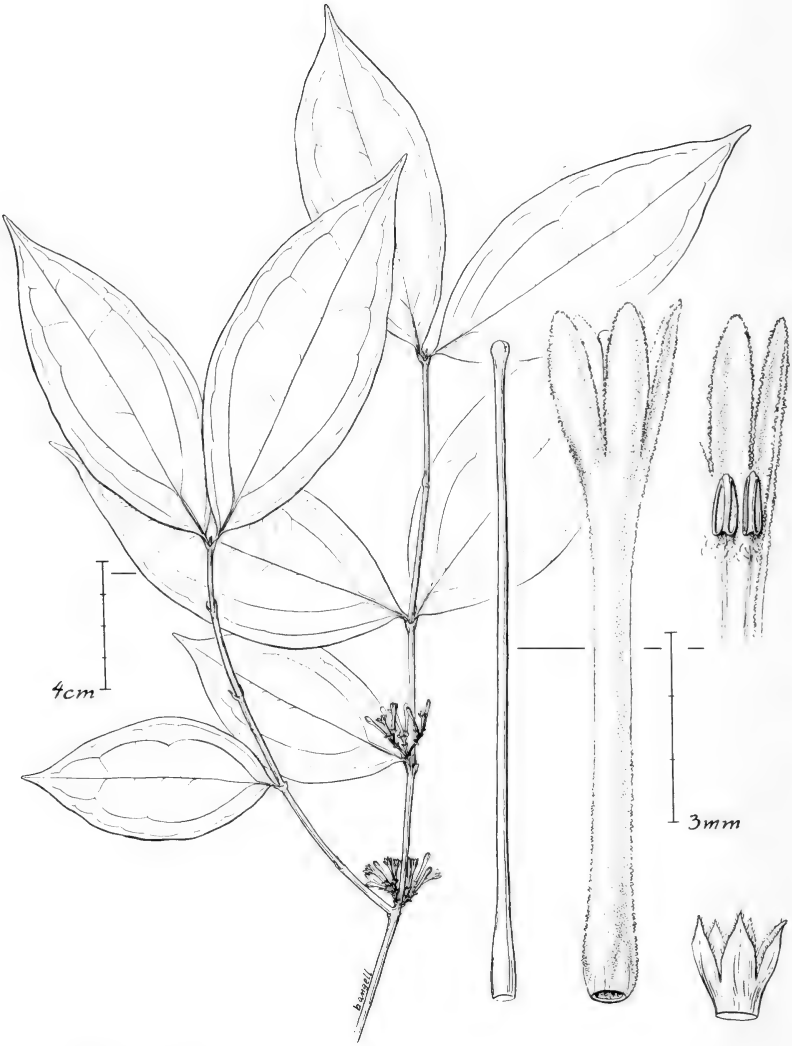
Folsom, J. P., 6368 (32a).
Froehner, Christoph., 61 (70).
Froes, R. L., 32488 (68).

Garcia-Barriga, H., 14021 (30).
Gentry, Al., 14849 (53), 20816 (39).
Gibbs, P. E., 4324 (25).

Hammel, Barry, 1138 (32a).
Harley, R. M., 19142 (55).
Herbarium Jard. Bot. Rio, 139431 (59), 184060 (39), 186333 (11).
Heringer, E. P., 326 (11), 11945 (33), 12858 (25), 14399 (33).
Heyde, N. M., 199 (20), 363 (52), 520 (61), 641 (32).
Hijman, M., 220 (20).
Holguer, Lugo S., 2841 (38a).

Kujikat, A., 67 (70), 150 (70).

Labouriau, L., 1160 (25)



Holguer Lugo S. 2841

Strychnos ecuadoriensis Krukoff & Barneby

SUPPLEMENTARY NOTES ON AMERICAN MENISPERMACEAE XV

NEOTROPICAL TRICLISIEAE AND ANOMOSPERMEAE

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Since the latest paper of this series (Supplement XIV) was published 68 new collections were examined, adding to our knowledge of several species: Extension of ranges were noted from 8 but no new species were described. The new record of genus Caryomene from French Guiana and collections of Sciadotenia eichleriana and S. pubistaminea are of particular interest.

I. Chondrodendron Ruiz & Pavón, Syst. Veg. 261. 1798.

1. Chondrodendron tomentosum Ruiz & Pavón, Syst. Veg. 261. 1798.

Peru: San Martín: Mariscal Caceres, Timothy Plowman 7560; Amazonas: Rio Genepa, A. Kujikat 228 (MO).

This is the first record of this species from Amazonas.

2. Chondrodendron platiphyllum (A. de St. Hilaire) Miers, Ann. Mag. Nat. Hist. III. 19: 122. 1867.

Brazil: Rio de Janeiro: J. Almeida 1264 (RB), G. Martinelli 2816 (RB), D. Sucre 5113 (RB), 8994 (RB).

3. Chondrodendron microphyllum (Eichler) Moldenke in Krukoff & Moldenke, Brittonia 3: 11 1938.

Brazil: Bahia: S. A. Mori 10840, 9366 (mun. Ibicarai), 9825 (mun. Santa Cruz de Cabrálea), 10284 (mun. Almadina), Luiz Emygdio de Mello Filho 2935 (R), Harley 17880 (coastal zone).

II. Curarea Barneby & Krukoff, Mem. N.Y. Bot. Gard. 22(2): 7. 1971.

1. Curarea toxicofera (Weddell) Barneby & Krukoff, Mem. N.Y. Bot. Gard. 22(2): 9. 1971.

Panama: Darien: near ridgetop of Pierre Chain, 600-1100 m, J. P. Folsom 6357. Peru: Amazonas: Rio Genepa, 200-250 m, Ernesto Ancuash 1219, A. Kujikat 107 (MO).

This is the first record of the species from Darien.

Schunke 4605 was correctly anotated and cited in two card files as *Curarea toxicofera* but thru a typographical error cited as *Sciadotenia toxifera* in Suppl. #9 (Phytologia 25: 35. 1972) and in Exsiccatae (Phytologia 33: 340. 1976).

2. *Curarea candicans* (L. C. Richard) Barneby & Krukoff, Mem. N.Y. Bot. Gard. 22(2): 12. 1971.

Surinam: Lely Mts: J. C. Lindeman 805.

III. *Sciadotenia* Miers, Ann. Nat. Hist. II, 7: 43. 1851.

1. *Sciadotenia cayennensis* Bentham, Jour. Linn. Soc. Bot. 5 (Suppl. #2): 51. 1861.

Surinam: 850 m, A. G. H. Daniels 1109 (U).

2. *Sciadotenia toxifera* Krukoff & A. C. Smith, Bull. Torrey Club 66: 308. 1939.

Peru: San Martín, Mariscal Caceres, Timothy Plowman 7537.

6. *Sciadotenia eichleriana* Moldenke in Krukoff & Moldenke, Brittonia 3: 28. 1938.

Brazil: Amazonas: Manaus - Caracarai Road, G. T. Prance 24241.

This the first record of the species from the upper Rio Negro.

7. *Sciadotenia sprucei* Diels in Engler, Pflanzenreich 4 (94): 84. 1910.

Venezuela: Terr. Fed. Amazonas, 4 km, east of San Carlos de Rio Negro, Ronald Liesner 3645.

12. *Sciadotenia amazonica* Eichler, Flora 47: 395. 1864 and in Martius, Fl. Bras. 13(1): 201, tab 47, fig 3. 1864.

Peru: Loreto: Maynas, Iquitos, Christopher Davidson 5273.

13. Sciadotenia duckei Moldenke in Krukoff & Moldenke, Brittonia 3: 30. 1938.

Brazil: Amazonas: W. Rodrigues 9703 (INPA) (Manaus), L. Duarte 216 (Est. Biol. Walter Egler).

16. Sciadotenia pubistaminea (K. Schumann) Diels in Engler, Pflanzenreich 4(94): 85. 1910.

Brazil: Bahia: L. A. Mattos Silva 187.

This is the fifth collection of this species. It is known from the States of Bahia and Minas Gerais; its fruits are not yet known.

V. Telitoxicum Moldenke in Krukoff & Moldenke, Brittonia 3: 42. 1938.

1. Telitoxicum minutiflorum (Diels) Moldenke in Krukoff & Moldenke, Brittonia 3: 49. 1938.

Brazil: Amazonas: basin of Rio Negro, M. R. Santos 104 (MG).

2. Telitoxicum duckei (Diels) Moldenke in Krukoff & Moldenke, Brittonia 3: 47. 1938.

French Guiana: J. Lenormand s.n. (U).

This is the first record of the species from French Guiana.

3. Telitoxicum krukovii Moldenke in Krukoff & Moldenke, Brittonia 3: 44. 1938.

Surinam: Coppename River: Nature Reserve Raleigh Falls, N. M. Heyde 609 (U).

This is the first record of the species from Surinam.

VI. Abuta Barrère ex Aublet, Pl. Guian. 1: 618. Pl. 250. 1775.

1. Abuta rufescens Aublet, Hist. Pl. Guian. 1. 618. Pl. 250. 1775.

Brazil: Para: Serra dos Carajas, M. G. Silva 2932 (MG); Amazonas: Manaus - Itacoatiara road, Adair R. de Oliveira s.n. (23/06-1976). Peru: San Martín: Mariscal Caceres, Timothy Plowman 7474; Loreto: Maynas, A. Gentry 21742.

4. Abuta grisebachii Triana & Planchon, Ann. Sci. Nat. IV, 17: 47. 1862.

Brazil: Amazonas: Manaus - Itacoatiara road, J. Aluisio de Sousa s.n. (15/7-1976) (INPA).

9. Abuta pahni (Martius) Krukoff & Barneby, Mem. N.Y. Bot. Gard. 22(2): 43. 1971.

Peru: San Martín: Mariscal Caceres, Timothy Plowman 7473.

Prance 18681 was correctly anotated in MG as A. pahni in 1976 but the card was misplaced and thru error it was cited as A. grisebachii in Suppl. #14 (Phytologia 39: 245. 1978) and in Exsiccatae. This specimen is important as it is the first record of the species from Mato Grosso.

13. Abuta imene (Martius) Eichler, Flora 47: 389. 1864.

Prance 17487 was cited thru error as Abuta solimaesensis in Suppl. #11 (Phytologia 33: 332. 1976) and in Exsiccatae. It is Abuta imene.

14. Abuta selloana Eichler, Flora 47: 389. 1864.

Brazil: Rio de Janeiro: Herbarium Jard. Bot. Rio 148542 (RB); Parana: mun. Cerro Azul, G. Hatschbach 40218.

16. Abuta solimoesensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(2): 18. 1970.

Peru: San Martín: Mariscal Caceres, Timothy Plowman 7549.

17. Abuta velutina Gleason, Bull. Torrey Club 58: 361. 1931.

Brazil: Amazonas: Manaus, Reserve Forestal Ducke, Herbarium Inpa 72817.

21. Abuta sandwithiana Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(2): 18. 1970.

Brazil: Amazonas: Lago Miua, Roberto F. Melo 223 (MG).

26. Abuta chiapasensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(2): 23. 1970.

Guatemala: San Pedro, Elias Contreras 9512 (MEXI).

This is the first record of this species from Guatemala.

27. Abuta grandifolia (Martius) Sandwith, Kew Bull. 1937: 397. 1937.

Surinam: N. M. Heyde 139 (U), 193 (U), 244 (U) (area of Kabalebo Dam project) also N. M. Heyde 651 (U) (National Reserve Raleigh Falls). Para: J. M. Pires 16091 (MG); Amazonas: basin of Rio Negro, A. B. Anderson 233 (INPA), M. R. Santos 64 (MG), C. D. A. Mota s.n. (13/07-1976) (INPA); Mato Grosso: R. Sousa 10426 (UB); Rondônia: W. R. Anderson 12200 and 12295 (Rio Pacaas Novos), Herbarium Jard. Bot. Rio 184063 (RB). Peru: Loreto: Maynas, Al. Gentry 21887, 21985. Ecuador: Napo: Rio Suno, ± 400 m, L. Holm-Nielson 847 (AAU).

VII. Caryomene Barneby & Krukoff, Mem. N.Y. Bot. Gard. 22(2): 52. 1971.

3. Caryomene olivascens Barneby & Krukoff, Mem. N.Y. Bot. Gard. 22(2): 57. 1971.

French Guiana: Cayenne: Saül, Fournet 25.

This is the first record of genus Caryomene for French Guiana.

VIII. Anomospermum Miers, Ann. Nat. Hist. III, 14: 101. 1864.

4a. Anomospermum chloranthum Diels ssp. chloranthum, Mem. N.Y. Bot. Gard. 22(2): 68. 1971.

Peru: Loreto: Maynas, Al. Gentry 20846.

4c. Anomospermum chloranthum Diels ssp. isthmicola Krukoff & Barneby Mem. N.Y. Bot. Gard. 22(2): 70. 1971.

Panama: Panama: from Torti to the Pilota del Toro, J. P. Folsom 5062 (MO), 6789.

5a. Anomospermum reticulatum (Martius) Eichler ssp. reticulatum, Mem. N.Y. Bot. Gard. 22(2): 73. 1971.

Brazil: Para: basin of Rio Tocantins, M. G. Silva 3609 (MG); Amazonas: basin of Rio Negro, M. R. Santos 30(MG);

Mato Grosso: Rio Juruena, M. G. Silva 3333 (MG).

This is the first record of the species from Mato Grosso.

IX. Orthomene Barneby & Krukoff, Mem. N.Y. Bot. Gard. 22(2): 79. 1971.

1. Orthomene schomburgkii (Miers) Barneby & Krukoff, Mem. N.Y. Bot. Gard. 22(2): 80. 1971.

Surinam: N. M. Heyde 725. Brazil: Rondônia: Rio Guaporé, Ilha das Flores, Herbarium Jard. Bot. Rio 184062 (RB); Bahia: mun. Camaca, T. S. dos Santos 3317. Colombia: Antioquia: Rio Anori, ± 400-700 m, W. S. Anderson 34. Peru: Loreto: Requena, Al. Gentry 21280.

This is the first record of the species from the province of Antioquia, Colombia and from the State of Rondônia, Brazil.

List of Exsiccatae

The first list of Exsiccatae covering papers on Menispermaceae including Supplement VIII was published in Mem. N.Y. Bot. Gard. 22: 1-89. 1971, the second list covering Supplements IX, X, and XI in Phytologia 33: 337-340. 1976, the third covering Supplements XII and XIII in Phytologia 39: 292-293. 1978, and the forth list covering Supplement XIV in Phytologia 41: 254-255. 1979. The present list covers Supplement XV. The number in parenthesis corresponds with the species - number of this and other papers (Supplements XIII to XV). Only numbered collections and those of which the dates of collection are recorded have been listed. If a collector gathered his collection together with others, only his name is cited in this list. Collections with Dr. Prance's numbers are cited under Prance.

Almeida, J., 1264 (CH2).
Ancuash, Ernesto, 1219 (CU1).
Alverson, W. S., 34 (O1).
Anderson, A. B., 233 (A27).
Anderson, William R., 12200 (A27), 12295 (A27).

Contreras, Elias, 9512 (A26).

Davidson, Christopher, 5273 (S12).
Duarte, L., 216 (S13).

Folsom, J. P., 5062 (AN4C), 6357 (CU1), 6798 (AN4c).
Fournet, A., 25 (C3).

Gentry, A., 20846 (AN4a), 21742 (A1), 21280 (01), 21887 (A27), 21985 (A27).

Harley, R. M., 17880 (CH3).
Hatschbach, G., 40218 (A14).
Herbarium Inpa, 72817 (A17).
Herbarium Jard. Bot. Rio, 148542 (A14), 184062 (01), 184063 (A27).
Heyde, N. M., 139 (A27), 193 (A27), 244 (01), 609 (T3), 651 (A27), 725 (01).
Holm-Nielsen, L., 847 (A27).

Kujukat, A., 107 (CU1), 228 (CH1).

Lenormand, s.n., (T2).
Liesner, Ronald, 3645 (S7).
Lindeman, J. C., 805 (CU2).

Martinelli, G., 2816 (CH2).
Mattos Silva, L. A., 187 (S16).
Mello Filho de, Luis Emilio, 2935 (CH3).
Melo, Roberto F., 223 (A21).
Mori, S. A., 9366 (CH3), 9825 (CH3), 10284 (CH3), 10840 (CH3).
Mota, C. D. A., s.n. (13/07-1976) (A27).

Oliveira de, Adair R., s.n. (23/06-1976) (A1).

Pires, J. M., 16091 (A27).
Plowman, Timothy, 7473 (A9), 7474 (A1), 7537 (S2), 7549 (A16), 7560 (CH1).
Prance, 17487 (A13), 24241 (S6).

Rodrigues, W., 9703 (S13).

Santos, M. R., 30 (AN5a), 64 (A27), 104 (T1).
Santos dos, T. S., 3317 (O1).
Silva, M. G., 2932 (A1), 3353 (AN5a), 3609 (AN5a).
Sousa de, J. Aluisio, s.n. (15/7-1976) (A4).
Sousa, R., 10426 (A27).
Sucre, D., 5113 (CH2), 8994 (CH2).

NOTES ON THE SPECIES OF ERYTHRINA. XIV

B. A. Krukoff

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In connection with preparation of Supplement XII which was recently submitted for publication in Annals of Missouri Botanical Garden-377 collections were examined. Of these 195 collections are cited in this paper. Extension of range is noted only for E. chiriquensis. No new species are described.

The important part of this paper is the second List of Exsiccatae covering specimens cited in Supplements XII and XIV. In connection with work on Lists of Exsiccatae some errors were detected. The work on the genus was carried on since 1938. Many thousands of collections were named, duplicates of some of these deposited in different herbaria. All errors occured in my working in various herbaria where I was pressed for time. These and typographical errors are being corrected in this paper and the others will be corrected in the next supplement after my visit to various herbaria.

It seems fortunate that most active collecting in a century is being carried on presently in Mexico which is a center of the genus as far as the number of species (28 species and subspecies) is concerned. The end of this is not yet in sight. Another very large collection from Mexico is on the way to me for identification.

1. Erythrina fusca Loureiro, Fl. Cochinch. 427. 1790 based on Gelala aquatica Rumphius, Herb. Amb. 2: 235. t. 78. 1750.

Panama: Panama: slopes of Cerro Jefe, ± 3200 ft, F. Almeda 3475 (CAS). Colombia: delta of Magdalena River, Dugand 865 (MAD), 933 (MAD). Peru: Loreto: Maynas, Antonio Arostegui V., 49 (MAD),61 (MAD), coll. undes. 49 (MAD). Surinam: cultuurtuin 190 (MAD). Brazil: Bahia: mun. Ilheus, S. A. Mori 10395, 10396; Rio de Janeiro: H. M. Curran 307 (MAD) (cult.); Parana: Rio Tibagi (cult. (?)) Herbarium Mus. Nac. Rio 66685 (R).

2. Erythrina crista-galli L. Mant. 99. 1767.

Brazil: Minas Gerais: Ponta Grossa, Pe. Leopoldo Krieger 7667 (RB): Rio de Janeiro: Herbarium Jard. Bot. Rio 143027 (RB) (cult.); Rio Grande do Sul, Lino Tatto 3668 (MAD). Argentina: H. H. Curran 30 (MAD), 83 (MAD), 89 (MAD). Morocco: Rabit, J. Lewalle 8696 (cult.), 8708b (cult.). U.S.A.: Florida: D. Burch 6831 (MO) (cult.). Country undesign.: Marcelo Navarrez s.n. (MAD).

3. Erythrina falcata Bentham in Mart. Fl. Bras 15 (1): 172. 1859.

Brazil: Minas Gerais: J. A. Ratter 2677 (UB), A. P. Duarte 13068 (RB), L. d' A. Freire de Carvalho 1085 (RB); Rio de Janeiro: Herbarium Jard. Bot. Rio 80834 (Petropolis) (RB), 11288 (RB), 157825 (Horto Forestal) (RB); São Paulo: Juquiá-Piedade, P. E. Gibbs 6651 (SP). Argentina: Misiones: H. H. Curran 2 (MAD), 708 (MAD). Bolivia: Sorata: Graf s.n.

5. Erythrina ulei Harms, Verh. Bot. Ver. Brand. 48: 172. 1907.

Peru: Junín: ± 700 m, Al. Gentry 16417.

The collector states on the label: "flowers visited by hummingbirds."

6. Erythrina verna Velloso, Fl. Flum. 304. 1825.

Brazil: Minas Gerais: E. P. Heringer 7777A (Paraopeba), (UB), 15166 (mun. Bom Jesus do Galho), (UB), Roberto S. Ramalho 1004 (Viçosa, cult.) (RB).

7. Erythrina poeppigiana (Walpers) O. F. Cook in Bull. U. S. Dept. Agr. Bot. 25: 57. 1901.

Costa Rica: Cartago: F. Almeda 4194 (CAS) (cult.). Colombia: Cuatrecasas 14504 (MAD). Brazil: Rio de Janeiro: cult., Paula Laclette 452 (R). Taiwan: cult., C. E. Chang 10027 (K).

8. Erythrina suberosa Roxburgh, Hort. Beng. 53, nomen 1814; Fl. Ind. 3: 253. 1832.

India: Dehra Dun., Ram Prasad Doval s.n. (3/27-1929-flrs.) (6/30-1929-frts.) (MAD).

12. Erythrina arborescens Roxburgh, Hort. Beng. 53, nomen 1814: Pl. Coromandel 3: 14, pl. 219. 1819.

India: Tehri-Gorhwal; near Bhatwari, P. P. Huggins A18 (BM); West Bengal: H. Ohashi et al. s.n. (July 25, 1972) (the Fifth Bot. Exp. Himalaya) (BM) (Darjeeling, ± 2200 m). Nepal: L. W. Beer 25713 (BM) (± 6000 ft), Stainton 6698 (BM) (± 7000 ft); H. Kanai s.n. (July 11, 1970) (BM), s.n. (Aug. 22, 1972) (BM), Bhutan: R. E. Cooper 1293 (BM), 2612 (BM), Ludlow s.n. (5/8-1949) (± 7500 ft), s.n. (5/8-1949) (± 5400 ft).

13. Erythrina subumbrans (Hasskarl) Merrill in Philipp. Jour. Sci. Bot. 5: 113. 1910.

Thailand: Chiang Mai: ± 450 m, Edward F. Anderson 4195 (CAS); Mae Hong Son: ± 750 m, Edward F. Anderson 4250 (CAS). India: Chota Nagpur Hazaribagh District, F. H. W. Kerr 2029 (BM).

14. Erythrina breviflora Alph. DeCandolle, Prodr. 2: 413. 1825.

Mexico: Morelos: X. Lozoya s.n. (Oct. 19, 1977) (MEXU), Alma D. Villegas s.n. (Sept. 9, 1978) (Cuernavaca) (MEXU); Michoacan: R. Kral 27670 (MEXI), C. R. Parks 295 (CAS); Gerrero: Teresa German 939.

16. Erythrina speciosa Andrews, Bot. Repos. 7. pl. 443. 1806.

Brazil: Rio de Janeiro: Museu Imper. Petropolis, Elsie F. Gumaraes s.n. (May 1976) (RB). Hongkong: Kadoorie Gardens, G. Baretto 148 (K).

19. Erythrina montana Rose & Standley in Contr. U.S. Nat. Herb. 20: 179. 1919.

Mexico: Sinaloa: Sierra Surufoto, ± 5800 ft, Breedlove 18599 (CAS).

20. Erythrina leptorhiza Alph. DeCandolle, Prodr. 2: 413. 1825.

Mexico: Mexico: Dudley Gold 178 (± 2250 m) (MEXI), C. Dziekanowski 3040 (± 8000 ft), Rzedowski 28300 (± 2800 m) (MEXI), 30762 (± 2600 m) (MEXI), 32034 (Cerro del Tigre, (± 2500 m) (MEXU); 33269 (± 2300 m) (MEXI); Distr. Fed.: A. Ventura A. 1399 (± 2550 m) (MEXI), 1486 (± 2800 m) (MEXI), 1578 (± 2400 m) (MEXI), 1882 (± 2500 m) (MEXI), 2769 (± 2050 m) (MEXI), S. Moreno G. 247 (MEXI); Hidalgo: ± 2500 m, A. Ventura A. 149 (MEXI); Morelos: J. Vasques 1770 (MEXU).

22a. Erythrina herbacea L. subsp. herbacea Erythrina herbacea L. Sp. Pl. 706. 1753. sens, str.

U.S.A.: D. H. Caldwell 8736 (MAD); South Carolina: Duane Isely 10399 (CAS); Florida: W. L. Stern 138 (MAD), 226 (MAD), Ira L. Wiggins 19656 (CAS), Archie Wilson s.n. (July 1953) (MAD).

22b. Erythrina herbacea L., subsp. nigrorosea Krukoff & Barneby in Phytologia 25(1): 6. 1972.

Mexico: San Luis Potosi, D. B. Dunn 19189 (MEXI); Veracruz: F. Chiang 444 (mun. Ozuluama) (MEXU), C. Vasquez Yanez 593 (MEXU) and 889 (MEXU) (Cerro Monte de Oro).

This entity was described in 1972 and by now it is known from 87 collections from 9 eastern states in Mexico, being especially common in Oaxaca.

23. Erythrina standleyana Krukoff in Brittonia 3: 301. 1939.

Mexico: Campeche: R. Grether 576 (MEXU).

24. Erythrina flabelliformis Kearney in Trans. N.Y. Acad. 14: 32. 1894.

Mexico: Sonora: Arthur C. Gibson 2280 (MEXI), J. R. Hastings 71-193 (± 885 m) (MEXI), 71-204 (± 975 m) (MEXI).

25. Erythrina coralloides Alph. DeCandolle, Prodr. 2: 413 1825.

Mexico: San Luis Potosi: A. Gomez 500 (mun. Villa Hidalgo); Mexico: ± 2300 m, J. Espinosa s.n. (11/3-1973). Portugal: Lisboa, cult., A. A. de Carvalho Monteiro 6667 (BM).

28b. Erythrina lanata Rose subsp. occidentalis (Standley) Krukoff & Barneby in Phytologia 27: 117 1973.

Mexico: Sinaloa: in open savanna, D. H Norris 20146 (CAS): Tres Marias Islands: John T. Howell 10455 (CAS); Jalisco: 20 km NW de Chamela, nivel del mar, M. Sousa 3927 (MEXU) also seedling grown from seeds of this collection, J. Arturo S. Magallanes 729 (mun. La Huerta) (MEXU); Morelos: Chimalacatlan, J. Vasquez S. 1959 (MEXU).

29. Erythrina goldmanii Standley in Contr. U.S. Nat. Herb. 20: 181. 1919.

Mexico: Oaxaca: Mario Sousa 525 (mun. Jamiltepec, 440 m) (MEXU), 6999 and 7021 (Distr. Putla) (flor roja, caliz purpuro oscuro); 7405 (Distr. Juchitan, 50 m), (MEXU), Chiapas: Breedlove 39981 (mun. San Fernando), (CAS), 40625 (mun. Amatenango de la Frontera) (CAS)

30. Erythrina caribaea Krukoff & Barneby in Phytologia 25: 9. 1972.

Mexico: Veracruz: T. Croat 39662 (2 km N of Huatusco) (MO), Mario Sousa 4290 (MEXU) (mun. S. Andres Tuxtla), John H. Beaman 5261 (Catemaco) (MEXU); Tabasco: slope of Cerro Las Campanas. 30-100 m, J. Conrad 2825; Oaxaca: (mun. Chiltepec); Guadelupe Martinez-Calderon 1393 (CAS); Chiapas: Ocusingo, 470 m, Juan I. Calzada 2840 (F).

31. Erythrina folkersii Krukoff & Moldenke in Phytologia 1: 286. 1938.

Belize: Yale 3327 (MAD). Mexico: Veracruz: C. Vasquez Yanez 751 (MEXU), Leija Gonzales 835 (Veracruz-Coatzacoalco) (MEXU), 3969 (MEXU); Oaxaca: Pochutla, ± 750 m, Mario Sousa 7575; Chiapas: mun. Palenque, ± 300 m, Breedlove 24215 (CAS).

35. Erythrina hondurensis Standley in Field Mus. Publ. Bot. 4: 309. 1929.

Honduras: Atlantida: Lancetilla valley, 10-150 m, T. Croat 42660 (MO). Nicaragua: Paul J. Shenk 63 (MAD).

36. Erythrina chiapasana Krukoff in Brittonia 3: 304. 1939.

Mexico: Chiapas: R. F. Thorpe 41518 (± 5400 ft) (CAS), H. Mill 366 (Jitotol Ridge, 5800 ft) (CAS), E. W. Lathrop 5166 (3 km N of Pueblo Nuevo Solistahuacan) (CAS), R. F. Thorne 41207 (mun. Pueblo Nuevo, ± 5400 ft) (CAS), D. E. Breedlove 39647 (mun. Zinacantan) (CAS), 39804 (mun. Ocozoatla de Espina) (CAS), 41240 (mun. Chanal (MO).

39. Erythrina williamsii Krukoff & Barneby in Phytologia 22(4): 266. 1971.

Guatemala: Alta Verapaz vicin. of San Juan Chamelco, ± 1450 m, L. O. Williams 43201 (US).

41. Erythrina chiriquensis Krukoff in Brittonia 3: 222. 1939.

Panama: Darien: Cerro Tacarcuna, premontane wet forest, 1250-1450 m, Gentry & Mori 13946.

This is a new record of this species from Darien.

42. *Erythrina macrophylla* Alph. DeCandolle, Prodr. 2: 411. 1825.

Guatemala: El Quiche: ± 2100 m, Antonio Molina 30293 (MEXI).

43. *Erythrina guatemalensis* Krukoff in Amer. Jour. Bot. 28: 688. 1941.

Guatemala: Alta Verapaz: along road to El Estor, T. Croat 41484 (MO), 41717 (MO).

44. *Erythrina globocalyx* Porsch & Cufodontis in Arch. Bot. Sist. Fitog. & Genet. 10: 35, pl. 1. 1934.

Ray W. Lent 1163 was identified at first as *E. chiriquensis* but corrected and identified later correctly as *E. globocalyx*. Cards, however, were not removed from the card index and as a result the specimen was cited in Suppl. V (Phytologia 22: 277. 1971) under both species. This collection was correctly cited in Exsiccatae.

45. *Erythrina florenciae* Krukoff & Barneby in Mem. N.Y. Bot. Gard. 20(2): 171. 1970.

Mexico: Chiapas: mun. Motozintla de Mendoza, ± 2100 m, montane rain forest, Breedlove 41696 (MEXU).

49. *Erythrina lanceolata* Standley in Contr. U.S. Nat. Herb. 17: 432. 1914.

Honduras: Comayagua: Toulabe, Garcia Maynor 033 (MO)

50. *Erythrina costaricensis* M. Micheli, Bull. Herb. Boiss. 2: 445. 1894.

Panama: M. Nee 7268 (MAD); Canal Zone J. P. Folsum 1938; Panama: J. P. Folsum 6594 (MO).

52. *Erythrina americana* Miller, Gard. Dict. ed. 8, No. 5. 1768.

Mexico: Nepantla, O. Converse 131 (MEXI); Veracruz:

G. K. Arp 4174 (10 kms E of Huatusco) (F), Roberto V. Ortega Ortiz 0-287 (Jilotepeg) (F), C. Velázquez Lices VL-290 (Tepatlaxco) (F), Manuel G. Zolá Baez Z-457 (La Concepcion, Vista Hermosa, ± 1120 m) (F), Juan Ismael Calzada 2427 (Casautlan) (F), 3080 (Xalapa) (F), 3177 (F); Morelos: Cuernavaca: ± 1400 m, Alma D. Villegas 17 (MEXU).

53. Erythrina berteroana Urban, Symb. Ant. 5: 370. 1908.

Panama: Chiriquí: Berenice de Caballero 19 (MO), J. P. Folsom 3935 (MO), 3937 (MO); Coclé: J. P. Folsum 2740 (MO); Canal Zone: Edwin L. Tyson 7400 (MEXU), G. A. Sullivan 587. Puerto Rico: W. R. Durland s.n. (MAD).

54. Erythrina rubrinervia H. B. K. Nov. Gen. & Sp. 6: 434. 1824.

Panama: Darien: Barry Hammel 1336 (MO).

58. Erythrina gibbosa Cufodontis in Arch. Bot. Sist. Fitog. & Genet. 10: 34. 1934.

Panama: Coclé: Barry Hammel 4807 (MO), J. P. Folsum 2755 (MO).

71. Erythrina caffra Thunberg, Prodr. Pl. Cap. 121. 1800.

Morocco: Royal Palace (cult.), J. Lewalle 8695.

72. Erythrina lysistemon Hutchinson in Kew Bull. 1933: 422. 1933.

Hong Kong: Kadoorie Gardens, cult., G. Baretto 150 (K).

79. Erythrina senegalensis Alph. DeCandolle, Prodr. 2: 413. 1825.

Cameroun: Ngéchéwe, J. Raynal 12774 (K).

80. Erythrina excelsa Baker in Oliver Fl. Trop. Africa 2: 183. 1871.

Southern Nigeria: Dageman District, P. A. Talbot 3747.

81. Erythrina mildbraedii Harms in Mildbr. Deutsch. Zentr.-Āfr. Exp. 1907/1908, 2: 264. tab. 30. 1911.

Ghana: W. T. S. Brown 2152 (MAD).

83. Erythrina mendesii Torre in Bol. Soc. Brot. (Ser. 2) 39: 212. 1965.

Angola: E. J. Mendes 1079 (Isotype) (BM).

A colored photo of this species was published in Conspect. Fl. Angol. 3: fasc. 2. 1966.

86. Erythrina livingstoniana Baker in Oliver Fl. Trop. Africa 2: 182. 1871.

Rhodesia: Chiredzi, G. Pope 1511 (K).

87. Erythrina tholloniana Hua in Bull. Soc. Linn. Paris, n.s. 1: 53. 1898.

West Africa: G. LeTestu 1691 (BM)

89. Erythrina droogmansiana DeWildeman & Th. Durand in Bull. Soc. Roy. Bot. Belg. 40: 19. 1901.

Angola: de Malanje, R. de Champs 1461 (MAD).

93. Erythrina sigmoidea Hua in Bull. Mus. Hist. Nat. Par. 3: 327. 1897.

Oubangi-Chari: G. Le Testu 1015 (BM), 2677 (BM), 3720 (BM).

95. Erythrina abyssinica Lamarck, Encycl. Bot. 2: 392. 1788; ex. Alph. DeCandolle Prodr. 2: 413. 1825: Gillet in Kew Bull. 15: 426. 1962.

Burundi M. Reekmans 5319. Angola: Huambo, R. DeChamps 1042 (MAD). Kenya: S. S. Hooper 1447 (K), 1505 (K). Rhodesia: Eyles Herbarium 4538 (BM). Malawi: Northern province: Jean Pawek 5772 (CAS).

96. Erythrina variegata L. Herb. Amboin. 10. 1754; Amoen. Acad. 4: 122. 1759, based on Gelala alba Rumphius, Herb. Amboin, 2: 234. t. 77. 1750.

East Pakistan: Chittagong, S. Majumder s.n. (2/19-1966) (MAD), s.n. (6/25-1968) (MAD). North Borneo: E. L. Foster 65 (MAD). New Guinea: J. H. L. Waterhouse 266 (MAD). New Caledonia: MacKee 33650 (K). Australia: Queensland: V. K. Moriarty 1171 (K).

97. Erythrina tahitensis Nadeau, Enum. Pl. Tahiti 80. 1873.

Hawaii: Sherwin Carlquist 595 (MAD).

102. Erythrina velutina Willdenow, Ges. Nat. Freunde Berlin Neue Schr. 3: 426. 1801.

Brazil: Paraiba: mun. Barra do Santa Rosa, Jose Edinaldo Santo 59 (RB); Fed. District, cult., Heringer 12865 (UB); Bahia: Maracas, S. A. Mori 1141; Rio de Janeiro, cult., Luis Emygdio de Mello Filho 4133 (K). Ecuador: Guyas: C. H. Dodson 6842 (SEL); Galapagos Islands, Syuzo Itow 29 (Isla Santa Cruz), (CAS), E. Yale Dawson s.n. (29/1-1964) (Isla Darwin) (CAS), s.n. (1/2-1964) (Isla Wolf) (CAS), Robert I. Bowman s.n. (26/8-1957) (CAS). West Africa: Cape Verde Islands: cult., R. T. Lowe s.n. (28/5-1875) (BM).

108a. Erythrina melancantha Taubert ex Harms in Ann. Ist. Bot. Roma 7: 96. 1897. ssp. melanacantha.

Ethiopia: Sidamo province, Ash 2780 (US).

1. Erythrina x bidwillii Lindley, Bot. Reg. 33: pl. 9. 1849.

Hong Kong: Joseph P. W. Wood 148 (CAS), G. Baretto 151 (K) (Kadoorie Gardens, Taipo).

7. Erythrina x sykesii Barneby & Krukoff in Lloydia 37: 447. 1974.

Hong Kong: Kadoorie Gardens, G. Baretto 149 (K). Australia: New South Wales: Sabina Holmes 1447 (US).

10. Erythrina x blakei Parker, A. Forest Flora for the Punjab with Hazara and Delhi, p. 159. 1918.

India: Dehra Dun, Circuit House Grounds, P. N. Parker s.n. (3/5-1923).

List of Exsiccatae

The first list of Exsiccatae was published in Supplement #13 (Phytologia 41: 256-300. 1979). The present list of Exsiccatae covers Supplements #12 and #14.

Only numbered collections and those of which the dates of collection are recorded have been listed. If a collector gathered his collection together with others, only his name is cited in this list. Collections with Dr. Prance's mumbers are cited under Prance.

Almeda, F., 3475 (1), 4174 (41), 4194 (7).
Anderson, Edward F., 4195 (13), 4250 (13).
Arguelles, Elizabeth, 388 (26).
Arostegui V., Antonio, 49 (1), 61 (1).
Arp, G. K., 4174 (52).

Backer C., s.n. (Oct. 1907, flrs.) (98).
Baretto G., 148 (16), 149 (Hybrid #7), 150 (72), 151 (Hybrid #1).
Beaman, John H., 5261 (30).
Beer, L. W., 25713 (12).
Bennett, 808 (19).
Bowman, s.n. (Sept. 26, 1957) (102).
Breedlove, D. E., 18599 (19), 24215 (31), 39647 (36), 39804 (36), 39981 (29), 40625 (29), 41240 (36), 41696 (46).
Brown, W. T. S., 2152 (81).
Burch, D., 6831 (2).

Caballero de, Bernice, 19 (53).
Caldwell, D. H., 8736 (22a).
Calzada, Juan Ismael, 2427 (52), 2840 (30), 3080 (52), 3177 (52).
Camp. W. H. E., 3643 (15a).
Carlquist, Sherwin, 595 (97).
Carvalho de, L., d'A. Freire, 1085 (3).
Carvalho de, Monteiro, A. A., 6667 (25).
Castellanos, A., 22820 (102).
Cazalet, P. C. D., 5030 (15a).
Champs de, R., 1042 (95), 1461 (89).
Chiang, F., 444 (22b).
Coll. undesign., s.n. (Herb. Lamb.), (Holotype of E. guineensis G. Don-BM) (79).
Coll. undesign., s.n. (cult. Kew 404. 62-labelled E. marmorata) (96), 462.67 (96), 101.68 (99-island form).
Coll. undesign., s.n. (30/9-1931) (9).
Conrad, J., 2825 (30).

Chang, C. E., 10027 (7).
Converse, O., 131 (52).
Cooper, R. E., 1293 (12), 2612 (12).
Croat, Thomas B., 38658 (15a), 38702 (15a), 39662 (30), 41484 (43), 41717 (43), 42660 (35).
Cuatrecases, 34504 (7).
Curran, H. M., 2 (3), 30(2), 83 (2), 89 (2), 307 (1), 708 (3).

Danin, Avinoan, 2/22-1976 (1).
Davis, E. W., 347 (15).
Dawson, E. Yale, s.n. (Febr. 1, 1964) (102) s.n. (Jan. 29, 1964) (102).
Dodson, C. H., 4319 (15a), 5334 (15a), 6241 (15a), 6737 (5a), 6842 (102), 7249 (15), 7333 (15a), 7740 (15a)
Doval, Ram Prasad, s.n. (3/27-1929) (8).
Duarte, A. P., 13068 (3).
Dugand, 865 (1), 933 (1).
Duke, J. A., 13232 (58).
Dunn, D. B., 19189 (22b).
Dziekanowski, C., 3040 (20).

Escobar de, Linda Albert, 860 (15b).
Espinosa, J., s.n. (11/III-1973) (25).
Espinosa, Reinaldo, 668 (15), 1347 (15).
Estrada Martinez, Emma, 192 (55).
Eyles Herbarium,4538 (95).

Fagerlind, 657 (15a).
Folsum, J. P., 1938 (50), 2740 (53), 2755 (58), 3935 (53), 3937 (53), 3957 (53), 3986 (49), 3999 (41), 5637 (50), 6435 (50), 6594 (50).
Foster, E. L., 65 (96).

Garcia-Barriga, H., 20059 (15), 20062 (15).
Garcia, Maynor, 033 (49).
Gentry, Al., 9650 (15a), 13946 (41).
German, Teresa, 939 (14).
Gibbs, P. E., 6651 (3).
Gibson, Arthur C., 2280 (24).
Gold, Dudley, 178 (20).
Gomes, A., 500 (25), 2809A (6).
Gonzalez Leija, 835 (31), 3969 (31).
Greenway, P. J., 14814 (76).
Grethen, R., 576 (23).
Grupo Etnobiologia, 111 (24), 192 (20).
Gumaraes, Elsie F., s.n. (May 1976) (16).

Hammel, Barry, 1336 (54) , 3017 (15), 3848 (50), 4807 (58).

Hastings, J. R., 71-193 (24), 71-204 (24).
Helms, Sabina, 1447 (Hybrid #7).
Herb. Bogor, 50 (9), 837 (11/8-1922, flrs.) (98), 879 (98), 4701 (flrs., frts.) (98), 9620 (9), 12785 (9), 14598 (9), 14599 (9), s.n. (2-0-10) (98) (some seeds may not belong here), (2/0-16, flrs.) (98).
Herb. Koorders, 46 (9), 49 (9), 51 (9), 65 (9), 66 (9), 71 (9), 72 (9).
Herb. H. LeTestu, 1015 (93), 1691 (87), 2677 (93), 3720 (93).
Herb. R. T. Lowe, s.n. (28/5-1875) (102).
Herb. Mus. Nac. Rio, 66685 (1).
Herb. Jard. Bot. Rio, 80834 (3), 112888 (3), 143027 (2), 157825 (3), 173067 (102).
Heringer, E. P., 2809 (6), 7603 (6), 7777A (6), 12865 (102), 15166 (6), 16978 (6), s.n. (13/6-1974) (16)
Hernandez, H. M., 1 (70), 2 (70), 3 (2), 5 (28a), s.n.(Apr. 15, 1978) (70).
Hitchcock, 20417 (15a).
Hooper, S. S., 1447 (95), 1509 (95).
Howell, John T., 10455 (28b).
Huggins, P. P., A18 (12).

Isely Duane, 10399 (22b).
Itow, Syuzo, 29 (102).

Jacobs, M., 4886 (24/5-1951, flrs.) (98).
Jativa, Carlos, 189 (15a), 559 (15a).

Kanai, H., s.n. (July 11, 1970) (12) s.n. (Aug. 22, 1972) (12).
Kerr, F. H. W., 2029 (13).
Kral, R., 27670 (14).
Krieger, Leopaldo, 7667 (2).
Krukoff, B. A., 7a (41), 1969-104 (41), 1969-105 (41), 1069-112 (41), 1969-113 (41), 1969-146 (41), 1969-283 (41), 1973-4 (41), 1973-5 (41), 1973-6 (41), 1973-7 (41), 1973-8 (41), 1973-9 (41), 1973-10 (41), 1978/21 (42).

Laclette, Paula, 452 (7).
Lathrop, E. W., 5116 (36).
Lewalle, J., 8695 (71), 8696 (2), 8708b (2)
Little Jr., Elbert L., 6194 (15a).
Lozoya, X., s.n. (10/19-1977) (14).
Ludlow, s.n. (5/8-49) (12), s.n. (6/8-1949, flrs.) (12).

MacKee, 33650 (96).
Mad, 19211 (2), 22125 (1).
Madsen, H. Balslev, 10324 (15).
Majumder, S., s.n. (2/19-1966) (96), s.n. (6/25 1968) (96)

Magallanes, J. Arturo S., 729 (28b).
Martinez-Calderon, Guadeloupe, 1393 (30), 1395 (31).
Marquez, Wilfrido, M-851 (47).
Mattos, J., 9768 (102), s.n. (21/II-1962) (102).
Meebold, A., 9728 (9).
Mello Filho de, Luis E., 4132 (102).
Mendes, E. J., 1079 (isotype-BM) (83).
Mexia, 2632 (24).
Mill, H., 366 (36).
Molina R., Antonio, 7 (41), 20547 (41), 30293 (42).
Montalvo, E. A., 4821 (42).
Moreno G., S., 247 (20).
Mori, S. A., 10395 (1), 10396 (1), 11141(102).

Navarrez, Marcelo, s.n. (MAD 15021) (2).
Nee, M., 7268 (50).
Neill, David, 2974 (41), 3120 (53), 3719 (45), 4142 (45).
Norris, D. H., 20146 (28b).

Ohashi, H., s.n. (July 25, 1972) (12).
Ortega Ortiz, Roberto V., 0-287 (52).

Parker, P.N., s.n. (3/5-1923) (Hybrid#IO).
Parks, C. R., 295 (14).
Pawek, Jean, 5772 (95).
Plowman, T., 3923 (15).
Pope, G., 1511 (86).
Prescott Decie, s.n. (1914) (syntype of E. platyphylla Baker f.-BM) (95).

Ramalho, Roberto S., 1004 (6).
Ratter, J. A., 2242 (3), 2677 (3).
Reekmans, 5319 (95).
Rodrigues, W., 9645 (7).
Rose, J. N., 22594 (15a).
Roynal, J., 12774 (79).
Rzedowski, J., 28300 (20), 30762 (20), 32034 (20), 33269 (20).

Santo, Jose Edinaldo, 59 (102).
Schulz, A. C., s.n. (4).
Seemann, 26 (1867) (53).
Shank, Paul J., 63 (35).
Shepherd, John D., 665 (54).
Smith, Austin, A-29 (41), P2238 (41).
Smith, P. A., 1872 (83).
Sousa, M., 3927 (28b), 3927 (seedling-28b), 4224 (42), 4290 (30), 5251 (29), 5506 (28c), 6999 (29), 7021 (29), 7056 (type) (28c), 7226 (36), 7405 (29), 7452 (28c), 7493 (28c), 7541 (28c), 7575 (31), 7586 (28c), 7642 (28c), 8014 (28a).

BOOK REVIEWS

George M. Hocking
School of Pharmacy, Auburn University
Auburn, Alabama

"AN ATLAS OF POLLEN OF THE TREES AND SHRUBS OF EASTERN CANADA AND THE ADJACENT UNITED STATES," by R.J. Adams and J.K. Morton. Part I: 52 pp., 1 fig., 16 pls. - Part II: 53 pp., 18 pls. - Part III: 37 pp., 14 pls. University of Waterloo (Ontario, Canada) Biol. Series Nos. 8, 9, 10 (resp.). 1972, 1974, 1976 (resp.) $2.50 for each part.

The first number describes the techniques used in making good scanning electron microscope (SEM) pictures. To avoid distortion of the pollen grain in acetolysis and critical point drying in liquid carbon dioxide, special apparatus was developed and is described and illustrated. Part One includes the pollens from Gymnospermae and Angiospermae (Salicaceae to Fagaceae); Part Two pollens from families Ulmaceae to Rosaceae; Part Three pollens from Leguminosae to Cornaceae. A fourth Part is to be published at a later time to complete the coverage of the vascular seed plants. The plates lie opposite to the listing of the spp. represented; a very brief description and an indication of magnification are given. The plates are excellent in showing the pollen grain (generally two views for each one) as seen at about 1000 to 2000 X magnification and then also in many cases further magnifications to 5000 X. An index is given at the end of each Part with an indication of the herbarium source of the materials used. This set of volumes should prove of much interest to paleoclimatologists, geostratigraphists, medical immunologists, allergologists, as well of course as the group of primary interest - the palynologists.

GMH

"THE ALGAL RIDGES AND CORAL REEFS OF ST. CROIX: THEIR STRUCTURE AND HOLOCENE DEVELOPMENT," by W. H. Adey. Atoll Res. Bull No. 187: 67 pp., 45 figs.; 1975.

The shallow coral reef and algal ridge systems on the eastern shelf of St. Croix (U. S. Virgin Islands) are described and mapped. The algal ridges are Holocene in development (i.e., from end of Pleistocene to present). The primary ridge builders are *Lithophyllum congestum*, *Porolithon pachydermum*, and several *Neogoniolithon* spp. Coral reefs on the open coasts develop steep ridges after they have built to the ocean surface.

GMH

"SUPPLEMENT TO THE FLORA OF PHULCHOKI AND GODAWARI," by S. B. Amalla, Chairman of Editorial Board, Department of Medicinal Plants, Ministry of Forests, Nepal, Thapathali, Kathmandu, Nepal. Bulletin No. 5, Dept. Med. Plants: ii, a - c, 1-53, xvii; 1974.

This annotated listing of plants supplements data in the Flora proper which was published as Bulletin No. 2 in 1969. The main work contained 527 spp. of angiosperms and two spp. of Gymnospermae. The supplement includes 80 spp. of Pteridophyta with 44 spp. of Angiospermae. Citations, synonyms, brief descriptions, vernacular names, and collection data are given.

GMH

"THE NATURAL HISTORY OF JOHNSTON ATOLL, CENTRAL PACIFIC OCEAN," by A. B. Amerson, Jr. and P. C. Shelton. Atoll Research Bull. No. 192: xx + 479 pp., 91 tabs., 117 figs., 1976.

The history, physical environment, and biota of the Atoll, which includes two natural islands and two man-made islands located ca. 450 miles s.w. of the Hawaiian Islands, are given in detail. 93 spp. of marine algae, 33 spp. in the lagoon waters, and 12 spp. benthic, are listed; 127 spp. of vascular plants from the four islands are enumerated, of which only three spp. are native, the others introduced by various means. (pp. 47-65). Annotated listings of vascular plants spp. are given for Akau Island (pp. 387-392), Hikina Is. (393-395); Johnston Island (pp 396-417), Sand Is. (man-made part) (418-428), and Sand Is. (original portion)(429-442).

GMH

"ANNUAL REGISTER OF GRANT SUPPORT, 1977-78. ELEVENTH EDITION," (Anonymous) xxiii + 757. Marquis Academic Media, Marquis Who's Who Inc., 200 E. Ohio St., Chicago, Ill. 60611. 1977. $54.50.

This is one of some 16 volumes published by Marquis Academic Media for the special benefit of educators and certain other professional men and women. The present volume is considered a very valuable reference book for the college professor, dean, or president, and for other members of the higher education community; the book is of value to the individual as well as the organization. Specific data are furnished for some 2,391 current grant programs, which are available through funding by governmental agencies, private foundations, corporations, unions, educational and professional associations, church groups, etc. This particular edition exhibits 400 new programs and 330 new grant-furnishing organizations. The large clothboard volume has ten major subdivisions: (1) General (ex. Firestone Foundation, offering support to secondary and tertiary schools, etc.) (2) Humanities (general)(ex. Institute for Advanced Study, with grants for research in mathematics, natural sciences, etc.). Following the general section, there are several special areas indicated (such as arts, history, literature) with numerous fund sources. (3) International affairs (ex. Chinese Cultural Center) (4) Race and minorities (ex. Bureau of Indian Affairs). (5) Urban and regional affairs (ex. Center for Fire Research). (6) Education (ex. Danforth Foundation). (7) Social sciences (ex. National Library of Medicine); (8) Physical sciences (ex. Woods Hole Oceanographic Institution); (9) Life sciences (ex. Botanical Society of America, Inc.); and (10) Technology (ex. Institute of Food Technologists). There are four indexes: (1) Subject (2) Organization and program (3) Geographic (4) Personnel. (A broadening of the subject index to show various subdivisions would have been helpful). The data supplied for each program include: address, officers, area of interest, type, purposes, eligibility, financial data, application information, etc.

GMH

"DIRECTORY OF MEDICAL SPECIALISTS," Anonymous. 18th edition, 1977-1978. In 2 volumes: vol. I: i-xxii; pp. 1-1832. vol. II: xxiii-xxxv; pp. 1833-3461. Marquis Who's Who Inc., 200 East Ohio St., Chicago, Ill. 60611. 1978 $69.50 (2 vols.)

The first edition of this massive reference work appeared in 1940; a new revision appears every two years. The listing is of diplomates in 22 major medical specialties, including internal medicine and its subdivisions and family practice. Thus it includes virtually every practitioner in the United States. (A diplomate is one certified by one of the various specialty boards). Each edition of the work has shown an increase in the number of biographical sketches, that is, in the number of physicians included, culminating in a total in this edition of ca. 190,000!! The biographies are arranged primarily by specialty, secondarily by state or country (some diplomates have moved outside of the USA), then by municipality (like the states arranged alphabetically), and finally by surname of individual also in alphabetic order. An excellent idea for guidance in the use of the work is the illustrative example posted plainly on an early page in each volume. This represents a key to the individual biography, with a write-up of a mythical person. Personal data is kept to a minimum; mostly professional information is given: date and place of graduation; where interned; present hospital and teaching posts; military service; current address; etc. Much information is also given on the activities of the various American specialty boards. There is an enormous amount of information in this work - a work which should be present in every public, science, and medical library of the country.

GMH

"ANNUELLES ET LEGUMES. RESULTATS DES CULTURES D'ESSAI," (Anonymous) Jardin Botanique de Montréal, Montréal, Québec, Canada. 228 pp., 10 figs. 1975.

Annual ornamentals are arranged in alphabetic order by botanical name: Ageratum houstonianum, etc. (pp. 1-123) and vegetables are arranged in the order of their common French names (aubergine, Solanum melongena, etc.)(pp. 124-228). Various cultivars are presented with descriptions of type of growth, flowers, fruits, etc.

GMH

"PLANT BIOLOGY: A CONCISE INTRODUCTION," by Rose H. Arnett, Jr. and George F. Bazinet, Jr. Fourth Edition. xii + 553 pp., 726 figs., 7 col. pls., 10 tabs. C. V. Mosby Co., St. Louis, Mo. 1977 $10.50 (limp plastic cover).

While this volume has retained much of the old classic form seen in standard texts, there is a considerable amount of the newest advances in the field. The well-printed text is characterized by having numerous good photographs, with occasional full page photos of special attraction. The text is co-authored by teachers of biology at Siena College, a Catholic school at Loudonville, New York. (There is an excellent chapter on evolution with no mention of the Biblical special creation theory). The senior author has been co-author of the three previous editions; Bazinet is new in the present edition. (Previous editions carried a slightly different title: "An introduction to plant biology.") The last previous edition came out in 1970. At the end of each chapter there is a series of Questions and Problems, topics for discussions, and additional references. A glossary and the index are at the end of the volume, preceded by 75 pages of appendices: App. A is an outline classification of the plant kingdom, showing botanical origins and common names of representative taxa. App. B details the life cycles of 23 plants from the viruses (Virulenta) to Lilium (angiosperm). Treating viruses as living microorganisms is somewhat controversial as they are now generally thought to be lifeless complex organic compounds which reproduce themselves.

GMH

"PRACTICAL EMULSIONS," by H. Bennett, Jack L. Bishop, Jr., and Max L. Wulfinghoff. Volume I Materials and Equipment - vii + 181 pp., figs., and tabs.; 1968. $12.00. Volume II Applications - vii + 204 ; 1968. $13.00. 3rd Edition, Chemical Publishing Co., Inc., 212 Fifth Avenue., New York 10010

As entitled "Practical Emulsions" the two volumes approach the subject of emulsions from an empirical basis, i.e. practical application. The books may serve as handy reference for those people in the field of emulsions. Academically, the subject matter is not covered in sufficient depth with regard to the physical chemical theory. However, I don't feel the authors intended the latter. The authors are to be commended for their efforts in the compilation of the "endless" list of emulsifying agents with their suppliers and classifications. Is it possible that further cross reference could be made to these emulsifiers with regard to their HLB (Hydrophile-Lipophile Balance) values? Such values are commonly used. Such values may be quite useful in realizing successful products as treated in volume II. A brief discussion of the HLB value has been covered in Volume I. It might be suggested that the price of the two volumes is rather high.

(Geo. E. Crevar)

"LES REMEDES DU VIEUX TEMPS: REMEDIES AND CURES OF THE KAPLAN AREA IN SOUTHWESTERN LOUISIANA", by Anna M. Boudreaux. Southern Folklore Quarterly 35: 121-140; 1971.

The use of domestic remedies by the rural peoples of this area (white, Catholic, French-Acadian culture) has been established as a matter of necessity and convenience. On the basis of interviews with 15 knowledgeable individuals of the area, the medicinal use of 17 plants of the area (ex. fleurs de cirie, Myrica cerifera) are cataloged. The plants collected were identified by a botanist. The French plant names and instructions for use are given verbatim, as used in 41 indications (diseases, disorders). Thus, for example, the pounded seeds of Erythrina herbacea (mamou) are mixed with honey and taken on retiring at night for cough. In this area, a traiteur (treater), an individual who heals by prayer and basic medication, is often consulted. The usages recorded here were compared with those reported by others (Roberts, J. Amer. Folklore; 1927; Brandon, Le Bayou; 1955).

GMH

X DRUGS OF THE BIBLE," by B. B. Brown and E. Wood Hall. 51 pp. (s.p.) College of Pharmacy, The University of Texas at Austin. 1976.

Various drugs and drug plants having mention in the Scriptures are discussed. In Part 1 there is a review of the various items under the drug or plant name. Part II (EWH and students), various drugs and plants in alphabetic order from "Almond" to "Wine" are described. Following this another series of drugs (in alphabetic order from Aloes to Wormwood) is given along with specific quotations from the Bible with citations of book, chapter, and verse. Finally biographical data on the two authors is furnished.

GMH

"THE NIGHTSHADES AND HEALTH", by Norman Franklin Childers and Gerard M. Russo. viii + 189 pp., 37 figs., 21 tabs. Horticultural Publications, Somerset Press, Inc., Somerville, N.J. 08876. 1977. $20.00.

The thesis of this book is that members of the family Solanaceae are unsuited to the human diet, in other words, that the white potato, tomato, garden peppers, and eggplant should be eliminated from our diets. Tobacco is also considered harmful. The first portion of the book deals with these matters and includes case histories. Ch. IV(by Dr. A. Zitnak) discusses steroids and capsaicinoids of solanaceous food plants; Ch. V (by Dr. T. C. Tso) concerns tobacco and tobacco smoke), and Ch. VI (by Dr. G. K. Davis) takes up the effect of Solanum malacoxylon Sendt. on livestock and Ca metabolism. The last 20% of the book is occupied with many abstracts on common toxic plants by R. T. Kelly consists mostly of tables reviewing toxic plants of all kinds.

GMH

"AN EXOLOGICAL AND TAXONOMIC STUDY OF SELECTED HIGHER FUNGI IN NORTHEASTERN OHIO," by William G. Cibula. viii, 95 pp., 1 chart, 6 figs., 37 pls., 3 tabls. Ohio Biological Survey, Biological Notes No. 7. Ohio State University, Columbus, Ohio 43210. 1974. Gratis (?)

This work helps to fill a gap in the knowledge of the Fungi of northeastern Ohio, which have not received much study in the past. A major reason for the fungi not being known better as compared with the higher and many of the lower plants is the evanescence of their fruiting bodies "here today and gone tomorrow". Mushrooms decay and disappear soon after they appear. Unfortunately, there is also a certain disdain or even revulsion to these primitive organisms. We sometimes speak of a person as "pale as a mushroom". The Greek word for mushroon is related to the word for mucus and slime ("mykos"). It is a wonder these lowly plants are as well known as they are. Now that we are learning more about important values in medicine and elsewhere, this attitude is slowly changing and with it there has been an increase in our knowledge of members of the group. In this brochure, 31 taxa have been treated with rather good descriptions, illustrations, and general information. (One name, Pluteus admirabilis shows the authorities incompletely). There is not as much collection information as one might expect for the area. In addition to the descriptions of taxa, there is a useful introductory part which supplies much information on collection, preparation, and study methods. Also included are a glossary and color chart of fructifications and a useful bibliography. The table of contents serves adequately as an index.

GMH

"INTERMOUNTAIN FLORA: VASCULAR PLANTS OF THE INTERMOUNTAIN WEST, U.S.A.," by A. Cronquist, A. H. Holmgren, N. H. Holmgren, J. L. Reveal, and Patricia K. Holmgren. Vol. VI: The monocotyledons. XI + 1-588, numerous line drawings (s.n.), frontispiece; 1977. Columbia University Press, 562 W. 113 St., New York. $54.00

This sixth volume follows directly after the first one which appeared in 1972, and which besides important introductory and background information furnished coverage of the lower groups of vascular plants (Lycopodophyta, Equisetophyta, Polypodiophyta, Pinophyta), in the older terms, the pteridophytes and conifers. The flora is a cooperative effort in which the named authors had useful support from their institutions - the N. Y. Botanical Garden (A. C., N.H.H., P.K.H.), Utah State Univ. (A. H.H.), Univ. Maryland (J.L.R.). In addition, many other botanists, specialists in various areas, have contributed to the "Flora". The authorship of the various subdivisions of the flora can be learned only by referring to the Introduction, since there is no listing or reference in the table of contents. The keys are abundant and generally very thorough and the descriptions of family, genera, and species are more detailed than one would find in a manual of the flora for a particular region. Synonymy appears to be complete for the various taxa, and a good bit of detail will be found in the small type on ecology and distribution and various data (including controversies) on the respective taxa. The excellent drawings are in some cases original but most are borrowed from "Vascular Plants of the Pacific Northwest". No novelties were noted except for one new variety, but there are several new combinations, including the following: _Potamogeton filiformis_ var. _latifolius_ (J. W. Robbins) Reveal (P. pectinatus var. l.); _Juncus ensifolius_ var. _brunnescens_ (Rydb.) Cronq. (J. b.); _Scirpus pungens_ var. _longispicatus_ (Britton) Cronq. (S. americanus var. l.); _Carex scirpoidea_ var. _curatorum_ (Stacey) Cronquist (C. c.); _Calochortus panamintensis_ (Ownbey) Reveal (C. nuttallii var. p.); _Allium atrorubens_ var. inyonis (M. E. Jones) Ownbey et Aase (A.i); _A. bisceptrum_ var. _palmeri_ (S. Wats.) Cronq. (A. p.); _Aristida purpurea_ var. _glauca_ (Nees) A. Holmgren et N. Holmgren (Chaetaria g.); _A. purpurea_ var. _robusta_ (Merr.) A. Holmgren et N. Holmgren (A. longiseta var. r.); _Yucca harrimaniae_ var. _neomexicana_ (Wooton et Standley) Reveal (Y. n.); _Y. baileyi_ var. _intermedia_ (McKelvey) Reveal (Y.i.); _Y. elata_ var.

utahensis (McKelvey) Reveal (Y. u.) and var. verdiensis (McKelvey) Reveal (Y. v.); Y. angustissima var. kanabensis (McKelvey) Reveal (Y. k.), var. toftiae (S. L. Welsh) Reveal (Y. t.), and var. avia var. nov. (Piute Co., Utah); Sisyrinchium douglasii var. inflatum (Suksd.) P. Holmgren (Olysnium i.). This book is clearly printed on high grade glossy paper and strongly bound in cloth matching the first volume. The set should present a handsome effect on the library shelf. Volumes 2 to 5 which are next to appear will cover the Dicotyledoneae. The relatively low cost of the volumes is a most attractive feature in this age of inflation.

GMH

"FLORA OF THE RIO PALENQUE SCIENCE CENTER, LOS RIOS PROVINCE, ECUADOR," by C. H. Dodson and A. H. Gentry. xxx, 628 pp., 18 figs., 5 maps, 278 pls., 1 col. pl., 2 tabs. Selbyana, The Journal of the Marie Selby Botanical Gardens, Sarasota, Fla. (representing Vol. 4, No. 1-6). 1978.

The introduction tells considerably about the area of the Center, which is not far from the center of Ecuador, and covers 167 hectares (400 acres). This is followed by the systematic part, covering both Pteriodophyta and Spermatophyta. Ecuador may possess the greatest number of plant species for its area in South America, the total being estimated to lie between 10 and 20 thousand. A total of 1112 spp. are recorded here in this the first comprehensive listing for any area in Ecuador. Included are Ocotea sp. nov., representing a new but as yet undescribed species; and Disciphania sp. nov. cf. inversa Barneby, meaning an unknown species close to D. inversa. There are a number of other instances of species which were apparently as yet unknown to science. Proposed is Alternanthera pubiflora (Benth.) Kze. f. purpurea (Standl.) comb. nov. (A. williamsii Standl. f. p.). Each taxon is illustrated with a pen and ink sketch, which doubtless in most cases represents a first illustration for the plant entity. The flora is a cooperative effort in which many specialists participated in identification of specimens. A specimen listing appears in the appendix. A comprehensive index terminates the volume. This is a very useful account of plants in this great wonderland of South American plants.

GMH

"STRUCTURE AND BONDING," Bolume 11, Edited by J. D. Dunitz et al. 170 pp. Springer-Verlag, Berlin--Heidelberg--New York. 1972. $17.25.

The eleventh volume of this series includes four articles by eight authors, these from Great Britain (Oxford, Norwich, Sussex), USA (Univ. Calif., Univ. Illinois), Australia (Monash

Univ.), and Czechoslovakia (Charles Univ.). The eight editors publishing the series include men from Switzerland, USA, Germany, and England. One of the American editors is from Evanston (Illinois no doubt, although there are Evanstons in at least four other states), and another comes from Berkeley (undoubtedly California; however there are at least five other places called Berkeley in the USA). (Europeans often forget that where there is only one Rome (Roma) in Europe, there are no fewer than 10 Romes in the American Union. Every U.S. state apparently considers itself sovereign in the matter of place names). The text of this volume is entirely in the English language. As usual, the subjects are quite diverse: (1) chemistry of platinum complexes, representing an antitumor drug (A. J. Thomson et al.) (2) chemistry of vitamin B_{12} enzymes (3) molybdenum-containing enzymes (4) evolution of biological iron-binding centers. In the second of these papers, the authors (J. M. Wood, D. G. Brown) first review the history of B_{12} (short for vitamin B_{12}), chemistry and biochemistry, which includes the discovery that several well-characterized enzymes require B_{12} coenzymes (5'-deoxyadenosylcobalamin and analogous compounds). (Unlike cyanocobalamin, B_{12}, these coenzyme compounds possess stable Co-C bonds, and represent series of what are termed alkyl-cobalt corrinoids (corrinoids are derivatives or corrin, the large cobalt ring found in vitamin B_{12}). The biologically significant properties of the alkyl-corrinoids are discussed, then the methyl-transfer enzymes (transferases) with formation of a series of synthetases (enzymes which catalyze the combination of two molecules using energy derived from breakdown of the phosphate bond especially in the form of ATP). The methyl-transfer and hydrogen-transfer enzymes are discussed. Finally, the application of magnetic resonance technics to B_{12} compounds and B_{12} enzymes is detailed, this representing a new approach to the study of the macromolecules. It is held that much progress will be made in the elucidation of coenzyme-enzyme interactions through the use of electron spin resonance (ESR). A bibliography of 146 references is appended to this article.

GMH

"CATALOGUE DES PLANTES VASCULAIRES DU NIGER," by B. Peyre de Fabregues and J. P. Lebrun. Instit. d"Elevage et de Méd. Vetérin. des Pays Tropicaux (Alfort, France) Etude Botanique No. 3: 444 pp., 3 maps; 1976.

This annotated listing of vascular plants gives considerable data on geographical distribution and ecology. The first 30 pages consider the history of plant exploration in the area and a general view of the vegetation of the area. 1045 spp. in ± 527 genera and ± 114 fams. are cataloged. The leading fams. are Gramineae, Papilionaceae, and Cyperaceae. A remarkable character is the total absence of Orchidaceae. Nine spp. are newly reported for the domain of the flora of west tropical Africa. Indexes of fam. and genera.

GMH

"SPRING FLORA OF WISCONSIN: A MANUAL OF PLANTS GROWING WITHOUT CULTIVATION AND FLOWERING BEFORE JUNE 15," by N. C. Fassett. Univer. Wisconsin Press, Madison, 4th ed., ix + 422 pp.; 571 figs., 4 maps, 1976.

This edition published on the 20th anniversary of Dr. Fassett's death is considerably larger than previous editions. Although Wisconsin is mentioned in the title, the flora is almost equally useful in many adjoining states. This revision was prepared by Olive S. Thomson with the collaboration of a number of specialists. Besides the various keys and systematic descriptive text for the taxa (all Angiospermae in Engler's order, there is a brief introductory text telling about the State of Wisconsin), a glossary, and a listing of selected references: these include a list of 68 papers on Wisconsin flora from the Transactions of the Wisc. Acad. of Science. This pocket-size manual is very useful in field and herbarium and costs only $3.95, a really good buy!

GMH

"THE PLANT CELL WALL," by A. Frey-Wyssling. Encyclopedia of Plant Anatomy (Edition 2), General Part, Vol. III, Part 4, Section Cytology, XI + 1-294, 193 figs., 20 pls., 27 tabs., 1976. DM. 176,-- Gebrueder Borntraeger, Johannesstrasse 3A, 7 Stuttgart 1, BRD.

The Encyclopedia (Linsbauer's Handbuch der Pflanzenanatomie) contains in the second edition 22 volumes so far published including the one under review. The plan of the large work shows two large divisions, the first General (with subdivisions into histology and cytology of plants in general) and the second Special, which deals with specific groups of plants, such as Bacteria, classes of Fungi, lichens, Pteridophyta, gymnosperms, and angiosperms. Although this is part of the second completely revised edition of the whole large work, rather strangely the book under review is a third edition, two previous editions being van Wisselingh's "Die Zellmembran" (1925) and Roelopsen's "The Plant Cell Wall" (1959). While this volume by the Swiss emeritus Professor Frey-Wissling is in the English language, the various volumes of the Encyclopedia are variously in German, English, and French, depending on the authorship. The text is written in English of good quality and in the clearest possible style with constant attention to the accompanying illustrations, pointing out each detail. The printing and binding of the book are excellent in all details. The entire work makes an impressive and attractive addition to any library. The drawings, diagrams, and microphotographs are well done and appear to all be original. The study of the cell (and especially of the cell wall) extends back some 300 years to Hooke and is a most important and informing scientific field. Much emphasis has been placed in the book on the biogenesis of the cell wall. The three chief divisions of the text are (1) ultrastructure and biogenesis; (2) biochemistry and (3) biophysics. A very thorough treatment of our present knowledge on the subject is furnished in this volume. This and other volumes of the series belong in every scientifically oriented library. The book is of interest primarily to plant anatomists and cytologists, but also to other botany specialties, such as morphology, genetics, plant physiology, phytochemistry, paleobotany, phytogeography, forestry, plant pathology, and mycology. The bibliography of 18 pages is very useful. Author, botanical name, and subject indexes are present, followed by a listing of abbreviations and symbols used in the text.

GMH

"ORAL CONTRACEPTIVES AND STEROID CHEMISTRY IN THE PEOPLE'S REPUBLIC OF CHINA," by Josef Fried, Kenneth J. Ryan, and Patricia Jones Tsuchitani (Editors). Committee on Scholarly Communication with the People's Republic of China Rept. No. 5. ix + 99 pp., 10 tables. National Academy of Sciences, Washington, D. C. 1977. $8.00

This represents a "trip report of the American Steroid Chemistry and Biochemistry Delegation" which visited mainland China during October, 1976. Many details of their findings are given here. It will come as a surprise to learn that the PR of China produces and uses more steroid contraceptives than any other nation on earth. Apparently they are convinced that bigger is not necessarily better and that "enough is enough". With a population representing about a quarter of the total inhabitants of mother earth, they can well afford to say "Halt!" to population growth. The eleven members of the delegation seemed to have obtained a great deal of information in such a short period of time (19 days). The plants utilized as primary sources are identified (species of Dioscorea, Agave, Solanum, Strophanthus, etc.), also some details of microbiological transformations, and structural formulas of many of the steroids. Informative book!.

GMH

"CATALOGUE OF THE FLOWERING PLANTS AND FERNS OF CONNECTICUT GROWING WITHOUT CULTIVATION," by C. B. Graves, et al. J. Cramer, Vaduz, Liechtenstein. - ii + 569 pp.; 1910 (1975).

Shop price (Ladenpreis) DM 60,--.

This is an unchanged republication of a plant listing, showing a total of 1481 native spp. and 461 introduced spp. and 286 vars., a total of 2228 infra-generic taxa. There are no keys and very little descriptive text but a considerable amount of data on habitats and geographical locations of plants, also time of anthesis. Other features include additions; native plants not found in recent years; excluded spp.;, fugitive spp.; detailed statistical summaries; and authorities cited.

GMH

"NOVA SCOTIAN BOLETES," by D.W. Grund and A.K. Harrison. (Bibliotheca Mycologica Band 47) iv + 283 pp., 68 bpls., 80 figs.; 1976. (J. Cramer, Vaduz, Liechenstein).

In order to attempt to solve the many difficulties encountered in determining the Boletaceae of Nova Scotia (Canada), the authors made a determined effort to describe and illustrate as many as possible, following the pattern of Smith and Thiers, "Boletes of Michigan" (1971). Collections made 1973-5 were the basis of study; however, some organisms of collections made as long ago as 1926 could not be found in the later period and these may have been extirpated due to destruction of forest habitats. Only 4 Leccinum spp. are included but many more are known to occur in the area and should be studied. General discussions precede the systematic survey, which includes 80 taxa. Among these are the following novelties: Boletus pseudosulphureus Kallenbach var. pallidus, B. badius Fr. var. glaber, Fuscoboletinus viscidus (L. ex Fr. et Hoek) comb.nov. (B.v.), and Tylopilus cyaneocinctus (Singer) comb. at stat. nov. (Porphyrellus porphyrosporus (Fr. in Fr. et Hoek) Gilbert subsp. c.). This cloth-bound neatly printed volume has a selling price of DM. 60,--.

GMH

"THE COLOR DICTIONARY OF FLOWERS AND PLANTS FOR HOME AND GARDEN," by R. Hay and P.M. Synge. Compact edition. Crown Publishers, Inc., New York. 1-584, 2048 col. pls. (on 342 pp.); 1976. $6.95.

This excellent plant guide includes annuals, biennials, perennials, trees, and shrubs, and is provided chiefly with useful and accurate illustrations of 2,048 plant spp. arranged in alphabetic order of genera within six sections (pp. 35-376); this is followed by the textual part of the dictionary in a single alphabetic sequence (208 ppl). Preceding these "dictionaries" is a brief introductory portion with suggestions on cultivation, photographing plants, etc. The textual dictionary has many common names included in the alphabetic arrangement, with cross-references. Hence, this portion serves also as an index. The plant descriptions are concerned chiefly with data on the ornamental values, modes of culture, etc., with considerable emphasis on various vars. This edition has the same content as the original edition of 1969 but with a slight reduction in page size. This book, while aimed at the ornamental horticulturist, will be of great utility also to botanists, and is very reasonably priced.

GMH

"ARBOLES DE COSTA RICA," Vol. I., by L.R. Holdridge, and L.J. Poveda R. Centro Cientifico Tropical, San José, C.R. xiii + 546 pp., 527 figs.; 1975.

More than a botanical listing with descriptions of the trees of Costa Rica, this also tells a great deal about the uses made of each tree. 527 spp. of trees are included: palms; other monocots; dicot trees with divided or lobed leaves. In a planned one or two volumes to follow, trees with simple and unlobed leaves and coniferous trees will be taken up. The key used is a rather simple one, with entries at the heading of each page: it should be a practical mode of identification, particularly since there is one plant per page and each is clearly illustrated with a good photograph. In some cases, the entire tree is shown; it would have been advantageous to have shown the whole tree as a regular thing. The descriptions present in systematic order the size of the tree, the leaves, flowers, and fruits, its habitat, geographical distribution inside and outside of Costa Rica and under "Note" regularly the use made of the tree and its parts with other practical information. An introduction of 7 pages gives a number of interesting general facts. The book ends with a glossary, bibliography, and index. The senior author, Dr. Holdridge, is a "Connecticut Yankee" who has however passed most of his life in the American tropics (since 1934). The junior author is a native of Costa Rica, now an assistant in the national Herbarium. This first book covering the trees of Costa Rica as a whole will have a wide appeal to many different categories of persons and occupations, and also to persons of different geographic locations outside of Costa Rica, since the trees described in this volume are generally found in other countries of Central America, Mexico, etc. (In the treatment of the storax tree, Liquidambar styraciflua, mention is made of the resin exuding from the trunk; this product is of course a true balsam).

GMH

"THE GENERA OF ORCHIDACEAE IN HONG KONG," by Shiu-Ying Hu. The Chinese University Press, Shatin, N.T., Hong Kong. xv + 1-160, 74 figs (some in color), 2 col. pls. (One on dust cover), 1 tab.; 1977. H K $ 60.--

This book represents a self-contained unit of a "General Flora of Hong Kong" now in preparation. Thus, the volume provides explanatory texts on the nature of orchids as well as a glossary (with English and Chinese definitions), a list of generic names with an explanation of their origins, a bibliography, and an index. Keys, descriptions, and illustrations are provided for the total of 104 spp. of native orchids (in 50 genera) found in Hong Kong and the New Territories. Including the exotic or cultivated (non-native) orchids, there are described a total of 134 species in 64 genera. The orchid flora of Hong Kong is truly rich since the genera here represent 30% of the genera of orchids found throughout the whole of China. Although as indicated by the title, the work is primarily concerned with genera, many of the species have been described and illustrated. Where the genus has two or more species a key to its species has been provided. This work should have a wide appeal - to botanists, floriculturists, and to many lay persons who are amateur orchid growers. The book is neatly and attractively printed with substantial binding. The dust cover presents a colored sketch of *Cymbidium maclehoseae* which illustration is not incorporated within the covers. Hence the dust cover in this case represents a part of the entire work and should be preserved with the book.

GMH

"FLOWERS OF GREECE AND THE AEGEAN," by Anthony Huxley and William Taylor. vi + 185 pp., 560 figs. (483 colored), 2 maps. Transatlantic Arts, Inc. North Village Green, Levittown, New York 11756. 1977. $16.95.

This beautiful book lends itself either to field study of plants in the area of record (or perhaps throughout the eastern Mediterranean) or to reading in home or library to learn about the floral beauties of this "home of democracy." It is said to be the first "handy guide" (as opposed to formal floras) to the flowering plants of this region. That it is not comprehensive is shown by the fact that 660 species, subspecies, and forms are included out of a total of some 6,000 taxa known for Greece, hence representing only a bit more than 10% of the total flora. However, the plant entities included are the commoner and more conspicuous flowering plants which would normally be encountered. The first section describes the plant cover and environment in a general way, one chapter having the interesting title of "Wild flowers on the ancient sites." Some of the colored plates show samples of the terrain encountered in Greece and the Islands, often with picturesque ruins as part of the total scene. The second part of the book is the systematic part, taking up the various families, genera, and species, with brief descriptions and notes on distribution, flowering months, and (where à propos) mention of uses today or in antiquity, biblical, mythological, or classical allusions to the plant, and so on. Thus, the decorative use of Acanthus spinosus (which covers parts of the Palatine Hill in Rome) by the ancients, in gardens, decorations, sculpture, etc.,is mentioned, also the medicinal uses of parts of the plant. (The beautiful jacket colored photograph of the remains of the temple of Apollo at Corinth surrounded by masses of Chrysanthemum coronarium is not duplicated in the pages within). The authors have been active in field study of the plants of the Mediterranean region and have published books on the flower life of southern Europe.

GMH

"PLANTS OF THE TAMPA BAY AREA," by Olga Lakela, Robert W. Long, Glenn Fleming, and Pierre Genelle. 3.Ed., with supplements. xv + 198 pp., 1 map, paperback. Banyan Books, Inc., P.O. Box 431160, Miami, Florida 33143. 1976. $7.95.

This compilation of taxa is a Contribution (No. 73) from the Botanical Labs., University of South Florida at Tampa. Following an introductory portion with references, there follows the systematic part arranged in the Englerian order. The area covered is that included in Hillsborough, Pinellas, Manatee, and Sarasota Counties of west Florida. Data include the Latin scientific name, common name (in capital letters), the habitat (often in rather general terms), and the period of flowering. The Index is followed by the two supplements (1) correction of errors in the text; (2) addition of taxa, both those omitted in error and those discovered growing in the area after publication of the listing. There are no keys. The addenda are not picked up by the Index so that the Supplements should be consulted whenever the book is used.

GMH

"THE GENUS LEPTONIA ON THE PACIFIC COAST OF THE UNITED STATES, INCLUDING A STUDY OF THE NORTH AMERICAN TYPES," by David L. Largent. 286 pp., 94 figs. (Photographs). J. Cramer, Vaduz, Liechtenstein, 1977. DM. 80,--

136 spp. are recognized for this agaricaceous genus, along with many varieties and forms. The descriptions of the new taxa are very detailed but where the taxon has been recently described in the literature and where such description is adequate, only a brief description or none at all is given, in both cases, of course, a citation to the literature is given. There are numerous keys in addition to the principal one. Two subgenera are recognized - Leptonia and Paludocybe, the latter with eight sections, including sect. Paludocybe Largent, with series Viridiflavipes ser. nov. and series Paludocybe ser. nov., also

sect. Carneorubescens sect. nov. and sect. Chromocystoteae sect. nov. Included in this monograph are 29 new species, one new status, 42 new combinations, five new combination and status, 15 new varieties, one new form, one provisional form, and one provisional variety. An important and valuable feature is the synoptic key (pp. 44-56) whereby one can either identify a species by a single feature or at least place it among a limited number of species having this feature in common. There are at the back of the volume a bibliography, index, and collection of excellent photographs with both macro- and microscopic details of many taxa. The microscopic features of 96 species are described as noted in the study of type specimens. Descriptions in detail and keys are furnished for 58 species, 18 varieties, and ten forms from the Pacific coast area. Among the new species are Leptonia violaceanigra (from Washington state), L. cyaneonita (from Trinity Co., California), and L. fabaceola (from the state of Washington).

GMH

"CHORDATE DEVELOPMENT," by H.E. Lehman. xvii + 369, 84 figs., 27 tabs. Hunter Publishing Co., 2475 S. Stratford Rd., Winston-Salem, N. Ca. 27103. 1977. $12.95 (paper), $15,95 (cloth).

This is a combination textbook and laboratory manual in descriptive and experimental embryology, mostly vertebrate. It gives the appearance of being a good sound text with many, mostly colored, figures, chiefly diagrammatic. The terminal index is preceded by appendices which present information on other available texts, journals, films, and sources of embryological materials. There is also a rather elaborate glossary of the special terms used in embryology. The large (letter-sized) pages, the clear typography, and the excellent illustrations should make this a superb book for teaching the important subject of embryology. The author is associated with the zoology department at the University of North Carolina and the Bermuda Biological Station.

GMH

"FLORA DE S. TOMÉ E PRINCIPE. CAESALPINACEAE," by Maria Candida Liberato. Jardim e Museu Agricola do Ultramar, Lisboa. 32 pp. 1976.

Keys and descriptions are provided for 10 genera of the fam., including Peltophorum (with one sp., P. pterocarpum (DC.) Heyne, here reported for the first time from S. Tomé); Caesalpinia (2 spp.); the following genera with one sp. each: Delonix; Dialium; Haematoxylon; Tamarindus; Cynometra; Perlebia; Pauletia. Cassia with 11 spp. includes C. javanica L. var. javanica, here reported for the first time from S. Tomé.

GMH

"MYCOLOGIE DU GOUT: 200 MENUS ET RECETTES À BASE DE CHAMPIGNONS," by Marcel V. Locquin. 100 pp., 1 tab. J.F. Guyot S.A., Editeur, Paris, France. 1977. (Available from the author, 22b, rue J. Jaurès, St. Clement, 89100 Sens, France). $6.00.

This small volume addresses itself primarily to mycogastronomic persons (those who are fond of collecting, identifying, cooking, and eating mushrooms), but also to those less fortunate individuals who must be content with the mushrooms sold in the city -- fresh, dried, or preserved in jars or other containers. The number and modes of preparation of mushrooms is almost endless. Included in this mushroom cookbook are sauces, soups, salads, soufflés, and combinations with eggs, shellfish, cakes, tarts, fish, white meats (poultry, veal, etc.), joints, frogs, game, vegetables, cheeses, desserts, and even beverages. Most surprising of all among the 200 recipes and dishes is the inclusion of mushrooms in chewing gum and tobacco for smoking in pipes!

GMH

"FLORA OF NAGARJUN," by S.B. Malla et al. Bulletin No. 4, Department of Medicinal Plants, Nepal. His Majesty's Government of Nepal, Ministry of Forests, Dept. of Medicinal Plants, Thapathali, Kathmandu, Nepal. ix, 131 pp., xix, 9 figs., 18 tabs.; 1973. Price not given.

About 300 taxa of Spermatophyta are shown for the flora of Nagarjun Royal Forest located in the northern border region of Kathmandu Valley. Included are brief descriptions, the local name in Nepali (with transliteration), and months of flowering and fruiting. Families are arranged in the order of Hooker (Flora of British India). Appendix I has an additional list of ca 60 spp. in which families are in alphabetical order. Appendix II is a vegetational survey of the Forest, with ecological information. The work is aimed at an eventual Flora of Nepal.

GMH

"FLORA OF LANGTANG AND CROSS SECTION VEGETATION SURVEY (CENTRAL ZONE)," by S.B. Malla and others (Editorial Board). Bull. Dept. Med. Plants Nepal No. 6: (XII) + XXVII + 273, 20 tabs., 3 maps, 5 figs. Dept. Medicinal Plants, Ministry of Forests, Thapathali, Kathmandu, Nepal. 1976. $8.00.

The first part of this volume is occupied by a vegetational survey of central Nepal, the region in which lies the Langtang and Gosaikunda areas. A survey of earlier studies (from ca 1800) is presented in the Introduction. The systematic part includes in the neighborhood of 1500 species (there is no census), with citations, synonymy, collection information, and descriptions. (No keys). Common names in Nepalese and transliterations are given for many plants. Bentham and Hooker's arrangement is followed. An index by scientific name and one by vernacular (local) name with a bibliography complete the text. Although it is obvious that the flora is incompletely known for Nepal, this work will contain much useful information for the person interested in Asiatic plants.

GMH

"CATALOGUE OF NEPALESE VASCULAR PLANTS," by S.B. Malla (Chairman, Editorial Board) and others. Bull. Dept. Med. Plants Nepal No. 7. II + IX + 211 + (a - 1), + 40, 1 map, 1 tab. Dept. of Medicinal Plants, HMG. Ministry of Forests, Thapathali, Kathmandu, Nepal. 1976. Rs. 35/-; US $5.

Following a brief survey of the country, a bare list of plant species follows with genera in alphabetic order under families which are arranged in the order used in Hooker's "Flora of India." The list includes 3121 taxa of Angiospermae, 24 taxa of Gymnospermae, and 308 taxa of Pteridophyta, giving a total of 3453 taxa of vascular plants. This compares with a total of 7,000 taxa estimated by the British Museum (Natural History) for Nepal. Following the list is an appendix with a list of Nepalese plant collectors and References. The index terminates the bound volume. There is no list of errata.

GMH

"PRELIMINARY INVENTORY OF THE BIOTA OF WOODSON COUNTY STATE FISHING LAKE AND GAME MANAGEMENT AREA," by Ronald L. McGregor. Reports of the State Biological Survey of Kansas No. 5: ii + 176 pp., tabs. State Biol. Survey of Kansas, Lawrence, Ks. 66055. 1976. Gratis.

Checklists are presented for lichens (22 taxa), mosses (44 taxa), liverworts (40 taxa), vascular plants (624 taxa). About half the text bears lists of animals.

GMH

"HISTORY OF NATURALIZED KANSAS PLANTS," by R.L. McGregor. Repts. of the State Biol. Survey No. 7: 35 pp. 1976. Gratis.

An annotated list is given of 207 taxa thoroughly established in the state, preceded by a history of the study of naturalized plants in Kansas. Indexes.

GMH

"THE MERCK VETERINARY MANUAL: A HANDBOOK OF DIAGNOSIS AND THERAPY FOR THE VETERINARIAN." Merck and Company, Inc., Rahway, New Jersey 07065 (USA). ix + 1686 pp., 4 tabs.; 1967. Price: $11.25.

This volume has a similar format (size, binding, type of paper, etc.) to the better known "Merck Manual." A distinctive red cover however readily distinguishes it from the dark blue-bound Merck Manual. There are 452 chapters of mostly medical (rather than surgical) data applicable to the prevention and treatment of diseases in the lower animals. The text is divided into 8 primary parts, the first section being devoted to live stock mammals and mammalian pets; Part II is headed "Toxicology"; then follow parts devoted respectively to poultry; fur, laboratory, and zoo animals; nutrition; an addendum with such information as laboratory procedures, body temperatures, oxygen therapy, routine procedures, and reference tables; prescriptions (keyed to the preceding texts on therapy); and Part VIII, the Index. The largest part of the volume is made up by Part I, which is subdivided into 15 subdivisions, viz., Allergy, Blood, Digestion, Endocrines, Eye and ear, Infectious Diseases, Metabolic disorders, Musculo-skeletal system, Neoplasms, Nervous system, Parasitic diseases, Physical influences, Reproductive and urinary systems, Respiratory disorders, and Skin and connective tissue states. As in the case of the other Manual, the chapters on diseases take these up in a systematic order -- synonyms; etiology; diagnosis; prophylaxis; treatment. Several methods have been used to render the book's contents more readily available to the user: the table of contents in front, the terminal index, the table of contents at the beginning of each Part and each subdivision, and the thumb-tabs. The volume was edited by O.H. Siegmund of the Merck, Sharp, and Dohme Research Laboratories, and was prepared with the collaborative assistance of 290 leaders in veterinary medicine. There are numerous signs of extensive revision of the text. The value of this work is not by any means restricted to North America, and it should prove to be just as useful in Victoria, Australia or Victoria, Canada, as in Des Moines, Iowa.

GMH

"THE ENVIRONMENT OF AMCHITKA ISLAND, ALASKA," by Melvin L. Merritt and R. Glen Fuller (Editors). Tech. Inform. Center, Energy Res. and Devt. Administration; Natl. Tech. Inform. Service, U.S. Dept. Commerce, Springfield, VA 22161. xii + 1-684, 260 figs., 139 tabs.; 1977 (recd. 1978). (4 maps separate in pocket). $20.00

Amchitka Island was selected and used from 1967 to 1973 as a nuclear test area because of its remote location in the Aleutian Islands, it being near the end of this chain and the most southerly island (except for Amatignak) and almost the southernmost point of Alaska. This island along with most of the others are in the Aleutian Islands National Wildlife Refuge. Although a rich plant growth occurs on the Island, there are relatively few land plant taxa. Fewer than 200 taxa are known: these are listed on pages 215-7. Only one established annual higher plant was found -- Koenigia islandica L. (Polygonaceae). The meadow-like tundra vegetation of the island is depicted in many illustrations and described in detail. The marine algae found in the vicinity of the Island were also studied methodically and in detail; a listing of ca 130 spp. appears on page 360. The rocky shores of the Island are densely covered with algal communities and include extensive floating kelp beds. From this it would appear that the thallophytic component of the flora is relatively more important and more complex than the higher plant component. Besides the chapter on the ecology of terrestrial plants (Chap. 10) and of marine algae (Chap. 17), there are numerous chapters devoted to the island's geography, geology, hydrology, geomorphology, edaphology, climatology, limnology, oceanography, history, earlier scientific investigations, animal life (including an entire section on marine mammals), and environmental contaminants. A summation of the studies in the final chapter indicates that nuclear testing had only slight impact on the ecology of the area. It is stated that there was no evidence to show "that any biotic population on Amchitaka was lost or endangered as a consequence of the nuclear test program." Animal population losses were small and there was evidently even less damage to the plant population. It is a comfort to know how resilient living things are to such physical violence.

GMH

"MODERNE METHODEN DER PFLANZENANALYSE," (begr. v. K. Paech u. M. V.Z. Tracey). Continuing editing by H.F. Linskens and M.V. Tracey with the collaboration of B.D. Sanwal. Volume 7: XXIV + 735 pp., 64 figs. and many tabs.; 1964. Cloth bound, DM 136,-- (ca $ US 61). Springer-Verlag Berlin.

This splendid volume contains the writings of 31 scientists (USA, Canada, Australia, Great Britain, India, Japan, Germany, Spain, France); 22 chapters are in English and one each in French and German (682 pp. in English and 20 in French). There is an elaborate table of contents in front and German and English indexes at the back of the volume; there is also a French index to the single chapter in French. In this volume is continued and completed the coverage of enzymes commenced in Volume 6. At the end of each chapter stands a bibliography, which is remarkable for its comprehensiveness. Abbreviations used in the various chapters are tabulated as a footnote on the first page of each chapter. At the end of the volume before the indexes is a summary of recommendations on enzyme terminology (IUB) and recommendations for symbols for enzyme kinetics; also a list of cytochromes and a key to numbering and classification of enzymes. -- This volume is devoted to a consideration of special methods of isolation and purification of the following groups of enzymes: (1) enzymes for the metabolization of sulfur, phosphate, inorganic nitrogen, vitamins, and of ascorbic acid metabolism; (2) enzymes involved in synthesis and breakdown of indoleacetic acid; (3) enzymes of aromatic biosynthesis; (4) enzymes of amino acid metabolism (deamination, decarboxylation, transmethylation, intermediary metabolism; transaminases and racemases); (5) enzymes of peptide and protein metabolism: those of purine and pyrimidine nucleotide synthesis; (6) enzymes of fat metabolism; (7) enzymes of carbohydrate synthesis and of glycolysis; (8) enzymes of pentose phophate cycle; (9) enzymes in photosynthesis; (10) enzymes of Krebs cycle and glyoxalate cycle; and (11) enzymes of terminal respiration. -- This is the last volume of a series, in which an outline of contents of the various volumes might appropriately be given: (I) General and special methods for analysis of plant materials; (II) carbohydrates and related; fatty oils; volatile oils; carboxy compounds; lactose; (III) volatile oils and resins; triterpenes; phytosterols; carotenoids; quinones; lignans; anthocyanins; tannins; antibiotics; etc. (IV) Proteins and related substances; chlorophylls; nucleic acids; alkaloids; amines; betaine; (V) Advanced methods of assay of plant materials (ex. spectrometry, immunological methods); (VI) Silicon compounds; sulfhydryl group; lichen substances; gibberellins; plant toxins; and many other groups; enzymes (general methods of study); (VII) Enzymes. Without question, this series of books is an almost indispensible part of any library where plant chemistry, drug analysis, and related areas are important.

GMH

"FLORA OF WEST PAKISTAN," by E. Nasir, and S.I. Ali (Editors). Department of Botany, University of Karachi, Karachi, Pakistan. Published in parts.

Parts 1 (Flacourtiaceae) to 3 (Phytolaccaceae) were published in 1970.
Parts 4 (Oxalidaceae) to 12 (Thymelaeaceae) were pub. in 1971.
Parts 13 (Martyniaceae) to 30 (Goodeniaceae) were publ. in 1972. (Includes No. 20, Umbelliferae, bound).
Parts 31 (Parnassiaceae) to 55 (Brassicaceae) were publ. in 1973. (Part 55 bound).
Parts 56 (Buddlejaceae) to 77 (Verbenaceae) were publ. in 1974.
Parts 78 (Lythraceae)to 95 (Betulaceae) were publ. in 1975.
The 1975 and subsequent numbers are abstracted below:

The individual numbers are mostly pamphlet-style with card covers, but a few are hard cover books, mostly with coverage of only a single family. Each issue has a map. 1975:
No. 79: Potamogetonaceae. 1-11, 2 figs., 1 map. (K. Aziz

and S.M.H. Jafri). Represented in Pakistan by gen. Potamogeton and 11 spp. No novelties.

No. 80: Ruppiaceae. 1-3, 1 fig., 1 map. (K. Aziz). Ruppiaceae is represented in Pakistan by only one sp., Ruppia maritima L. Hippuridaceae.

No. 81: 1-3, 1 fig., 1 map. (K. Aziz). The fam. is represented by Hippuris vulgaris L.

No. 82: Hippocastanaceae. 1-3; 1975. (E. Nasir and S.I. Ali) Aesculus indica (Wall. ex Camb.) Hook. f. is the sole sp. of the only gen. of the fam. represented in Pakistan.

No. 83: Alliaceae. ii + 31 pp., 10 figs. (E. Nasir). 41 spp. of Allium, the only genus represented in Pakistan, are discussed, including A. tripterum sp. nov. (Swat; probably related to A. macranthum Baker).

No. 84: Commelinaceae. ii + 14 pp., 3 figs. (M. Qaiser and S.M.H. Jafri). Genera of the fam. occurring in Pakistan include Rhoeo, Cyanotis, Zebrina, Setcreasea, Murdannia, and Commelina, the latter with C. paludosa Blume forma pedunculata f. nov. (Univ. Karachi campus).

No. 85: Elaeagnaceae. ii + 6 pp., 1 fig. (Y. Nasir). Treatment of two genera, Hippophäe with one sp. and Elaeagnus with 3 spp.

No. 86: Araliaceae. ii + 5 pp., 1 fig. (Shahina Ghazanfar). Hedera nepalensis K. Koch, Aralia cachemirica Dcne., and Schefflera bengalensis Gamble are discussed.

No. 87: Berberidaceae. ii + 31 pp., 8 figs. (S.M.H. Jafri). Treats Epimedium elatum Morr. et Decne., Mahonia borealis Takeda, and 20 spp. of Berberis, including B. brevissima sp. nov. (Peshawar; resembles B. lycium Royle); B. orthobotrys Bien. subsp. capitata subsp. nov., B. pachyacantha subsp. zabeliana (Schneider) stat. nov. (B.z.); B. kunawurensis Royle forma chitrioides form. nov.; B. stewartiana sp. nov. (Gilgit, etc. in Kashmir; resembles B. parkeriana Schneid.); B. pseudumbellata Parker supsp. gilgitica subsp. nov. (Gilgit) and an unnamed sp., which is described; it is close to B. boreali-sinensis Nakai.

No. 88: Cornaceae. ii + 4 pp., 1 fig. (Shahina Ghazanfar). Cornus capitata Wall., C. macrophylla Wall., and C. oblonga Wall. are taken up.

No. 89: Myrsinaceae. ii + 8 pp., 2 figs. (S.M.H. Jafri and Saida Qaiser). Covers five genera and six spp. represented in Pakistan.

No. 90: Resedaceae. ii + 9 pp., 2 figs. (Y. Nasir). Treats three genera Oligomeris, Ochradenus, and Reseda, with (resp.) 1, 2, and 5 spp. One of the latter was left unnamed as an appar. undescribed sp.

No. 91: Sabiaceae. ii + 5 pp., 1 map. (A. Ghafoor). Descriptions of Sabia, S. campanulata Wall., and of Meliosma and M. simplicifolia (Roxb.) Walp., the only taxa of the fam. known from Pakistan.

No. 92: Aceraceae. ii + 7 pp., 2 figs. (E. Murray). Eight spp. of Acer are reported from Pakistan.

No. 93: Pittosporaceae. ii + 3 pp., 1 fig. (Shahina Ghazanfar). The fam. is described and the single sp. found in Pakistan, Pittosporum napaulense (DC) Rehder et Wils. and its var. rawalpindiense Gowda.

No. 94: Dipsaceae. ii + 12 pp., 3 figs. (Y. Nasir). Five genera include Dipsacus inermis Wall. var. mitis (D. Don) comb. nov. (D.m.) (widely distributed in c. Asia) and Scabiosa maslakhensis sp. nov. (Baluchistan; resembles S. rotata M. Bieb.).

No. 95: Betulaceae. ii + 5 pp., 1 map. (Y.J. Nasir). Betula utilis D. Don and Alnus nitida (Spech) Endl. are described. Two additional B. spp. have been reported from Chitral but same could not be confirmed. It is suggested they may be variable forms of B. utilis.

1976:

No. 96: Begoniaceae. 4 pp., 1 fig. (S. Ghazanfar and P. Aziz) Begonia picta Sm. and B. tenella D. Don are described, figured, and discussed as to their distribution in Pakistan.

No. 97: Trapaceae. ii, 4 pp., 1 fig. (S. Ghazanfar). Trapa bispinosa Roxb. and T. natans L. are described, figured, and discussed as to distribution in Pakistan.

No. 98: Orobanchaceae. ii, 1-25, 5 figs. (S.M.H. Jafri). One sp. each of Aeginetia, Christisonia, and Cistanche are taken up, together with 19 spp. of Orobanche. Among the last-named is Orobanche cernua Loefl. var. pseudoclarkei var. nov.(similar to O. clarkei Hook. f.)

GMH

"SEED PATHOLOGY," by Paul Neergaard. 2 volumes. Vol. I: xxiv, 1-840, 243 figs., 5 pls (col.), 64 tabs. Vol. II: vii, pp. 841-1187. John Wiley & Sons, Inc. (Halsted Press), Somerset, N.J. 08873. 1978. $97.50.

The reviewed work has both teaching and reference applications, reflecting the experience and knowledge of the author who has served as a teacher of seed pathology at an Institute in Copenhagen devoted to promoting agriculture in the developing countries of the world (or Third World)(such as India, Kenya, etc.). The entire reading text of this work is contained in Volume I, while Volume II is made up of the large glossary and an immense bibliography (141 pages!) followed by the exhaustive subject index. (There is no author index; presumably the literature reference section, arranged alphabetically by author, is adequate). To simplify the status of the two volumes, one might say that volume I is the text and volumes I and II the reference work. The subject is a relatively new one -- at least as an organized separate field of endeavor. However, it is of very great importance since food -- the very staff of life -- being basically vegetative, depends nearly entirely on the success of the total seeding operation. The subject actually represents a merging of the many fields of scientific activity: phytopathology and seed technology preeminently. The reviewed work crowns the efforts of more than eight years of concentrated application to this field. The causes of loss of seed and loss of proper germination are multifactorial and include such organisms as bacteria, fungi, nematodes, and insects, also viruses, ageing, mechanical injury, inherited defects (genetic), and "physiogenic diseases" (deficiency states (K, N, Mn, B, etc.), too high to too low temperatures, low and high humidities, poisons, and so on. Even bacteriophages and mycoplasmata are considered, even with the rather sketchy knowledge we have of these agencies at this time. The text of volume I is subdivided into five major parts: (I) Pathogens; diseases; hosts; (II) Mechanisms of seed transmission of diseases; (III) Control of diseases of seeds; (IV) Testing methods; (V) Assessment of seed-borne inoculum. A wide variety of subject matters is involved: mycology, virology, microbiology, pesticides, analytical procedures, etc. The book is written in an excellent style of English, as though the author had been raised in the language. The book is worthy of a place in all general scientific and agricultural libraries.

GMH

"PLANT BIOLOGY," by Knut Norstog and Robert W. Long. Ed. 1. vi + 585 pp., 2 end papers, 373 figs., 5 tabs. W.B. Saunders Company, Philadelphia, Penna. 1976. (Teachers' Guide: vi + 98 pp.). $14.50.

This attractive textbook of botany follows much the same plan as other such texts: general information - the cell - plant physiology - ecology - algae - fungi - bryophytes - paleobotany - pteridophytes - gymnosperms - angiosperms - genetics - plant growth and development control. A scanning study of the book indicates that if fully utilized, the text would satisfy the needs of an average course in botany. Besides the excellent physical characteristics of the work, its strongest features are the clear and lucid writing and the equally clear typography; the well selected and interesting illustration; and the not too lengthy chapters. There are a glossary and index at the volume's end. The chapters are provided with "Supplementary Reading" lists and this feature should be useful to those interested in enlarging their horizons. The book in fact could well be a useful reference work for the school library.

GMH

"FIRST SYMPOSIUM ON THE SCIENTIFIC ASPECTS OF ORCHIDS, OCTOBER 24, 1974, SOUTHFIELD, MICHIGAN," by H.H. Szmant, and J. Wemple (Editors). Chem. Dept., Univ. Detroit, Detroit, Mich. 48221. iii + 164 pp., 5 charts, 42 figs., 18 tabs.,; 1976.

14 contributions are included in this volume, representing papers presented in conjunction with the Mid-America Orchid Show. Seven papers are of predominantly botanical interest, seven of chemical. Included are: Use of pollinaria in orchid systematics (DRESSLER, R.L.); electron microscopy of orchid seedlings (WIESMEYER, H. and HOFSTEN, Angelica V.); pollination strategies in orchids of southern Australis (STOUTAMIRE, W.); observations on equitant Oncidiums as examples of introgressive hybridization (WITHNER, C.L.); ecology of epiphytic orchids in relation to their substrates (FREI, J.K.); some urgent problems of orchid ecology (SANFORD, W.W.); chemical composition of fragrances of some orchids (HOLMAN, R.T. and HEIMERMANN, W.H.); amiño acid analysis of the flower of Vanda Miss Joaquim (MIWA, T.H. and ZEITLIN, H.); alkaloids of Dendrobium (MANSKE, R.H.); studies on some Dendrobium alkaloids from the Chinese drug "Shi-hu" (INUBUSHI, Y. and TOSHIRA, I.); biosynthesis of the alkaloids of Dendrobium pierardii using ^{13}C-nuclear magnetic resonance (LEETE, D. and BODEM, G.B.); Orchidaceae alkaloids: some biosynthetic considerations (LUNING, B.); literature survey of reports on scientific investigations on orchids (June 1893 - June 1959). (ANON.); genetic control of orchid pigments (HARPER, W.J.).

GMH

"VASCULAR PLANTS OF BRITISH COLUMBIA: A DESCRIPTIVE RESOURCE INVENTORY," by R.L. Taylor and B. MacBryde. Bot. Garden (Univ. B.C.) Tech. Bull. No. 4: xxiv + 1-754, 2 figs., 1 map, 1 tab.; 1977. Univ. of British Columbia Press, Vancouver, B.C. $28.00.

This useful volume is essentially a computer printout on sheets 8½ by 11 inches and strongly bound in heavy card covers. However, it is a very useful and informative volume with its annotated listing of all plants of higher order known to grow in the Pacific Ocean province of Canada. It is a compilation which was badly needed since there is nothing really comparable to it for this area. A "Flora of British Columbia" with a "Supplement" seems to have been the only predecessor of sorts worthy of that name. The senior author (RLT) was previously editor of the Flora of North America project (1966-73) and his work there seems to have been carried over to this Flora of B.C. project. British Columbia possesses an enormous flora with 3,137 taxa known at the time of publication. The present inventory is the first step in a program with a keyed field guide as the second step and a multivolume flora (comparable to that for the Pacific Northwest by Hitchcock and Cronquist) will be the last step. (As a matter of fact, the work covering the Pacific Northwest includes southern British Columbia. The floras of Alaska will also complement the B.C. flora). The introductory section of this book gives a rounded view of the Province and its plant life, together with useful guidance in the use of the Inventory. The plant group arrangement is Pteridophyta, Pinophyta (conifers), Magnoliatae (dicots), and Liliatae (monocots). Families, genera, and species are arranged in strict alphabetic order within each group. For each species, the following data are presented: botanical name (with authorities), vernacular name, status (whether native, naturalized, etc.), flower color, choromosome status (diploid, etc.), chromosome base no., chromosome somatic number, poison status, duration of plant (perennial, etc.), anthesis (months of flowering), economic status, distribution, habit, (tree, etc.), fruit type, ornamental value, sex status (polygamous, monosporous, etc.), fruit color, and endangered status (immediate danger of extinction, etc.). This gives 16 points of information about the plant, several of them of important practical value. Many abbreviations are used as entries in order to save space (and time?); however the key to the abbreviations is inadequate for two reasons. It is placed on a sheet in the back part of the volume; and the abbreviations are set down with meanings under the various categories. What is really needed here is a single listing of abbreviations located prominently as first or last sheet of the book, and perhaps on colored paper, to make it more readily locatable. Not all the data listed are actually recorded; there are often gaps for chromosome data, ornamental value, economic status, etc. The appendices are very useful compilations: (I) "standard" references (floras of regions, popular compilations, etc.). (II) Miscellaneous references (articles, brochures, bulletins, etc.). (III) tabulation relating each taxon (by its Flora of British Columbia Project (FBCP) number used in the computer program) to a reference or references (indicated by a number or numbers keyed to a series of references, mostly monographic treatments of family, genus, or species) and also to a category number indicating the type of information in the reference (for instance distribution, poison status, etc.). (Not all taxa bear such references). (IV) References which are linked to taxa (938 references); few if any of these references appear in the other two bibliographic lists. (V) An alphabetic listing of all plant authorities which appear in the inventory -- often in abbreviated form. (VI) Sample data form: this bears an outline of all points in the Inventory coverage, and this also bears the abbreviations. The Appendices are followed by the Index, which has generic and family names, also common names. This volume is a valuable publication which fills in a gap formerly present in the floral coverage for the plants of western North America. Until the other parts of the program for B.C. flora are completed, botanists will have to use this volume in combination with available determinative and descriptive floras.

GMH

"THE THOMPSON BEGONIA GUIDE," by Mildred L. and Edward J. Thompson. (Second edition), Supplement I. Exhibition manual. vi + 98, 22 figs. Edward J. Thompson (Publisher), Southampton, New York. 1978. $4.75 (binder $3.50 additional).

This supplement constitutes text pages in a fourth letter-size looseleaf binder uniform in style with the earlier volumes (see Phytologia 40: 299-301; 1978). The contents are made up of four major sections. The first one, Classification for show purposes, presents the eight major divisions of the horticultural classification system (cane-like, shrub-like, thick-stemmed, semperflorens characteristics, rhizomatous, Rex Cultorum ("king of cultivated plants"), tuberous, and trailing-scandent). The second section presents suggested show classifications, and employs the same eight major divisions plus a ninth, "Contained atmospheres with single variety of Begonia." (A contained atmosphere is essentially a closed container, such as a terrarium, used to demonstrate horticultural values rather than floral arrangements). These divisions are designated by the letters "A" to "I". Each division is then subdivided into classes with a total of 101 classes for all nine. These are based mostly on differences in leaf and stem characters. Additional horticultural classifications are proposed (pp. 27-8). This second section also contains a very important listing of all known species and cultivars of Begonia, arranged of course in alphabetical order. (Examples: Begonia "A.D. Davis" and B. acida). The last two sections of the text deal with judging information and sample forms for use in flower shows.

GMH

"BIOLOGY, THE WORLD OF LIFE," by Robert A. Wallace. xviii + 513 pp., 314 figs., 26 pls.(col.), 16 tabs., 41 "boxes." Goodyear Publishing Co., Inc., 15115 Sunset Blvd., Pacific Palisades, Cal. 90272. 1975. $12.95.

This well-printed, richly illustrated, and firmly bound volume is available at a truly moderate price -- dependent apparently on an expected large volume of sales. Books of equivalent quality often sell at three times this price and more. If I were a student beginning in biology, I believe I would find this text a most attractive one, a pleasure to study. Attractive illustrations, graphic diagrams, even an occasional cartoon enliven the pages. Scattered through the pages are "boxes," framed sections of text in bold face type, with more detail on some topic not discussed or only touched on in the text proper. Thus, in the chapter on photosynthesis, a box appears describing chlorophyll, including a drawing of a chloroplast and a graphic formula. The contrast in a text such as this and an older textbook is truly remarkable. The attempt to sugar-coat the subject must surely meet with success. Since the area of biology is so pivotally important to many fields, such as medicine, pharmacy, oceanography, to mention only a few, it is obvious that the use of an "entering wedge" of information in this field will be beneficial to many professions and scientific specialties. The book follows a natural order of development -- a brief historical sketch of the development of biology as a science, the beginnings of life, the chemistry of life, the cell, heredity, reproduction, development, biological systems and their control, the endocrines, behavior, communities and competition, populations, and a final timely chapter -- "Resources, Pollution, and Values." The Appendix gives a modern classification system of plants and animals. Reading suggestions for each chapter, a glossary, and an index follow.

GMH

"MARIHUANA: AN ANNOTATED BIBLIOGRAPHY," by C.W. Waller, Jacqueline J. Johnson, Judy Buelke, and C.E. Turner. Macmillan Publishing Co., 866 Third Av., New York 10022. xxii + 560 pp.; 1976. Price $13.95.

This work contains rather thoroughly annotated listings of books and (mostly) articles published over the 11 year period 1964-1974; the coverage is international. The literature prior to 1964 was listed in a readily available publication: "The question of cannabis, Cannabis bibliography" (United Nations Commission on Narcotic Drugs, E/CN7/479; 1965). Hence, between these complementary works, all of the important literature on Cannabis is readily available for students. 3045 items are present in the listing under review. Entries are arranged in alphabetic order by senior author. Comprehensive author and subject indexes follow the bibliography to give greater access to the same. An introductory section presents the formulas for 70 compounds associated with Cannabis. There is also a tabular summary of the action of Cannabis on various animal spp. This is a very useful book for the science library and is reasonably priced at $13.95.

GMH

"THE GENUS APHELANDRA (ACANTHACEAE)," by Dieter C. Wasshausen (National Museum of Natural History, Washington, D.C.). Smithsonian Contributions to Botany No. 18: 1975, 163 pp.

Slightly acid 85% MeOH exts. of the dried leaves were chromatographed on Whatman 3 MM paper, using t-BuOH, AcOH, H_2O (3:1:1, v/v) as first mobile solvent and 15% AcOH as second. For the 30 various species studied, between 20 and 30 flavonoids were detected in each species. Spots were distinguished in 3 areas: No. 1 spots no. 8-12, apparently flavonol-7-glycosides; No. 2, spots no. 1-7, being flavone or flavonol aglycones; and No. 3, nos. 13-24, mostly flavonol-3-glycosides. It is suggested that Aphelandra is a good genus for study of interspecific biochem. variation in taxa over a wide geographic range. 49 references.

GMH

"MASTER TREE FINDER, A MANUAL FOR THE IDENTIFICATION OF TREES BY THEIR LEAVES," by May Theilgaard Watts. 64 pp., many figs. 1963. -- "WINTER TREE FINDER, A MANUAL FOR IDENTIFYING TREES IN WINTER," by May Theilgaard Watts and Tom Watts. 64 pp., many figs. 1970. -- "FLOWER FINDER, A KEY TO SPRING WILD FLOWERS AND FLOWER FAMILIES EAST OF THE ROCKIES AND NORTH OF THE SMOKIES, EXCLUSIVE OF TREES AND SHRUBS," by May Theilgaard Watts. 1955. -- Nature Study Guild, Box 972, Berkeley, California 94701. All priced at $1.25 each.

These little handbooks designed to fit into a shirt pocket are compacted with information of the greatest utility to amateur plant lovers who wish to find out the identity of the plants they encounter. For the small cost of each, it is difficult to see how one could obtain more value for his or her money. Perusal of some items showed a good level of accuracy and dependability.

GMH

"TREES AND SHRUBS OF KENTUCKY," by Mary E. Wharton and Roger W. Barbour. x, 582 pp., 914 figs., 8 maps, 260 pls. (col.). The University Press of Kentucky, Lexington, KY 40506. 1973. $12.95.

With shame must I admit it, this splendid volume was misshelved and not reviewed until now, five years later. This book has both a popular and a scientific appeal, and it shows several novel features. While it is devoted specifically to the woody flora of the State of Kentucky, at the same time it could be used with almost equal effectiveness in the seven States which adjoin Kentucky and even beyond that to parts of nine other States bordering these. Hence it represents a useful reference book on trees and shrubs in at least 17 states, 34% of the States of the Union. Described and figured are 282 species, representing practically all of the wild growing species of title category in the State of Kentucky. There is much more here than photographs and descriptions of the plants. Also included are chapters telling how the book may be most effectivly used, the ecology of Kentucky, with categorization of the various habitats to be found within the state and discussions of the physical environments occurring there. Rudimentary keys and excellent colored and black-and-white photographs are used as a means of identification of the various trees and shrubs. Following these two main sections of the book, Part III presents textual descriptions of the various species, followed by references, an illustrated glossary, and the index. This book is strongly bound, well printed, artistically attractive, and bound to advance the cause of nature love and nature study.

GMH

"WHO EXPERT COMMITTEE ON BIOLOGICAL STANDARDIZATION, 29th REPORT," by World Health Organization, Tech. Rept. Ser. No. 626. 147 pp. WHO, Geneva, Switzerland. 1978. Sw. fr. 14.--

Standards are released for many new biological products, including anti-hepatitis immunoglobulin, fluorescein-isothiocyanate-conjugated sheep anti-human immunoglobulin, several human serum proteins, human placental lactogen, and lysine vasopressin. Many changes in the older standards are indicated.

GMH

"FOLK MEDICINE PLANTS USED IN THE PENNSYLVANIA DUTCH COUNTRY," by Paul R. Wieand. Published by Wieand's Pennsylvania Dutch, Route 3, Allentown, Penna. 18104. Booklet. 48 pp., 37 figs.; 1963 (2nd printing).

At the end of this little volume (instead of at the beginning as expected), an answer is given as to "Why this book?" The answer is in the revival of interest in the old herbal remedies formerly so popular in this area of the Pennsylvania "Dutch" (actually Germans and German-speaking Swiss who settled in parts of Pennsylvania in the 1600's and 1700's). For 109 drugs, there are given the botanical names, common English and "Dutch" names, and a brief statement on the uses made by these people, along with in most cases a figure of the plant. There is an index to the English but not to the "Dutch" names. Most of the information was obtained from the natives of the area. An introduction tells of the importance of these plant drugs to the common people of the Dutch country.

GMH

"DIE MISTEL IN DER KREBSBEHANDLUNG," by O. Wolff (Editor). Vittorio Klostermann, Frankfurt am Main, BRD. 120 pp., 29 figs., 12 tabs.; 1975 (1976). DM 18,50.

Seven authors explore the possibilities of Viscum album in the treatment of cancers; there are also reviews of the pharmacological action of the drug. Most chapters deal with the clinical use of this material.

GMH

"COLORADO WEST: LAND OF GEOLOGY AND WILDFLOWERS," by Robert G. and Joann W. Young. Published by the authors, 612 Rico Way, Grand Junction, Colorado. 1-242, 208 col. figs.; 1977.

This paperback book carries text and good color photographs to illustrate the descriptions of the geology and plants of west Colorado. Both natural groups and individual wild flower plants are shown in that portion of Colorado west of the Continental Divide (roughly the western half of the state). The first part includes the geological history of the area, the various eras showing their evidences in the state, plant communities (Colorado deserts, sagebrush country, pinyon-juniper, scrub oak brush, spruce forests, alpine tundra). The scientific part comprises over half of the volume and includes two chief sections, the desert and the mountain flowers, with text on opposite pages to the colored photos. The attractive colored pictures are useful for the identification of the various plant spp. and should be useful to amateur and incidental students of the plant life of the area.

GMH

"FLORA OF THE NIAGARA FRONTIER: SUPPLEMENT," by C.A. Zenkert and R.H. Zander. Bull. Buffalo Soc. Nat. Sci. 16: iv, iv, 1-62; 1975 (recd. 1978).

This supplements the Flora published in 1934. 634 spp. and vars. are included, of which 106 are additions to the flora. There are 771 new distributional records. The senior author (CAZ) passed away in July, 1972.
An annotated bibliography of his publications in botany is given, along with a brief biography. The area of coverage is the area within a 50 mile radius of the city of Buffalo. Species new to the flora are shown in boldface type, new county records are denoted with small capitals. The records are based on herbarium specimens in some local herbaria. Bibliography is given.

GMH

OMMISSIONS FROM PREVIOUS REVIEWS:

Phytologia 29 (5): 429; 1975.
Publisher: Annual Reviews, Inc., 4139 El Camino Way, Palo Alto, Cal. 94306.
Phytologia 34 (1): 133; 1976.
Tyler and Schwarting, Experimental Pharmacognosy.

Add: Burgess Publishing Company, 426 S. 6th St., Minneapolis, Minn.

Phytologia 37 (2): 124; 1977.

Glassmann, "A revision of B.E. Dahlgren's Index of American palms." Add: Published by J. Cramer Verlag, Postfach 48, Lehre, BRD. (West Germany).

Ibid. 105.

"Peter Kalm's Travels in North America." Add: Dover Publications, Inc., 180 Varick St., New York 10014.

Ibid. 115.

"Carte Ecologique du Nepal." Add: Editions du CNRS, 15 quai Anatole France, Paris, France.

Ibid. 154-5.

"Flora Neotropica," Add: Published by the New York Botanical Garden, Bronx, New York 10458.

Ibid. 159.

"Flora of North America," Add: Published by The New York Botanical Garden, Bronx, New York 10458.

Acknowledgement

The seven 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.-40(3): 264-304; 1978) 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. This present contribution, the eighth, was partially supported (~20%) by Miscellaneous Grant Fund 6-40020 (Auburn University), herewith thankfully acknowledged.

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Price of this number $2.50; for this volume $11.00 in advance or $12.00 after close of the volume; $3.00 extra to all foreign addresses; 512 pages constitute a complete volume; claims for numbers lost in the mails must be made immediately after receipt of the next following number for free replacement.

NEW SPECIES OF VERNONIEAE (ASTERACEAE). I.

<u>VERNONIA</u> <u>HARLINGII</u> FROM ECUADOR.

Harold Robinson
Department of Botany
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The Tribe Vernonieae can be characterized generally as having alternate leaves. Some exceptions occur, however, and some examples have been discussed by Robinson (1976) in conjunction with the description of *V. sparrei*, an opposite-leaved species of Loja in southern Ecuador. Recently, another opposite-leaved species has been encountered in a collection by Harling and Andersson in El Oro in southern Ecuador. As in the previous case, the opposite-leaved condition had resulted in the specimen being sent as a member of the Eupatorieae.

The new species is remarkably distinctive in both the leaves and the involucral bracts. As indicated, opposite leaves are found in a few other species of *Vernonia*, but the sessile broad bases of the leaves of the new species are almost perfoliate in appearance, and the blades are large for the genus. The involucral bracts are prominently ornamented with laciniate or split whitish indurated apices and upper margins. Such appendaged bracts seem most closely approached elsewhere in *Vernonia* by some of the Stengelioid species of Africa (Smith, 1971), though the appendages of the latter are colored and thinner in texture. The combination of the leaves and involucre gives the new species a superficial resemblance to some members of the Tribe Inuleae, but the leaves are opposite and the flowers are Vernonian in all details. The new species may prove to be closest to *V. sparrei* H.Robins. and *V. trichotoma* Gleason, which also have opposite leaves, corymbose inflorescences, broad and obtuse involucral bracts, and anther appendages without glands, but their leaves are petiolate with smaller oblong blades, veins are prominulous on the upper surface, and the involucral bracts are unappendaged.

The species is named for the senior collector, Dr. Gunnar Harling, of the University of Göteborg, who is also editor of the "Flora of Ecuador" project.

Vernonia harlingii H. Robinson, sp. nov.

Plantae suffrutescentes pauce ramosae? 2 m altae. Caules brunnescentes subhexagonales striati dense hirtelli. Folia opposita sessilia; laminae papyraceae ovatae plerumque 10-20 cm longae et 5-10 cm latae base late rotundatae subamplexicaules margine subintegrae minute mucronato-denticulatae apice breviter acutae supra minute hispidulae subtus parce pilosulae et glandulo-punctatae, nervis pinnatis, nervis secundariis utrinque ca. 11, nervis et nervulis subtus albidis. Inflorescentiae terminales corymbosae, ramis dense hirtellis, ramis ultimis 3-10 mm longis. Capitula late campanulata 9-10 mm alta et 7-9 mm lata; squamae involucri ca. 30-35 persistentes subimbricatae 3-7 mm longae et 1-2 mm latae extus parce fulvo-tomentosae et minute glandulo-punctatae, bracteae 2-3 basilares ovatae inornatae extus sericeae cetera oblongae vel late lineares in apicem valde ornatae albo-alatae et laceratae, bracteae interiores sensim ornatissimae. Flores ca. 20 hermaphroditi. Corollae lavandulae extus breviter stipitato-glanduliferae, tubis ca. 4 mm longis in partibus cylindraceis 1 mm longis superne infundibularibus, faucis ca. 1 mm longis, lobis anguste lanceolatis ca. 3 mm longis et 0.7 mm latis; thecae antherarum ca. 2 mm longae inferne obtusae; appendices antherarum oblongae 0.5 mm longae et 0.25 mm latae non glanduliferae; basi stylorum noduliferi et annulate scleroidei, cellulis annularum subquadratis vel irregularibus plerumque 12-25 µm in diametro. Achaenia immatura usque ad 2.5 mm longa et ca. 1 mm lata inferne glandulifera parce breviter spiculifera; carpopodia distincta ca. 0.2 mm longa et 0.4 mm lata, cellulis subquadratis vel breviter oblongis ca. 20 µm latis, parietibus valde incrassatis; setae pappi interiores ca. 25 plerumque ca. 5 mm longae superne distincte latiores, cellulis apicalibus acutis, setae in sereibus exterioribus distinctae ca. 1 mm longae. Grana pollinis ca. 37 µm in diametro leniter lophorata, cristis valde spiniferis.

TYPE: ECUADOR: El Oro: Road Pasajo - Santa Isabel - Girón, valley of Río Jubones, mountain rain forest to dry steppe vegetation, alt. ca. 1600 m.s.m. Shrub ca. 2 m high. Corolla bluish violet. 7 V 1974. G. Harling & L. Andersson 14408 (Holotype GB).

Literature Cited

Robinson, H. 1976. A new species of Vernonia from Ecuador. Phytologia 34 (3): 301-304.

Smith, C. Earle, Jr. 1871. Observations on Stengelioid species of Vernonia. Agriculture Handbook No. 396: 1-87.

Vernonia harlingii H. Robinson, Holotype, Göteborg, Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Vernonia harlingii H. Robinson, enlargement of heads.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XVII.

ADDITIONS TO MONACTIS AND KINGIANTHUS.

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Smithsonian Institution, Washington, DC., 20560.

Monactis H.B.K. and Kingianthus H.Robins. form a related complex in the Andes of Ecuador and Peru. They are related to Verbesina but are clearly distinguished by the fusiform achenes. Monactis often bears a single pappus squama which was previously unique to the genus, but the new species of Kingianthus described here shows a similar pappus. Monactis was named after the single ray flower found in the head in many species. The heads of Kingianthus have more numerous rays arranged symmetrically.

The significant history of Monactis has been reviewed in the study by Robinson (1976). At that time Kingianthus was still treated as an anomalous South American species of Zaluzania, but the genus was segregated two years later (Robinson, 1978a) and an older name for the species was subsequently discovered (Robinson, 1978b). Quantities of new material have been seen since the cited studies, and additions to both genera are now necessary. It has seemed logical to treat the genera together because of their close relationship. Both genera are now seen to have geographically localized species, each in their own area. This is most obvious in Monactis in Ecuador where the areas of Pichincha, Canar, Azuay and Loja each have a characteristic species.

Monactis lojaensis H. Robinson, sp. nov.

Plantae frutescentes 1-2 m altae? Caules fulvi in nodis deflecti teretes pauce striati dense puberuli vel subtomentosi. Folia alternantia in partibus petioliformibus 2-6 cm longa superne sensim late alata; laminae late ovatae ad 17 cm longae et 14 cm latae base subabrupte acuminatae fere ad basem trinervatae margine integrae vel subcrenulatae apice breviter distincte acuminatae supra minute bullatae minute scabridulae subtus hirtellae et minute glandulo-punctatae, nervulis subtus valde prominentibus. Inflorescentiae terminales late corymboso-paniculatae, ramis parce puberulis vel hirtellis, ramis ultimis 0.3 mm longis. Capitula anguste campanulata vel cylindrica 7-9 mm alta sine radiis 2.5-3.0 mm lata; squamae involucri ca. 3-seriatae subimbricatae 10-12 oblongae vel anguste oblongae 2-5 mm longae et 1.5 mm latae margine fimbriatae apice rotundatae extus glabrae; paleae squamis involucri similares ca. 5-6 mm longae obtusae. Flores radii plerumque 1 saepe 2 in capitulo feminei; corollae flavae, tubis ca. 2 mm longis parce puberulis, limbis oblongis ca. 7 mm longis et 3 mm latis subtus glanduliferis. Flores disci 10-12 in capitulo hermaphroditi; corollae flavae 3.5-4.0 mm longae glabrae vel subglabrae, tubis ca. 1.5 mm longis, faucis campanulatae ca. 1 mm longis, lobis 1.0-1.5 mm longis et ca. 0.8 mm latis intus superne indistincte mamillosis; thecae antherarum ca. 1.5 mm longae; appendices antherarum nigrae ovatae ca. 0.3 mm longae et 0.23 mm latae. Achaenia submatura fusiformia 4.5 mm longa glabra; squamae pappi singulares ca. 1 mm longae et 0.3 mm latae. Grana pollinis ca. 30 µm in diam.

TYPE: ECUADOR: Loja: Colca, near San Vincente, slopes at the confluence between Río Arenales and Rio Catamayo, dry slopes, ± 2000 m. 15/5 1967. Benkt Sparre 16198 (Holotype S).

Monactis lojaensis is apparently the endemic member of the genus from Loja in southern Ecuador. The most significant features seem to be the extremely broad leaves with somewhat roughened upper surface, the presence of rays in the heads, and the presence of a pappus. The species of adjacent Azuay in Ecuador, M. holwayae (Blake) H. Robins., lacks rays. The Loja species is actually closer to M. hieronymi H. Robins. of adjacent Peru, but the latter has much narrower leaves which are sometimes markedly toothed.

Monactis macbridei H. Robinson, sp. nov.

Plantae suffrutescentes virgatae ad 3 m altae non ramosae. Caules fulvi recti vel superne in nodis leviter deflecti teretes pauce striati dense puberuli. Folia alternantia, petiolis 2-5 mm longis; laminae ovato-lanceolatae plerumque 5-10 cm longae et 2-3 cm latae in partibus basilaribus anguste cuneatae vel acuminatae 1-2 cm longae supra basem trinervatae margine superne serrulatae vel argute serratae apice anguste acutae supra interdum leviter minute bullatae dense scabridulae subtus in nervis nervulis et interdum areolis pilosulae dense minute glandulo-punctatae. Inflorescentiae terminales corymboso-paniculatae, ramis dense puberulis vel tomentellis, ramis ultimis 0-1 mm longis. Capitula anguste campanulata vel cylindrica ca. 7 mm alta sine radiis ca. 2.5 mm lata; squamae involucri ca. 3-seriatae subimbricatae 10-12 oblongae vel anguste oblongae 2-5 mm longae et 1.5 mm latae margine fimbriatae apice anguste rotundatae extus subglabrae minute glanduliferae; paleae squamis involucri similares ca. 5-6 mm longae apice obtusae. Flores radii 1-2 in capitulo feminei; corollae flavae, tubis ca. 1 mm longis puberulis et minute glanduliferis, limbis oblongis 5-6 mm longis 2.5-3.0 mm latis. Flores disci 10-12 in capitulo hermaphroditi; corollae flavae 4.0-4.5 mm longae, tubis 1.3-1.7 mm longis parce puberulis et glanduliferis, faucis campanulatis 1.5-2.0 mm longis glabris, lobis 0.7-1.0 mm longis et 0.5-0.7 mm latis intus obscure mamillosis extus parce minute glanduliferis; thecae antherarum ca. 1.5 mm longae; appendices antherarum nigrae ovatae ca. 0.4 mm longae et 0.25 mm latae. Achaenia submatura fusiformia ca. 2 mm longa glabra; pappus nullus. Grana pollinis ca. 30 µm in diam.

TYPE: PERU: Lima: Rio Blanco, steep stream hillside. 12,000 ft. Stems 8-10 ft. in clumps, scarcely woody, virgate, branchless. May 8-19, 1922. Macbride & Featherstone 771 (Holotype US). PARATYPE: PERU: La Libertad: Prov. Huamachuco: Road to Marcahuamacucho; alt. 3400. 23-II-1967. Riccio & La Rosa 3569 (US). Sinon. vulg. Churguis.

Monactis macbridei is distinguished from other members of the genus by the lanceolate leaves. The type specimen was seen at the time of the original study (Robinson, 1976), but the leaves were so unusual for *Monactis* and so much more like *Kingianthus* that treatment was deferred. The second specimen has confirmed the nature of the species. Some differences between the two specimens are noticeable, the leaves of the paratype are strongly serrate and the surfaces smoother, and the branches of the inflorescence are less densely pubescent. Still, pubescence of the corollas and paleae is basically the same and different from other members of the genus. One can assume more collections will show intermediate conditions.

The two localities for the species are both in the coastal ranges of Peru and the type specimen represents the most southward extention of the genus presently known.

Kingianthus paradoxus H. Robinson, sp. nov.

Plantae frutescentes ca. 1 m altae laxe ramosae. Caules recti teretes vel subhexagonales atro-brunnei dense albo-puberuli. Folia alternantia breviter petiolata vel subsessilia; laminae ovatae vel rhomboideae ca. 2-6 cm longae et 1.0-2.5 cm latae base subabrupte longe decurrentes et petioliformes supra basem trinervatae margine subtiliter vel distincte crenulatae vel subdentatae apice obtusae vel breviter acutae supra dense scabridulae parce glandulo-punctatae subtus dense albo-tomentosae, nervulis in reticulo minuto obscure prominulis. Inflorescentiae terminales corymboso-paniculatae, ramis dense puberulis vel subtomentosis et glandulo-punctatis, ramis ultimis 2-10 mm longis. Capitula campanulata ca. 7 mm alta sine radiis ca. 4 mm lata; squamae involucri ca. 2-seriatae subimbricatae ca. 15 lanceolatae plerumque 3-4 mm longae et 1 mm latae inferne extus parce vel dense puberulae et glanduliferae superne scariosae et glabrae apice acutae; paleae lanceolatae ca. 4 mm longae extus tomentosae et glanduliferae superne scariosae glabrae. Flores radii 6-8 in capitulo feminei; corollae flavae, tubis ca. 1 mm longis pilosulis vel hirtellis, limbis oblongis ca. 7 mm longis et 3.5 mm latis subtus glandulo-punctatis. Flores disci ca. 30-40 in capitulo hermaphroditi; corollae flavae 3-4 mm longae, tubis 1.0-1.5 mm longis puberulis vel subglabris, faucis anguste campanulatis ca. 1.5 mm longis extus glabris vel subglabris, lobis ca. 0.8-1.0 mm longis et 0.7 mm latis intus indistincte mamillosis extus glabris; thecae antherarum ca. 1.2 mm longae, appendices antherarum nigrae ovatae ca. 0.3 mm longae et 0.23 mm latae. Achaenia submatura subfusiformia 2 mm longa glabra; squamae pappi singulares lanceolatae ca. 1 mm longae et 0.2 mm latae. Grana pollinis ca. 32-35 µm in diam.

TYPE: ECUADOR: Azuay: 42 km S of Cumbe on road to Saraguro. Elev. 10,000 ft. Shrub 1 m tall. Florets yellow. 26 Jan. 1979. R.M.King & F.Almeda 7813 (Holotype US). PARATYPE: ECUADOR: Azuay: 28 km N of Oño on the road to Saraguro. Elev. 8900 ft. Shrub 1 m tall. Florets yellow. Common. 26 Jan. 1979. R.M.King & F.Almeda 7816 (US).

Kingianthus paradoxus is evidently restricted to southern Ecuador and is isolated from the type species of the genus, K. paniculatus(Turcz.) H.Robins., which occurs in the Pichincha region. The new species differs from K. paniculatus by the less abrupt contractions in the bases of the leaf blades, the more rhomboidal shape of the blade, the tomentose rather than pilosulous undersurfaces of the leaves, the denser reticulation of the leaf veins, and the presence of a pappus on the achene. The paradox is the apparent abundance of this undescribed entity in a region which has been visited by many botanists. The localities were passed by R. M. King during the same season of the year in 1976. It is possible that the great disturbance in the natural vegetation of Ecuador has allowed some previously restricted or even undescribed species to expand their range. A similar situation seems to be true in the case of *Ayapana ecuadorensis* K. & R. first described three years ago (King & Robinson, 1976). King reports from the most recent trip that the species is becoming increasingly weedy in areas near the type locality.

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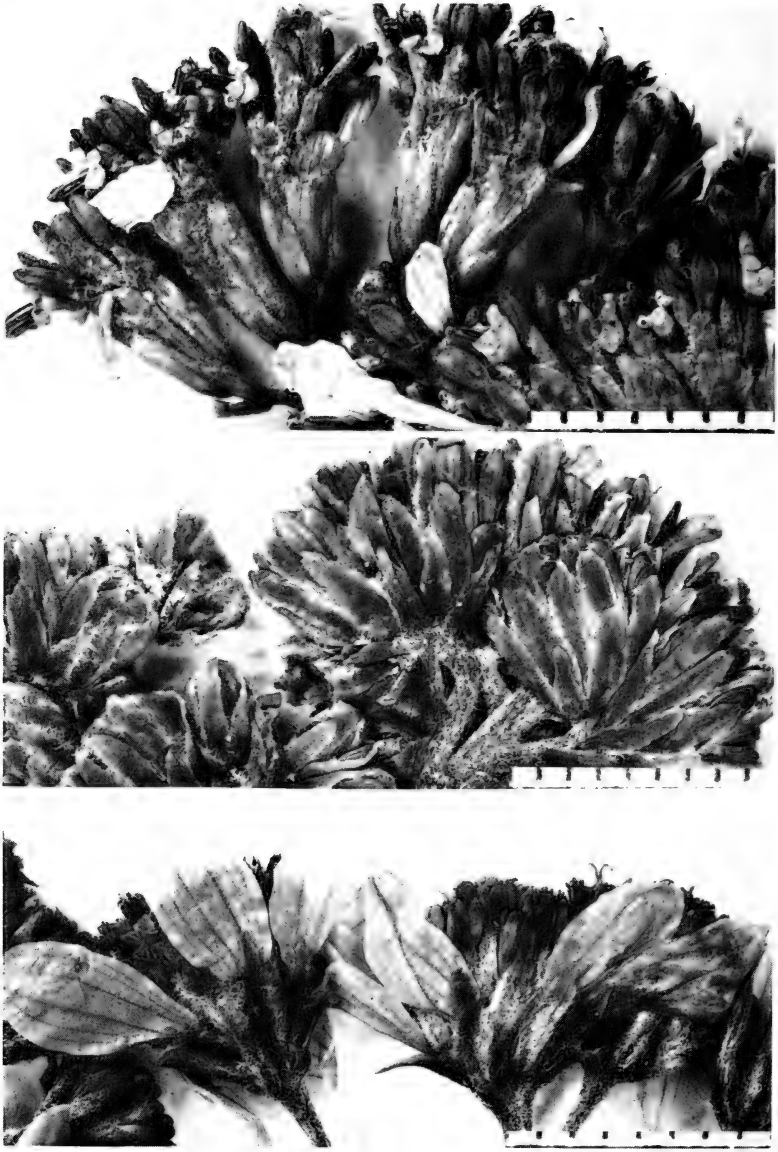
Monactis lojaensis H. Robinson, Holotype, Stockholm, Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

<u>Monactis</u> <u>macbridei</u> H. Robinson, Holotype, United States National Herbarium.

Kingianthus paradoxus H. Robinson, Holotype, United States National Herbarium.



Enlargements of heads. Top: *Monactis lojaensis*. Middle: *Monactis macbridei*. Bottom: *Kingianthus paradoxus*.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXV.

A NEW GENUS FROM BAHIA, *LITOTHAMNUS*.

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The Eupatorieae of Bahia, Brazil, includes numerous genera of the Gyptoid complex having distinctive vegetative form such as *Agrianthus*. The area is one in which the Gyptoid complex has proliferated greatly, and undescribed forms are to be expected. Recent collections from the coastal region of southern Bahia include a specimen of a slightly fleshy to coriaceous simple-leaved shrub that is Gyptoid in character, but unlike any known genus or species of the group.

The new genus, *Litothamnus*, has the general papillosity of style branches and corolla lobes, the glabrous style base, strongly annulated anther collars, and subequal involucral bracts that are characteristic of most members of the Gyptoid Complex. Both habit and geography suggest closest relationship within the Complex to the other genera with indurated leaves, *Agrianthus* and *Bahianthus*. But both of the latter genera are initially distinguishable by their characteristically alternate or spiralled leaf-insertion. Opposite leaves of *Litothamnus* are reflected even in the branching of the inflorescence which contrasts with both the densely clustered heads of *Agrianthus* and the alternating subfasciate branching of the inflorescence of *Bahianthus*. The broad glabrous leaves of *Litothamnus* with the smooth hardened upper surface are individually distinctive, and their crowded insertion further contributes to the characteristic habit of the plant. The veins of the leaves are only slightly raised and third-order veins seem sparse and crudely organized. The stems appear to have been rather fleshy in life, and the short internodes are marked by distinct lines at the nodes giving an articulated appearance. The heads of *Litothamnus* have broad involucral bracts, in contrast to those of *Agrianthus* and *Bahianthus*, and the pappus setae are scabrous on both the lateral and outer surfaces while those of the latter two genera are flattened and smooth externally.

The habit of *Litothamnus* is unlike that of any other member of the Eupatorieae, and furnishes an immediate distinction from all other members of the Gyptoid Complex. A few other genera of the tribe such as *Coreanthemum* and *Imeria* of the Critonioid Complex do approach Litothamnus in the texture and shape of their leaves.

It is possible that Litothamnus might be determined as Eupatorium carnosifolium B.L.Robinson, a species with a listed type from near Ilhéos, Bahia, and with a name very appropiate for the present plant. However, the description by Robinson (1928) indicates a larger plant having longer internodes, crenate leaves, heads with 50-60 flowers, and pubescent outer surfaces of the involucral bracts. A previous study (King & Robinson, 1972) has shown that the B.L.Robinson species is a mixed concept and the name is properly a synonym of Diacranthera crenata (Schlect. in Mart.) K. & R.

Litothamnus ellipticus R.M.King and H.Robinson, gen. & sp. nov. Asteracearum (Eupatorieae).

Plantae fruticosae ca. 2 m altae plerumque glabrae; caules et folia subcarnosa, internodis brevibus plerumque 5-10 mm longis. Folia congesta opposita, petiolis ca. 5 mm longis; laminae ellipticae vel leniter obovatae 4-8 cm longae et 2.5-4.0 cm latae in sicco coriaceae lucidae base obtusae vel breviter acutae margine integrae apice breviter obtusae fere ad basem trinervatae, nervis et nervulis supra et subtus subprominentibus, nervulis paucis irregularibus. Inflorescentiae corymbosae, ramis oppositis, bracteis anguste vel late ellipticis, ramis ultimis 2-4 mm longis. Capitula late campanulata 7-8 mm alta et 5-6 mm lata; squamae involucri 12-15 subaequilongae persistentes late oblongae vel ellipticae 5-6 mm longae plerumque 2-3 mm latae apice abrupte breviter acuminatae margine minute puberulae extus glabrae obscure 5-6 nervatae, squamae interiores lineares paucae; paleae raro vel nullae. Flores ca. 15 in capitulo; corollae disciformes albae anguste infundibulares ca. 5 mm longae extus parce glandulo-puberulae, lobis ovatis ca. 0.7 mm longis et 0.5 mm latis intus mamillosis extus superne indurate papillosis; filamenta in parte superiore incrassata ca. 0.25 mm longa, cellulis valde annulate ornatis; thecae antherarum ca. 1.7 mm longae rufescentes; appendices antherarum oblongae ca. 0.35 mm longae et 0.25 mm latae; basi stylorum glabrae non noduliferi; appendices stylorum lineares dense patentiter papillosae. Achaenia prismatica 5-costata submatura usque ad 2.5 mm longa plerumque glabra superne pauce glandulo-puberula; carpopodia annuliformia, cellulis 4-5-seriatis quadratis ca. 25 um in diametro; setae pappi ca. 30 plerumque 4.5-5.5 mm longae valde congestae subbiseriatae dense scabridulae superne angustiores apice leniter vel non latiores, cellulis apicalibus argute acutis. Grana pollinis 20-22 µm in diametro.

TYPE: BRASIL: Bahia: Municípios de Sta. Cruz de Cabrália e Porto Seguro. Rod. BR 367, a 18.7 km ao N de Porto Seguro. Prox. ao nível do mar. Folha SE-24 (16-39c). Arbusto, 2 m de altura. Flores brancas. S.A.Mori, L.A.Mattos Silva, J.A.Kallunki, T.S. dos Santos & A.V.Pereira dos Santos 9751, 20 Mar. 1978 (Holotype US).

The genus contains the single species.

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Litothamnus ellipticus R.M.King and H.Robinson, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Litothamnus ellipticus R.M.King and H.Robinson, enlargement of heads.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXVI.

THE RELATIONSHIP OF *EUPATORIUM CYRILI-NELSONII*.

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Among the various new species of Eupatorieae described in recent years from Central America, *Eupatorium cyrili-nelsonii* A. Molina has proven to be the most important test of the revised generic concepts for the tribe in that area. A reading of the original description (Molina, 1978) was enough to indicate an unusual species was involved. More recently, through the kindness of Lic. Cyrilo Nelson, catedrático of the Universidad Nacional Autonoma de Honduras, Tegucigalpa, an Isotype of the species has been made available to the U. S. National Herbarium. Considerations leading to a proper placement of the species are worthy of review here.

Eupatorium cyrili-nelsonii, as described by Molina (1978), is a subshrub with lanuginose stems, large opposite petiolate leaves, obovate to elliptical leaf blades rounded to obtuse at the base, and with large heads containing about 75 flowers. Without seeing material the characters suggest a member of the genus *Bartlettina* K. & R., a genus of many species in Central America. Examination of material shows some additional similarities to the latter genus such as the deciduous inner phyllaries common in the Critonioid-Hebeclinioid Eupatorieae and the broad lobes of the corollas. The characters of the achene, however, are not those of *Bartlettina*, but those of *Peteravenia* K. & R., another genus of about four species in Central America. The species is regarded here as a member of the genus *Peteravenia* in spite of the lack of cordate bases on the leaf blades which occur in the other known species of the genus.

Peteravenia is superficially similar to *Bartlettina*, and it has been placed in the same *Hebeclinium* Group in our recent review of the tribe (Robinson & King, 1977). Nevertheless, when first proposed, the genus *Peteravenia* (King & Robinson, 1971b) was not considered an immediate relative of *Bartlettina* (King & Robinson, 1971a, 1971c). The cordate leaf-base of *Peteravenia* was the most convenient character cited in the original description, but it was only of tertiary importance. The character has failed once previously in the cordate leaf-base of Bartlettina tenorae (Arist.) K. & R. of Venezuela. Two characters that more properly delimit Peteravenia are the details of the pappus and the structure of the carpopodium, characters in which Eupatorium cyrili-nelsonii is clearly a member of the latter genus.

The pappus of Peteravenia is fragile with the narrow articulated bases of the setae well-separated from each other. In all species the tips of the setae are slightly but distinctly enlarged. Only Decachaeta DC., among the undoubted relatives of Hebeclinium DC., has the pappus fragile, and in none of the relatives of Hebeclinium are the setae so uniform in size and spacing.

The carpopodium of Peteravenia is sharply delimitin cellular structure, while that of Bartlettina intergrades with the longer cells of the upper achene wall, especially along the ribs. In the mature achene the carpopodium of Bartlettina extends upward along the bases of the ribs. In all the undoubted relatives of Hebeclinium the ribs of the achene intergrade below with the carpopodium although they are not always included in the callus formation. Even the narrow achene bases of Amolinia K. & R. have enlarged cells adjacent to the carpopodium which are similar to the more immature stages of Bartlettina.

One final factor can be considered in assessing the relationship of Eupatorium cyrili-nelsonii and Peteravenia. The traditional basis of the genus Hebeclinium was the pubescent receptacle. It is now known that pubescent receptacles occur in some genera of the Eupatorieae in totally different subtribes, and there are undoubted members of the Hebeclinium Group where receptacles are glabrous. Still, the single species of Amolinia and Erythradenia (B.L.Rob.) K. & R., all species of Decachaeta, almost all species of Hebeclinium, and most species of Bartlettina have receptacles pubescent. Only Guayania, of the Group, has receptacles glabrous. In Peteravenia, all species, including the new addition, have receptacles completely glabrous.

The additional distinctive species of Peteravenia confirms the essential features of the genus even as it violates what has been the most convenient distinguishing characteristic. As such, the genus shows greater diversity than previously expected, and the non-Hebeclinioid nature of the genus is further emphasized.

The review of chromosome numbers of the Eupatorieae (King et al., 1977) presented three chromosome reports for Peteravenia phoenicolepis (B.L.Rob.) K. & R., n = 10 twice and a n = ca. 17. An x = 10 is probably basic for the genus. Hebeclinium and the South American members of Bartlettina also have x = 10, but Decachaeta and the Central American species of Bartlettina have x = 16. A chromosome count for Eupatorium cyrili-nelsonii would be instructive. We predict a count of n = 10.

The following transfer is required:

Peteravenia cyrili-nelsonii[1] (A. Molina) R. M. King & H. Robinson, comb. nov. Eupatorium cyrili-nelsonii A. Molina, Ceiba 22 (1): 39. 1978.

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King, R. M., D. W. Kyhos, A. M. Powell, P. H. Raven and H. Robinson 1977. Chromosome numbers in Compositae, XIII. Eupatorieae.

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______ and ______. 1971b. Studies in the Eupatorieae (Asteraceae). XXXVIII. A new genus, Peteravenia. Phytologia 21 (6): 394-395.

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Molina R., A. 1978. Un nuevo Eupatorium de Honduras. Ceiba 22 (1): 39-40.

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[1] Cyrilo Nelson informs us in a letter that the correct spelling of the species name should be cyrilli-nelsonii, and that this is to be corrected in a future issue of Ceiba.

Peteravenia cyrili-nelsonii (A.Molina) R.M.King & H.Robinson. Isotype of Eupatorium cyrili-nelsonii A.Molina, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Peteravenia cyrili-nelsonii (A.Molina) R.M.King and H.Robinson, enlargement of head.

PARMOTREMA LARENSE SP. NOV. FROM VENEZUELA (Lichenes: PARMELIACEAE)

Manuel López Figueiras
Apartado postal 130
MERIDA, Venezuela.

Thallus laxe corticola triste cinereus viridis usque ad 3-4.5 cm diametro lobis rotundatis 7-8 mm latis cortice superiore subundulato margine sorediatis, revolute et sparse ciliatis, ciliis simplicibus 0.9-2 mm longis, soraliis subcapitatis confluentibus parcialiter submarginalibus, sorediis granulosis; strato corticeo superiore 25μ crasso; strato gonidiali 10-15μ crasso; medulla alba 20-25μ crassa; strato corticeo inferiore 40-50μ crasso, nigro rhizinato in marginibus evoluto et griseo usque ad griseum albescens, sparse rhizinate stricte zonaliter in marginalibus, rhizinis simplicibus, nigris densibus, parte media densioribus minus ad margines. Apothecia ignota.

Thallus adnate on bark, greenish ashy gray, 3-4.5 cm broad; lobes rotund 7-8 mm wide; upper cortexe 25μ wide, dull weakly undulate; margins sorediate, revolute and sparsely ciliate, cilia simple 0.9-2 mm long; soralia subcapitate, confluent, in part submarginal, soredia granulate; algal layer 10-15μ wide; medulla alba 20-25μ wide; lower cortex 40-50μ wide, black and rhizinate but changing to brown or pale brown near margins, sparsely rhizinate in a narrow zone at the margins;rhizines simple,black,dense at the center and decreasing towards the edges.Apothecia unknown.

Chemistry : Atranorin,lichexanthone(in the medulla), norlobaridone,unknown (loxodin ?).

Holotype: Venezuela,Edo Lara,Sierra de Barbacoas,entre Barbacoas y San Pedro,1400-1500 m,cortiícola,12 marzo 1978,López Figueiras 19152(MERF) ;isotype in US.

This specie is easily identified by the occurrence of lichexanthone in the white medulla,it's chemistry and the presence of soredia.Norlobaridone was identified by co-chromatography with Parmotrema reitzii Hale and Parmotrema hababiabum (Gyel.) Hale.

The occurrence of what is normally a substance cortical,lichexanthone,in the medulla of P.larense is of considerable taxonomic importance.Only three other lichens Parmotrema ultralucens(Krog) Hale,Parmotrema diffractaicum (Essl.) Hale and Parmotrema conjunctum Hale (Hale 1974) are known to have this substance in the medulla.

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Krog, Hildur
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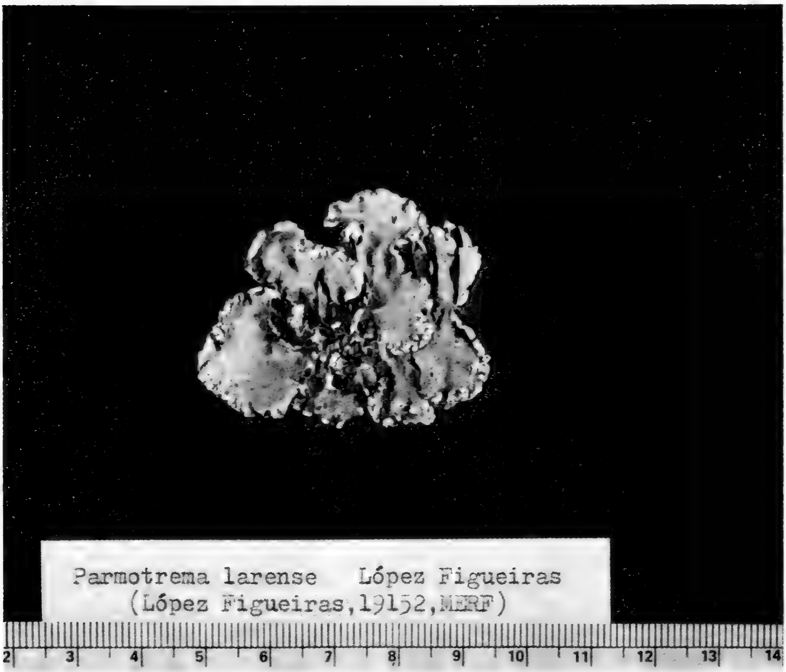

ADDITIONAL NOTES ON THE GENUS PRIVA. VIII

Harold N. Moldenke

PRIVA Adans.

Additional & emended bibliography: Schau. in A. DC., Prodr. 11: 529, 532—536, 555, & 556. 1847; Gürke in Engl., Pflanzenw. Ost-Afr. C: 338. 1895; Fedde & Schust., Justs Bot. Jahresber. 40 (2): 335. 1915; Heathcote in Heywood, Flow. Pl. World 237. 1978; Mold., Phytologia 43: 420—426. 1979.

PRIVA CORDIFOLIA var. FLABELLIFORMIS Mold.

Additional bibliography: Greenway & Vesey-Fitzgerald, Journ. East Afr. Nat. Hist. Soc. Nat. Mus. 28: 21. 1972; Mold., Phytologia 34: 261 (1976) and 43: 426. 1979.

Recent collectors describe this plant as a ruderal woody herb, growing in groups, to 3 feet tall, the sap colorless, the flowers odorless, and have found it growing in black loam of regenerating cultivated areas, at 300—900 feet altitude, flowering and fruiting in January. The corollas are said to have been "white" on Tanner R.T.3939. Tanner reports that in Tanzania the entire plants are pounded up while green and applied externally to treat pains in the stomach. He also reports the vernacular name, "nkamachuma". Greenway & Vesey-Fitzgerald (1972) list the variety from Lake Manyara National Park, citing Greenway 11119.

The Leach 11303, distributed as this variety, actually is P. meyeri Jaub & Spach.

Additional citations: TANZANIA: Tanga: Drummond & Hemsley 2413 (B); Schlieben 3231 (Mu—isotype); Tanner R.T.3939 (Ba, N). ZAMBIA: Fries, Nordlindh, & Weimarck 3990 (Mu).

PRIVA CURTISIAE Kobuski, Ann. Mo. Bot. Gard. 13: 7, pl. 2. 1926.

Additional synonymy: Priva curtisii Kobuski ex Mold., Fifth Summ. 2: 613, in syn. 1971.

Additional bibliography: Kobuski, Ann. Mo. Bot, Gard. 13: 6—8, 23, & 28—[31], pl. 2 & 3, fig. 1—6. 1926; Wangerin, Justs Bot. Jahresber. 54 (1): 1170. 1932; Fedde & Schust., Justs Bot. Jahresber. 54 (2): 747. 1934; Mold., Geogr. Distrib. Avicenn. 30 & 31. 1939; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14358. 1958; Mold., Phytologia 14: 394. 1967; Mold., Résumé Suppl. 15: 22. 1967; Glover, Stewart, Fumerton, Marindany, & Anderson, Gloss. Botan.-Kipsig. Names 160, 217, 250, & 260. 1969; Mold., Fifth Summ. 1: 238 & 241 (1971) and 2: 612, 613, & 905. 1971.

Illustrations: Kobuski, Ann. Mo. Bot. Gard. 13: [29] & [31], pl. 2 & 3, fig. 1—6. 1926.

Recent collectors describe this species as an erect perennial herb, to 4 feet tall, or with numerous, prostrate or ascending, branching, rough stems to 18 inches long, the sap colorless, the flowers small, odorless, in open racemes terminating the stems, and have found it growing in grassland, among rocks on hillsides, and "locally common with Barleria, Striga, Indigofera, Cassia, Pentanisia ouragyna, Polygala, Harpachne schimperi, and Pennisetum stramineum in Acacia drepanalobium — A. nilotica ssp. subulata — A. seyal — Ormocarpum — Pappea capensis — Carissa edulis thickets", at altitudes of 1250—1780 m., flowering in February, March, and May, fruiting in March. The corollas are said to have been "violet-red" on Strid 4089, "magenta-pink" on Greenway & Napper 13558, and "white" on Tanner 1269.

The vernacular names, "biriwob-sot", "ikubya", "maseiwob-sot" [masei, to wipe], "mosibit-ab-tiriita" [a name that really belongs to Leonotis and Leucas], and "pirir-wob-sot" [from birire, rubbing or crushing in the hands, and sot, a gourd]. The leaves are crushed in the hands to make a seal over sewing on milk gourds. The juice is squeezed into the eyes as a remedy for ophthalmia, and the pounded leaves are added to flour to make a poultice for sores. The plant is also used to clean out milk gourds.

Additional citations: TANZANIA: Tanga: Tanner 1269 (N). KENYA: Greenway & Napper 13558 (Mu); Strid 4089 (Go).

PRIVA DOMINGENSIS Urb., Symb. Antill. 7: 354. 1913.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 40 (2): 335. 1915; Kobuski, Ann. Mo. Bot. Gard. 13: 2, 6, 8—9, & 23. 1926; Mold., Geogr. Distrib. Avicenn. 7. 1939; Mold., Phytologia 14: 348—349. 1967; Mold., Fifth Summ. 1: 103 (1971) and 2: 905. 1971.

Recent collectors describe this species as herbaceous, prostrate or decumbent to erect, 25—40 cm. tall, branched from the base, or a "low shrub" (Liogier 13641a), the foliage very aromatic, and have found it growing in limestone soil in open places and among thickets and rocks on limestone hillsides, at altitudes of 50—500 m., flowering in February, March, May, June, and November, fruiting in February and June. Liogier speaks of it as "common" in some areas, "rare" in others.

The corollas are said to have been "blue" on Liogier 13642 & 15198, "reddish" on Liogier 11588, "purple" on Liogier 17041 and Liogier & Liogier 22556, and "white" on Liogier 13641a.

Additional citations: HISPANIOLA: Dominican Republic: Ekman H. 13737 (Ld); A. Liogier 11588 (N), 13641a (N, Z), 13642 (Ac, N), 15198 (Ac, N, W—2576806A), 17041 (Ld, N, W—2801657); Liogier & Liogier 22556 (N).

PRIVA GRANDIFLORA (Ort.) Mold., Phytologia 2: 142. 1946.

Additional & emended bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 495. 1858; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 628. 1894; Solered., Syst. Anat. Dicot. 714. 1899; D. H. Scott in Solered., Syst. Anat. Dicot. [transl. Boodle & Fritsch] 1: 631. 1908; Kobuski, Ann. Mo. Bot. Gard. 13: 2—4, 7, 17—18, & 32—[35], pl. 4 & 5, fig. 13 & 22. 1926; Wangerin, Justs Bot.

Jahresber. 54 (1): 1170. 1932; Fedde & Schust., Justs Bot. Jahresber. 54 (2): 747. 1934; Mold., Geogr. Distrib. Avicen. 14 & 39. 1939; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 628 (1946) and imp. 3, 2: 628. 1960; Mold., Phytologia 14: 349—350. 1967; Mold., Résumé Suppl. 15: 22. 1967; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 1, 717. 1969; Sanchez-Sanchez, Fl. Val. Mex., ed. 1, 326 & 327, fig. 251 C. 1969; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Mold., Fifth Summ. 1: 73 & 368 (1971) and 2: 613, 614, 644, 672, 693, 703, & 905. 1971; Bolkh., Grif, Matvej., & Zakhar., Chromos. Num. Flow. Pl., imp. 2, 717. 1972; Mold., Phytologia 22: 458. 1972; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Mold., Phytologia 29: 43 (1974) and 36: 122. 1977.

Illustrations: Kobuski, Ann. Mo. Bot. Gard. 13: [33] & [35], pl. 4 & 5, fig. 13 & 22. 1926; Sanchez Sanchez, Fl. Val. Mex., ed. 1, fig. 251 C. 1969.

Recent collectors describe this species as a scarce or rare cespitose perennial, growing in clumps, "semi-rastrera" or "rastrera", and have encountered it on pine savannas, in secondary matorral, "volcanic very thin soil in oak and sparse pine forests", "among scrub junipers in rocky alluvium of rocky plateau", in "mesquite-nopal savannas on gentle slopes of reddish sandy loam", on open volcanic rock slopes of mesas, on gravel roadbase, in "pastizal of Bouteloua radicosa, Hilaria cenchroides, Muhlenbergia rigida, and Lycurus phlaeoides", in "pastizal" and "pastizal ladera", on "valley floor with mixed oak and thorn", on "slopes with igneous rock and pastizal vegetation", and "in open hilly grasslands with gravel base", as well as in "ladera andesítica con vegetación de zacatal perturbado", at altitudes of 1980—2830 m., flowering from July to September, in fruit in July and August. It is reported to be "common" in grassland below the limit of oaks in Jalisco, Mexico. Derman (1936), Noack (1937), and Bolkhovskikh & his associates (1969) all report the chromosome number as 10.

The corollas are said to have been "pink" on Correll & Johnston 20062, "purple" on Rzedowski 301, 1799, & 22899, "light-purple" on Rzedowski 22962, "pale-violet" on Flyr 1529, "pale-lavender" on McVaugh 17143, and "pale-bluish, nearly white" on McVaugh 18278.

Sanchez (1969) keeps P. grandiflora and P. rhinanthifolia (Mart. & Gal.) B. L. Robinson as two separate and valid species, listing "pegarropa" as a vernacular name for the latter in Mexico. I feel convinced that the two are conspecific.

Material of P. grandiflora has been misidentified and distributed in some herbaria as Bouchea sp. and Verbena sp. and even as Dyschoriste sp. in the Acanthaceae.

Additional citations: MEXICO: Aguascalientes: R. McVaugh 18278 (Au—235353, Ld, N). Chihuahua: Ellis, Dunn, & Wallace 918 (Ld); Stuessy 1031 (Au—257494, Ld). Durango: Correll & Johnston 20062 (Ld); Flyr 1529 (Au); Johnson & Johnson 1828 (Ws);

M. C. Johnston 2664 (Ln—196289); LeDoux & Dunn 1909 (Ld). Federal District: Cruz Cisneros 1729 (Mi); Lyonnet 596 (Mi); J. Rzedowski 301 (Ip), 1799 (Au—241276, Ip). Jalisco: R. McVaugh 17143 (Mi); A. R. Moldenke 1821 (Ld). México: Bayona 38 (Au—303161, Mi, N, N); Cruz Cisneros 786 (Ws); J. Rzedowski 15717 (Ip), 16803 (Ip), 22899 (Ip), 22962 (Ip, Mi), 23974 (Ip), 28260 (Mi). Michoacán: Detling 8485 (W—2669366); Hinton 13204 (Au—121523, Se—187211); A. R. Moldenke 1803 (Ac).

PRIVA HUMBERTI Mold., Phytologia 3: 423—424. 1951.
Additional bibliography: Mold., Phytologia 14: 350. 1967; Mold., Fifth Summ. 1: 262 (1971) and 2: 905. 1971.

PRIVA LACINIATA Mold., Feddes Repert. Spec. Nov. 41: 35—36. 1936.
Additional bibliography: Mold., Feddes Repert. Spec. Nov. 41: 35—36. 1936; Mold., Geogr. Distrib. Avicen. 12. 1939; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 30 & 99 (1942) and ed. 2, 58. 1949; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14358. 1958; Mold., Phytologia 14: 350. 1967; Mold., Fifth Summ. 1: 113 (1971) and 2: 905. 1971.

PRIVA LAPPULACEA (L.) Pers., Syn. Pl. 2: 139. 1806.
Additional & emended synonymy: Priva lappulacea Pers. apud Steud., Nom. Bot. Phan., ed. 1, 657. 1821. Priva lappulacae Kobuski, Ann. Mo. Bot. Gard. 13: 4 sphalm. 1926. Tamonea lappulacea Lam. apud Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 604 in syn. 1927. Zappania lappulacea Lam. apud Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 604 in syn. 1927. Verbena lappulaceae Grieve & Leyel, Modern Herb., imp. 1, 2: 832 sphalm. 1931. Priva lappuiacea (L.) Pers. ex Mold., Résumé Suppl. 16: 25 in syn. 1968. Zapania lappulacea Lam. ex Mold., Fifth Summ. 2: 736 in syn. 1971. Priva lappulacea f. lappulacea [(L.) Pers.] ex Mold. in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 78 & 147. 1973. Priva lappulacea f. lappulacea [Moldenke] ex Mold., Phytologia 28: 462 in syn. 1974. Priva lappulaceae (L.) Pers. ex Mold., Phytologia 28: 462 in syn. 1974. Priva lappula Andrews ex Mold., Phytologia 36: 45 in syn. 1977.
Additional & emended bibliography: Sloane, Voy. Jamaic. Nat. Hist. 1: 174, pl. 110, fig. 1. 1707; L., Sp. Pl., ed. 1, imp. 1, 1: 19. 1753; P. Browne in Sloane, Civil Nat. Hist. Jamaic., ed. 1, 116—117. 1755; L., Syst. Nat., ed. 10, 2: 852. 1759; L., Sp. Pl., ed. 2, 28. 1762; Crantz, Inst. Rei Herb. 1: 572. 1766; [Retz.], Nom. Bot. 11. 1772; Jacq., Select. Stirp. Amer. Hist. 8. 1788; P. Browne in Sloane, Civil Nat. Hist. Jamaic., ed. 2, 116—117. 1789; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 41 (1789) and ed. 13, imp. 2, 2: 41. 1796; Raeusch., Nom. Bot., ed. 3, 3. 1797; Willd., Enum. Pl. Hort. Berol. 2: 633—634. 1809; Stokes, Bot. Mat. Med. 1: 39—40. 1812; H.B.K., Nov. Gen. Sp. Pl., ed. folio, 2: 225 (1817) and ed. quarto, 2: 278. 1818; Pers., Sp. Pl. 3: 348. 1819;

Sweet, Hort. Brit., ed. 1, 1: 324 (1826) and ed. 2, 418. 1830; G. Don in Loud., Hort. Brit., ed. 1, 246 (1830) and ed. 2, 246. 1832; Loud., Hort. Brit., ed. 2, 552. 1832; G. Don in Loud., Hort. Brit., ed. 3, 246. 1839; Sweet, Hort. Brit., ed. 3, 552. 1839; Voigt, Hort. Suburb. Calc. 473. 1845; Schau in A. DC., Prodr. 11: 529, 534, & 556. 1847; Schau., Linnaea 20: [476]. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 367, 368, 495, & 507. 1858; A. Wood, Am. Bot. Flor., ed. 1, imp. 1, 235 (1870), ed. 1, imp. 2, 235 (1871), ed. 1, imp. 3, 235 (1872), ed. 1, imp. 4, 235 (1873), ed. 1, imp. 5, 235 (1874), and ed. 1, imp. 6, 235. 1875; A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 334 (1878) and ed. 2, 2 (1): 334. 1886; O. R. Willis in A. Wood, Am. Bot. Flor., ed. 2, 235. 1889; T. S. Brandeg., Proc. Calif. Acad. Sci., ser. 2, 3: 164. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 310 (1893) and imp. 1, 2: 628. 1894; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Ramírez Goyena, Fl. Nicarag. 2: 557. 1911; Loes., Verh. Bot. Ver. Brand. 53: 80. 1912; Arthur, Mycologia 14: 18. 1922; Seaver, Mycologia 17: 9. 1925; Kobuski, Ann. Mo. Bot. Gard. 13: 1, 2, 4, 11—16, 24, & 32—[35], pl. 4 & 5, fig. 10 & 19. 1926; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 604—605. 1927; Kern, Mycologia 20: 72. 1928; Grieve & Leyel, Modern Herb., imp. 1, 2: 832. 1931; Roys, Ethno-bot. Maya [Tulane Univ. Midd. Am. Res. Ser. Publ. 2:] 290 & 324. 1931; Wangerin, Justs Bot. Jahresber. 54 (1): 1170. 1932; Mold., Geogr. Distrib. Avicen. 3—12, 14—24, 26, 28, 33, & 39. 1939; Yuncker, Field Mus. Publ. Bot. 9: 330. 1940; Darlington & Janaki Ammal, Chromos. Atlas 270. 1945; Savage, Cat. Linn. Herb. Lond. 4. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 310 (1946) and imp. 2, 2: 628. 1946; Hill & Salisb., Ind. Kew Suppl. 10: 33. 1947; Metcalfe & Chalk, Anat. Dicot. 1040. 1950; Arnoldo, Zakfl. 125, 126, 160, & 167, pl. 62, fig. 136. 1954; Darlington & Wylie, Chromos. Atlas, ed. 1, 323. 1956; Vélez, Herb. Angiosp. Lesser Ant. 117. 1957; R. C. Foster, Contrib. Gray Herb. 184: 170. 1958; Grieve & Leyel, Modern Herb., imp. 2, 2: 832. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 310 (1960) and imp. 3, 2: 628. 1960; Macbr., Field Mus. Publ. Bot. 13 (5): 660. 1960; Darlington & Wylie, Chromos. Atlas, imp. 2, 323. 1961; V. E. Graham, Trop. Wild Flow. 111 & 112. 1963; Hepper in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 434 & 435. 1963; Robertson & Gooding, Bot. Caribb. 156 & 233, fig. 77 D. 1963; Backer & Bakh., Fl. Java 2: 599. 1965; Castañeda, Fl. Cent. Boliv. 328—329, fig. 143. 1965; Gooding, Loveless, & Proctor, Fl. Barbados 362—363. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 921. 1966; Hirata, Host Range Geogr. Distrib. Powd. Mild. 276. 1966; D'Arcy, Rhodora 69: 439. 1967; Grieve, Modern Herb. 832. 1967; Hocking, Excerpt. Bot. A.12: 425. 1967; Mold., Résumé Suppl. 15: 3, 4, 16, & 22. 1967; Mold., Phytologia 14: 394 (1967) and 17: 114. 1968; Burlage, Ind. Pl. Mex. 183, 202, 235, & 241. 1968; Mold., Biol. Abstr. 49: 4199 & 11291. 1968; Mold., Résumé Suppl. 16: 2—5, 25, & 28 (1968) and 17: [1] & 2. 1968; J. A. Steyerm., Act. Bot. Venez. 3: 156. 1968; Barriga-Bonilla, Hernández-Camacho, Jaramillo-T., Jaramillo-Mejía, Mora-Osejo, Pinto-

Escobar, & Ruiz-Carranza, Isla San Andres 59. 1959; Bolkh., Grif, Matvej., & Jakhar., Chromos. Numb. Flow. Pl., imp. 1, 716. 1969; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 262. 1969; M. Martinez, Pl. Med. Mex., ed. 5, 502. 1969; A. L. Mold., Phytologia 18: 120 & 125. 1969; Rickett, Wild Flow. U. S. 3 (2): 365—366. 1969; G. W. Thomas, Tex. Pl. Ecolog. Summ. 77. 1969; Dennis, Kew Bull. Addit. Ser. 3: 177. 1970; Duke, Econ. Bot. 24: 363. 1970; Gibson, Fieldiana Bot. 24 (9): 219—221, fig. 42. 1970; Hocking, Excerpt. Bot. A.15: 422. 1970; Mold. in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1337, 18 08, 1811, 1815, 1830, 1846, 1859, & 1876. 1970; Oberwinkler, Pterid. Sperm. Venez. 4 & 78. 1970; Dwyer, Raymondiana 4: 71. 1971; Long & Lakela, Fl. Trop. Fla., ed. 1, 740 & 953. 1971; Mold., Fifth Summ. 1: 30, 56, 73, 78, 80, 82, 84—86, 88, 91—93, 97, 99, 101, 103, 105—107, 109, 110, 112, 113, 119, 126, 130, 132, 134, 137, 138, 143, 169, 183, 220, 327, 368, 392, 399, & 403 (1971) and 2: 612—614, 618, 619, 639, 643, 669, 674, 679, 682, 685, 700, 708, 736, & 905—906. 1971; Mold. in Wiggins & Porter, Fl. Galáp. Isls. 497—[499], fig. 131 a & b. 1971; Wiggins & Porter, Fl. Galáp. Isls. 993, 997, & 998. 1971; C. D. Adams, Flow. Pl. Jamaic. 632, 792, 793, 796, 836, & 846. 1972; Alemán Frías, Aurich, Ezcurra Ferrer, Gutiérrez Vázquez, Horstmann, López Rendueles, Rodríguez Graquitena, Roquel Casabella, & Schreiber, Die Kulturpfl. 19: 422. 1972; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 945. 1973; Farnsworth, Pharmacog. Titles 8 (8): xvii. 1973; Mold., Phytologia 25: 228. 1973; Mold. in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 77—81 & 147, fig. 6. 1973; Alain in León & Alain, Fl. Cuba, imp. 2, 2: 302, fig. 130 A. 1974; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 2, 716. 1974; Howes, Dict. Useful Pl. 269. 1974; Mold., Phytologia 28: 432—434, 436, & 462 (1974) and 29: 56. 1974; Molina R., Ceiba 18: 66. 1974; Percival, Biotropica 6: 110 & 111. 1974; Troncoso, Darwiniana 18: 360, 408, & 411. 1974; Balgooy, Pacif. Pl. Areas 3: 245. 1975; Garcia, MacBryde, Molina, & Herrera-MacBryde, Malez. Preval. Cent. Am. 143 & 159. 1975; López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 74. 1975; Mold., Phytologia 31: 379—381, 383, 393, 400, 407, & 410. 1975; Molina R., Ceiba 19: 96. 1975; S. R. Hill, Rhodora 78: 33. 1976; Long & Lakela, Fl. Trop. Fla., ed. 2, 740, 953, & 961. 1976; Mold., Phytologia 34: 256. 1976; Soukup, Biota 11: 16. 1976; López-Palacios, Fl. Venez. Verb. 20, 503—511, 646, 647, 652, & 654. 1977; Mold., Phytologia 36: 30, 33, & 45. 1977; Powell, Econ. Bot. 31: 424. 1977; Dodson & Gentry, Selbyana 4: 578, 579, 605, & 624, pl. 271 D. 1977; Liogier, Moscosoa 1: 38. 1978; Mold., Phytologia 43: 330 & 333. 1979.

Additional & emended illustrations: Sloane, Voy. Jamaic. Nat. Hist. 1: 174, pl. 10, fig. 1. 1707; Kobuski, Ann. Mo. Bot. Gard. 13: [33] 7 [35], pl. 4 & 5, fig. 10 & 19. 1926; Arnoldo, Zakfl. pl. 62, fig. 136. 1954; V. E. Graham, Trop. Wild Flow. 111. 1963; Robertson & Gooding, Bot. Caribb. 156, fig. 77 D. 1963; Castañeda, Fl. Cent. Boliv. 329, fig. 143. 1965; Gibson, Fieldiana Bot. 24 (9): 220, fig. 42. 1970; Mold. in Wiggins & Porter, Fl. Galáp. Isls. [499], fig. 131 a & b. 1971; Mold. in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 79, fig. 6. 1973; Alain in León & Alain, Fl. Cuba, imp. 2, 2: 302, fig. 130 A. 1974; Garcia, MacBryde, Molina, & Herrera-MacBryde, Malez. Preval. Cent. Am. 143 (in color). 1975; Batson, Gen. East. Pl. 147. 1977; López-Palacios, Fl. Venez. Verb. [506], fig. 120. 1977; Dodson & Gentry, Selbyana 4: 579, pl. 271 D. 1978.

Recent collectors describe this plant as a soft, weedy, annual herb, 0.2—1.5 m. tall, spreading from the base, erect or decumbent, the stems weak, square, purple at the areas of branching, the nodes constricted, the leaves "coarse, due to small pale-brown hairs which feel 'sandy'", the bracts olive-green, the pedicels and calyx green and hairy, the flower-buds blue, the flowers odorless, and the fruit green, deep-green when immature. Ton calls it a "shrub 4 feet tall" in Chiapas [Mexico], but surely this is erroneous — perhaps the plant was leaning against a shrub for support, as it often does.

The corollas are said to have been "blue" on Calderón 1044, Duke 13621, Liogier & Liogier 26451, and Tyson & al. 4825 and are also so described by López-Palacios (1975), "light-blue" on López-Palacios 4295, "pale-blue" on Asplund 15373, López-Palacios 1850, and Woodson & al. 1454, and are also so described by Graham (1963) and Grieve (1967), "pale-bluish" on Fosberg 54129, "blue to pale-purple" on Maas & Maas 212, "light-purple 5 P 7/7" on Schunke 4955, "purple" on Belshaw 3208, Kerr & Hagee 1108, and Rzedowski 24403, "the limb purplish, tube whitish" on Howell 8875, "white, edged with purple at the tips" on White & White 194, "petals pale-purple, tube white" on Woytkowski 35063, "violet" on Krizman s.n., "pale-violet" on Molina 263 and Proctor 16932, "lilac" on Gandara & Dorantes 44, López-Palacios 3851, Molina 27478, and Ventura 2630 & 3840, "pale-lilac" on Chambers 2783 and López-Palacios 3933, "white-lilac" on Contreras 3792, "lavender" on Fosberg 29002, Moore 2934, and Woodson & Schery 835, "pale pinkish-lavender" on McVaugh 15827, "pale-lavender" on Fosberg 29059 and Gentry 8521, and are also so described by Yuncker (1940), "lavender-pink" on Webster & Webster 13192, "petals have lavender margin and white" on King 328, "pink" on Wedel 1495, "pinkish" on Molina 26256, "lobes pink, throat white" on Dodson 5633, "pale-rose" on Molina 14272 & 15812, "mauve" on Adams 5429, and "white edged with lavender" on Howell 8606. Specimens with completely white corollas are here regarded as f. albiflora Mold.

Recent collectors have found P. lappulacea growing in fertile soil and in sand, in shady places, fields, moist thickets, muddy places, canyons, and clearings in ramoral covering ancient temple ruins, on roadside banks and shoulders, wooded slopes, and hillsides, in woods, rainforests, steep heavily wooded moist ravines, open grazed areas, cultivated fields, matorral, moist habitats in general, open waste land, and secondary forests, "along roadsides in the dry montane forest zone", "on weedy banks and flats at the edge of riverbanks above floodwater line", in open areas with vegetation mainly of leguminous shrubs and cacti, and "just beyond the reach of salt-spray along seabeaches, often in open sunlight", at altitudes of sealevel to 1320 meters, flowering and fruiting in every month of the year.

Harmon & Fuentes found it in weedy fields and along streamsides in the tropical rainforest zone of Guatemala, while Molina assert it to be "common in semi-humid tropical forests" there. Tyson & Blum refer to it as a "lawn weed" in the Panama Canal Zone. In Honduras it is said by Molina to be an "abundant weed in crops" and a "frequent" or "common" weed in semi-humid tropical woods; also common on Roatan island. Duke and his associates call it a "weed" in Panama. Chambers refers to it as "a roadside weed" on Dominica island, where the Websters also found it to be "common". D'Arcy (1967) reports it "a common weed" on Tortola; Andrews regards it a "roadside weed" in the Barbados and encountered it "in grassy open spaces" on Tobago; Fosberg reports it common on St. Croix, while Proctor describes it as "a common weedy herb" on St. Lucia.

In Veracruz, Mexico, Ventura refers to it as "scarce" in some localities, "abundant" in others, while Calderón found it "very abundant". Woytkowski reports it "common" in San Martin, Peru, and Fosberg found it to be common in Loreto but a "rare weed in burned fields" elsewhere in that country. Sparry encountered it in secondary monsoon forests, among open secondary vegetation, and in cultivated land in Ecuador. King reports it "not common along gravelly roadsides", while Kerr & Hagee aver "commonly found in grass-shrub association on riverbottoms and limestone hills".

Adams (1972) states that in Jamaica _P. lappulacea_ is "A common weed of cultivations, roadsides and waste places" at altitudes of 30 to 1750 feet, flowering and fruiting all through the year, native to the subtropics and tropics of the Americas, "recently naturalized in West Africa and Asia". Woodson and his associates describe it as an "herb, 1.5—2 m." tall — this is the only reference to its attaining a height of over 1.5 m. Wedel asserts on the label of his _no. 413_ "tree about 3 ft. with small green seeds", but this is obviously erroneous! Gooding & Loveless (1965) assert that it is a "common weed" in the Barbados, citing _Herb. Barb. Mus. 230_; Byrne found it common in abandoned gardens in the Bahamas. Gandara & Dorantes found it in "selva mediana subperennifolia secundaria, suelo lecho calizo arcilloso con humus" in Mexico. In Tabasco González & Pérez found it in secondary association vegetation with _Canna indica_, _Malachra fasciata_, _Corchorus hirtus_, _Heliconia latispatha_, and _Malvaviscus arboreus_ in dark-gray sandy soil "con grietas en la epoca seca". In Morelos Crespo encountered it in deciduous tropical forests in canyon bottoms. Rzedowski found it on "ladera caliza con vegetación de bosque tropical subdeciduo de _Brosimum_ y _Celtis monoica_". Kimber encountered it on damp but well-drained river-terraces on Dominica, while on Martinique he found it on "savannas improved by the planting of Sporobolus indicus". Dinsmore refers to it as a pioneer species on paths, especially in some shade, throughout the island of Little Tobago.

Backer & Bakhuizen van den Brink (1965) report Priva lappulacea naturalized near Bantur, Java. They also note that "In detached branches the corolla is very easily shed (traumatochory); when the fruit is mature the calyx (with the enclosed fruit) comes off from the persistent pedicel and easily clings to passing objects by the aid of the upcurved bristles".

Yuncker (1940) records P. lappulacea from Atlántida, Honduras, while Molina (1974) found it in Comayagua. Hill (1976) reports it from Long Island, Bahamas, citing Hill 2150. Sloane (1707) reports it from Jamaica and Arnoldo (1954) from Curaçao. Hepper (1963) lists it from Ghana, citing Hall 1891. Sweet (1826) says that it was introduced into cultivation in England from "S. Am." in 1822.

Alain (1974) gives its distribution as "terr. yermos" in all of Cuba, the Isle of Pines, Florida, the Antilles, continental tropical America, and Java. Gibson (1970) says that "Throughout most of the tierra caliente of Central America this is a common weed; often abundsnt about dwellings. The fruiting calyxes adhere to clothing and even to the feathers of birds by the abundant small uncinate hairs". Castañeda (1965) tells us that "Se encuentra desde Méjico, por todas Las Antillas, hasta Perú y Bolivia. Los animales la comen. Se encuentra dentro de los cultivos o en lugares soleados de suelo húmedo". Robertson & Gooding (1963) repeat that the species is animal dispersed. Runyon reports it occasional in alluvial soil of open woodland and old resaca banks, as well as at the edges of thickets, in southeastern Texas.

Darlington & Wylie (1956) and Bolkhhovskikh and his associates (1969) report the chromosome number for the species as x = 6; Patermann (1938) reports it as 2n = 12.

Among the recently reported common and vernacular names for P. lappulacea are "amor seco" [applied also to Desmodium spp.], "bristly-fruited priva", "burr-vervain", "burry vervain", "cadillito", "cadillo", "cadillo de bola", "cadillo de bolsa", "cadillo de bolsas", "cadillo pegajosa", "clammy bur", "codillo de bolsa", "coyolillo de raton", "fasten-'pon-coat", "favolito", "green button", "ismokotsiyat", "mozote", "mozote de bolsita", "mozotillo", "pegajosa", "pegapega", "pega-pega", "rama pegosa", "sadamsai", "secalotodo", "styptic bur", "tsayuntsay", "tzayentzal", "tzayuntzay" [=that which clings closely; also applied to Mentzelia asperata], "velvet bur", "velvetbur", "velvet-bur", "velvet-burr", "verbena", and "vuku-vuku-toriman".

Seaver (1925) reports the fungus, Cincinnobolus sp., attacking P. lappulacea on St. Croix island; Hirata (1966) lists the powdery mildews, Oidium verbenae and O. sp., on it in Puerto Rico and Dominica; Kern (1928) lists Puccinia lantanae Farl. on it in the Dominican Republic, citing Chardon 378 and Kern 36 & 65.

Dennis (1970) and Arthur (1922) also report *P. lappulacea* as host for *Puccinia lantanae* in Trinidad, Arthur citing *Seaver 2955*, *2970*, & *3397*.

Worth recording here is Linnaeus' original (1753) description of the species: "VERBENA diandra, calycibus subrotundis erectiusculis, seminibus echinatis", citing as synonyms Sloane's "*Scorodonia floribus spicatis purpurascentibus pentapetaloidibus*" and Houston's *Blairia*. He notes "Habitat in Jamaica". Stokes (1812) adds that the original collection was "gathered by Broughton in Jamaica". In the Linnean Herbarium, London, according to Savage (1945) sheets 5 and 6 under genus 35 VERBENA are inscribed "*lappulacea*" in Linnaeus' own handwriting, "*Verbena*" supplied on sheet 5 by Solander. It was collected by Browne [or, at least, transmitted to Linnaeus by him], while sheet number 6 was collected [or transmitted] by Rolander according to Linnaeus in his own handwriting. Sheet 6 is pinned to sheet 5. I have personally examined both these specimens and can confirm the above statements.

As to economic uses, Kelly reports that the plant is used by the Totonac Amerinds in Veracruz, while Pennington reports the leaves used as a poultice for headaches in Sonora, Mexico. Duke (1970) tells us that the plant is used to treat whooping cough by the Chocó Amerinds. Grieve (1967) asserts that it "is a vulnerary sub-astringent, being used even for very severe bleeding wounds on men and cattle, especially in Jamaica". Metcalfe & Chalk (1950) report the leaves used to make a tea. Martinez (1969) asserts that in Mexico the plant is used to treat leucorrhea; Airy Shaw (1966) also avers that the leaves are used to make a tea; Duke says that in Panama they are "used medicinally". Sloane (1707) reports that in Jamaica "The juice is counted a good vulnerary, healing green Wounds, often application giving some smarting pains". Browne (1755) adds that "This plant is a fine vulnerary and subastringent, and is commonly applied to bleeding wounds in either men or cattle by the inhabitants of the country parts of Jamaica; it is thought to be so powerful a stiptic or astringent as to stop the hemorrhage even when some of the more considerable arteries are cut; and may be deservedly considered as an excellent application in all manner of sores where the habit is relaxed."

Dodson & Gentry (1978) cite *Dodson 5633* from Los Ríos, Ecuador; Loesener (1912) cites *Seler 2063* from Chiapas, Mexico; Knuth (1927) cites *Moritz 126* and *Vargas s.n.* from Federal District, Venezuela, and *Ernst s.n.* and *Miller & Johnston 96* from Margarita island. Macbride (1960) cites from Peru: Cajamarca: *Raimondi s.n.* Huánuco: *Asplund 12096*. Junín: *Macbride 5296*. Lima: *Esposto s.n.* Loreto: *Klug 1238*; *Ll. Williams 291*, *397*, & *4428*. Tumbes: *Weberbauer 7737*. He comments that this is "A weedy plant decumbent-ascending, to even a meter tall, doubtless growing in other than the [above-mentioned]....departments....[also in] Most of warmer America."

Steyermark (1968) cites his *no. 88186* from Venezuela; Dwyer cites *Woytkowski 5618* from Amazonas, Peru; Adams (1972) cites *Adams 5429*, *Harris 6785*, and *Proctor 23897* from Jamaica; Liogier (1978) cites Liogier 26451 from the Dominican Republic. López-Palacios (1977) cites the following collections from Venezuela: Anzoategui: Porter 5156. Aragua: Badillo 4559; Benítez 433; Fendler 912; Fernández 315, 500; Ferrari 405; Moreno E.3; Trujillo 4873, 4976; Vogl 390. Barinas: Breteler 4440. Bolívar: Cardona 603; Sprague s.n.; Steyermark 88186. Carabobo: Asplund 15133; Engredt 17; Ll. Williams 11106. Delta Amacuro: Ruiz-Terán & López-Palacios 9733; Rusby & Squires 306. Falcón: Tamayo 1953. Federal District: Fernández 23; Funck 53 in part; Moritz 126; Vargas s.n. [72?]. Lara: Saer 580; R. T. Smith V.4283; Steyermark & Carreño 108774. Mérida: López-Palacios & Bautista 3384; Read 983; Ruiz-Terán 876. Monagas: Moritz 1902; Trujillo 9463. Portuguesa: Trujillo 3932. Sucre: Broadway 67; Funck 53 in part; Ruiz-Terán & López-Palacios 9896. Trujillo: Reed 1077. Yaracuy: Giné 2048. Zulia: Lasser 2560; Lescarboura 38; López-Palacios 1803, 1850; Mocquerys 909; Steyermark 100145. Margarita Island: Miller & Johnston 96.

Material of P. lappulacea has often been misidentified and distributed in herbaria as P. aspera H.B.K., Verbena sp., Phryma sp. (Phrymaceae), and "Labiatae". On the other hand, the Breteler 4380, Castañeda 9279, Correll 43873, Croat 23802 & 23861, Hinton 4360, 10366, 13941, & 13975, R. M. King 741, Liesner 83, Trouble-field & Rowell 2808, Tucker 501, Ventura 5801, Wedel 2834, and Wilbur & al. 7571 are P. lappulacea f. albiflora Mold., Henrickson 13264, 13291, & 13377, Lundell & Lundell 12382, and Reeves R.6288 are P. mexicana (L.) Pers., Liogier 17505 is Bouchea prismatica (L.) Kuntze, Castañeda 10612 is Salvia occidentalis Sw. (Lamiaceae), Gutiérrez R.287 is Teucrium inflatum Sw. (Lamiaceae), and Holguín s.n. [26/VI/1965], Rzedowski 19977, and Santos 2895 are Teucrium vesicarium Mill. (Lamiaceae).

Additional & emended citations: FLORIDA: Key Largo: J. A. Churchill s.n. [5 September 1970] (Ln—229854). County undetermined: Herb. Le Roy s.n. [s. Fla.] (Ms—30930). TEXAS: Cameron Co.: R. Runyon 562 (Au—269663), 4858 (Au—269657), 4884 (Au—269640). Hidalgo Co.: Fleetwood 8042 (Au—234388). MEXICO: Chiapas: Breedlove 11793 (Ld); Laughlin 1326 (Mi, W—2581038); Thorne & Lathrop 40554 (Ld); Ton 2992 (N, Ws), 3782 (Ws). Colima: R. McVaugh 15827 (Mi). Guerrero: Hinton 11545 (Se—187254), 14391 (Se—187207). Hidalgo: H. E. Moore 2934 (Ba). Michoacán: Hinton 13062 (Se—187253), 16120 (Ld). Morelos: Flores Crespo 8 (Ac, Ws). Oaxaca: R. M. King 328 (Mi). San Luis Potosí: González Quintero 132 (Ac); Kerr & Hagee 1108 (Mi); J. Rzedowski 24403 (Ip, Ws). Sonora: Krizman s.n. [30 August 1968] (N); Pennington 266 (Au—254319). Tabasco: González L. & Pérez J. 4252 (Ws). Tamaulipas: Richardson 74 (Ld). Veracruz: Chavelas P., Esparza,

& Acevas ESS.2472 (Ip); Gandara & Dorantes 44 (N); Gómez-Pompa 4608 (G); I. Kelly 311 (Ba); Martínez Calderón 1044 [Rec. Inf. D001793] (Mi); Moldenke & Moldenke 2206 (Ac); Ventura A.2630 (Au—303089, Mi, N), 3840 (Au—303885, Mi); Vera Santos 2221 (Au—263163). Yucatán: Degener & Degener 26781 (W—2298690). GUATEMALA: Baja Verapaz: Harmon 4252 (N). El Petén: Contreras 3792 (Au—278572, Ld, Ld); Cox & Guzmán 2941 (Oa); Harmon & Fuentes 2103 (N); C. L. Lundell 15343 (Au—228030); Molina R. 15812 (N, W—2566451). Guatemala: Harmon & Dwyer 3060 (W—2786618). Zacapa: Kellerman 7772 (W—2441953). BELIZE: A. Gentry 8521 (N). HONDURAS: Choluteca: Molina R. 23228 (N). Comayagua: Molina R. 14272 (N). Copán: Molina R. 26256 (N, W—2633215); Poole & Watson 1049 (Ld, Ld), 1132 (Ld). Distrito Central: Barkley & Nelson 39483 (Ac); Boghdan & Barkley 39404 (Ld). Morazán: Molina R. 263 (Ba), 27478 (N, W—2735873). BAY ISLANDS: Roatan: Molina R. 20812 (W—2751986). NICARAGUA: Managua: F. C. Seymour 2338 (Ld, N). COSTA RICA: Puntarenas: Burger & Liesner 6525 (N). PANAMA: Bocas del Toro: Wedel 413 (E—1218104), 1495 (E—1227974), 1601 (E—1218046). Canal Zone: Tyson 1070 (E—1813058), 2239 (E—1817251), 3525 (E—1836294); Tyson & Blum 3776 (E—1835352); P. White 243 (E—1193767); White & White 194 (E—1239974). Chiriquí: Woodson & Schery 835 (E—1208878). Darién: Duke 5368 (E—1814166), 13621 (Oh); Kirkbride & Bristan 1602 (E—1983552, N); Tyson, Dwyer, Blum, & Duke 4825 (E—1835141). Panamá: G. W. Barclay 2496 (W—2779869); Duke 3835 (E—1812212), 12045 (E—1891973); Mowbray, Correa, & Stimson 5044 (E—1900767). Province undetermined: Bristan 188 (N). TABOGA ISLAND: Woodson, Allen, & Seibert 1454 (E—1169746). PEARL ISLANDS: Saboga: Tyson 5594 (E—1980768). BAHAMA ISLANDS: Cat: Byrne 280 (N, Ws). New Providence: O. Russell s.n. [Correll & Popenoe 46961] (N). TURKS AND CAICOS ISLANDS: North Caicos: D. S. Correll 43296 (Ld). JAMAICA: C. D. Adams 5429 (Mu); Barkley & Proctor 38731 (Ld); Crosby, Hespenheide, & Anderson 95 (Ld). HISPANIOLA: Dominican Republic: Ekman H.12527 (Ld); Jacquemont s.n. [Marquisant, 1827] (P); Liogier & Liogier 26451 (N). PUERTO RICO: A. A. Heller 6181 (Ms—30931); Otero 249 (Ld). VIRGIN ISLANDS: St. Croix: F. R. Fosberg 54129 (N, W—2670188). LEEWARD ISLANDS: Dominica: K. L. Chambers 2783 (W—2468675); Kimber 841 (Ws); Webster & Webster 13192 (W—2469006). WINDWARD ISLANDS: Barbados: L. M. Andrews 680 (N). Grenada: Proctor 16932 (W—2613796). Martinique: Kimber 1497 (Ws); Larsen & Larsen 35219 (Ac). St. Lucia: Proctor 18127 (W—2585104). TRINIDAD & TOBAGO: Tobago: L. M. Andrews 3-52 (N). TRINIDAD OFFSHORE ISLANDS: Little Tobago: Dinsmore JJD.19 (Ws). WEST INDIES: Island undetermined: Herb. Mus. Paris D.31 (E—1652083). COLOMBIA: Antioquia: López-Palacios 3851 (Ld, N). Arauca: López-Palacios 3933 (Ld, N). Bolívar: Castañeda 9654 (N). Magdalena: H. H. Smith 545 (Ws). VENEZUELA: Mérida: Ruiz-Terán & López-Palacios 6176 (N). Sucre: Ruiz-Terán & López-Palacios 9896 (Ld). Zulia: López-Palacios 1850 (Ft). SURINAM: Nurmohammed & Reijenga s.n. [20-III-1963] (Ws). ECUADOR: Esmeraldas: Sparre 15313 (S), 15477 (S). Guayas: Asplund 15373 (N). Los Ríos: Dodson 5633 (W—2747906); Sparre 14441 (S). Manabí: MacBryde 1049 (N). GALAPAGOS ISLANDS: Charles: Howell 8875 (Gg—462960, W—281447). Chatham: Howell 8606 (Gg—462944). Indefatigable: López-Palacios 4295 (Ld); Wiggins & Porter 693 (Ld). PERU: Loreto: F. R. Fosberg 28905 (Ld), 29002 (W—2722044), 29059 (Ac); Martin & Lau-Cam 1245 (Oa). San Martín: Belshaw 3208 (Ba, Ld, Ld, N); Schunke Vigo 4955 (N, W—2796743); Woytkowski 35063 (Ca—1190472, E—1806587). BRAZIL: Amazonas: Maas & Maas 212 (Ut—3286338).

PRIVA LAPPULACEA f. ALBIFLORA Mold., Phytologia 17: 114. 1968.

Additional bibliography: Mold., Biol. Abstr. 49: 11291. 1968; Mold., Phytologia 17: 114. 1968; Mold., Résumé Suppl. 16: 2, 4, & 5 (1968) and 17: [1] & 2. 1968; Hocking, Excerpt. Bot. A.15: 422. 1970; Mold., Fifth Summ. 1: 56, 73, 85, 91, 109, 119, 126, & 138 (1971) and 2: 906. 1971; Mold. in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 81 & 147. 1973; Mold., Phytologia 25: 228 (1973), 28: 436 (1974), and 31: 379, 380, & 383. 1975; López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 74. 1975; Mold., Phytologia 34: 256 (1976) and 36: 30 & 33. 1977; López-Palacios, Fl. Venez. Verb. 511 & 652. 1977; Mold., Phytologia 43: 333. 1979.

Recent collectors describe this plant as a straggly or erect, unarmed, subwoody herb, usually 0.2—0.8 m. tall, or "arching to 6 feet" [Duke 8723], the stems quadrangular, fistulose or [when mature] very medullose, the leaves dull pale-green, the flowers 1/4 inch across, blooming in the morning, the anthers yellow or pale-yellow, and the fruit green. Wedel, on his no. 2834, calls it a "shrub 2 1/2" feet tall, but I doubt if this plant is ever a true shrub. Ventura says "las hojas se pegan en la ropa abundante". The corollas are usually described as "white", but are said to have been only "whitish" on Croat 23802 and Ruiz-Terán & López-Palacios 9733.

Collectors have found this plant growing in primary and open forests, rainforests, moist thickets, wettish coppices, the rich soil of fallow fields, rocky clay riparian soil, pastures, acahual, flatland matorral, and cleared roadways, as well as along the edges of ditches and streams, railroad tracks, and roadsides, at altitudes of 5 to 900 meters, flowering from June to February, in fruit in June, July, October, and December. King found it "in partial shade, sandy roadsides in grazed areas [of Oaxaca, Mexico], the vegetation mainly of thorny leguminous trees, shrubs, and cacti; not abundant". Wilbur and his associates refer to it as "common in weedy fields" on Dominica island; Fosberg reports it only "local" on Indefatigable island; while Croat found it "common in clearings" and "prevalent on limestone outcrops" in Belize.

Vernacular names reported for P. lappulacea f. albiflora are "cadillito", "cadillo de bola", "cadillo de bolsa", "cadillo pegajoso", "pegajosa", "pegapega", and "sacalotodo".

López-Palacios (1977) cites from Venezuela the following collections: Falcón: Breteler 4380; Lasser & Foldats 3030, 3056. Mérida: Ruiz-Terán & López-Palacios 6176. Zulia: López-Palacios 3000.

Most of the following list of collections were distributed and many even cited by me (before the present taxon was recognized) as typical P. lappulacea (L.) Pers. Material has also been misidentified and distributed in some herbaria as "Boraginaceae".

Citations: TEXAS: Hidalgo Co.: Fleetwood 8015 [4 June 1964] (Au—229461), 8015 [9 June 1964] (Au—231162). MEXICO: Chiapas: Moldenke & Moldenke 2287 (Ld). Guerrero: Herald & Clark 339 (Au—247180); Hinton 10366 (K, N); Troublefield & Rowell 2808 (Mi). México: Hinton 4360 (N, N). Michoacán: Hinton 13941 (Au, La, Ld, N, Se—187210, Ur), 13975 (Au, Ld, N, N, N, Se—187208). Oaxaca: R. M. King 741 (Au—214226, Ld), 1229 (Mi). Veracruz: Martínez Calderón 1947 [Rec. Inf. D003918] (Mi); Ventura A.5801 (Ld, Mi, Sd—89009). BELIZE: Croat 23802 (N, N), 23861 (N). EL SALVADOR: Morazán: Tucker 501 (Ba, Ca—1000902, Ld, Mi, N, Vi). PANAMA: Bocas del Toro: Lewis, Dwyer, Elias, & Robertson 926 (E—1881976—type, E—isotype, W—2589451—isotype). Canal Zone: P. C. Standley 27157 (Cp, W—1217427). Chiriquí: Liesner 83 (W—2745302). Darién: Duke 8723 (Ac, E—1836295). Panamá: Lewis, Blackwell, Hawker, Nowicke, Oliver, Robyns, & Verhoek 3028 (W—2788364). Colon Island: Wedel 2834 (E—1245168, Mi, N). BAHAMA ISLANDS: Crooked: Correll & Proctor 48844 (N). San Salvador: D. S. Correll 43873 (N). LEEWARD ISLANDS: Dominica: Wilbur, Dunn, Hespenheide, & Wiseman 7571 (Mi, W—2534439). COLOMBIA: Bolívar: Castañeda 9279 (N). Cundinamarca: López-Palacios 3629 (Ld). Magdalena: Cuatrecasas & Castañeda 24920 (W—2325692); Kirkbride 2528 (N). VENEZUELA: Bolívar: Ruiz-Terán & López-Palacios 11547 (Mi). Delta Amacuro: Ruiz-Terán & López-Palacios 9733 (Ld). Falcón: Breteler 4380 (N, W—2465527). Zulia: López-Palacios 3000 (Ac, N). ECUADOR: El Oro: López-Palacios 4103 (Ld). GALAPAGOS ISLANDS: Indefatigable: F. R. Fosberg 44862 (W—2828127, Z).

PRIVA MEXICANA (L.) Pers., Syn. Pl. 2: 139. 1806.

Additional & emended synonymy: Verbena mexican. L., Syst. Nat., ed. 10, 2: 852. 1759. Priva mexicana Pers. ex Desf., Tabl. École Bot., ed. 2, 65. 1815 [not P. mexicana Sieber, 1841]. Zapania mexicana Lam. ex Schau. in A. DC., Prodr. 11: 534, in syn. 1847. Verbena mexicana trachelii fol. &c. Dill. ex Buek, Gen. Spec. Syn. Candoll. 3: 495, in syn, 1858. Zapania hispida Zuccagni ex Buek, Gen. Spec. Syn. Candoll. 3: 507, in syn. 1858. Verbena mexicana Trachelii folio, fructu Aparine Dill. ex Druce & Vines, Dill. Herb. 182. 1907. Priva lappula Andrews, in herb.

Additional & emended bibliography: Dill. in Ray, Synop. Meth. Stirp. Brit., ed. 3, pl. 302, fig. 389. 1724; L., Sp. Pl., ed. 1, imp. 1, 1: 19. 1753; L., Syst. Nat., ed. 10, 2: 852. 1759; L., Sp. Pl., ed. 2, 28. 1762; Crantz, Inst. Rei Herb. 1: 572. 1766; [Retz.], Nom. Bot. 11. 1772; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 41 (1789) and ed. 13, imp. 2, 2: 41. 1796; Raeusch., Nom. Bot., ed. 3, 3. 1797; Ruiz & Pav., Fl. Peruv. Chil. 1: 21. 1797; Balbis, Cat. Pl. Hort. Bot. Taur. 48. 1804; Desf., Tabl. École. Bot., ed. 1, 54. 1804; Balbis, Cat. Stirp. Hort. Acad. Taur. 80. 1813; Desf., Tabl. École. Bot., ed. 2, 65. 1815; H.B.K., Nov. Gen. Sp. Pl., ed. folio, 2: 224--225 (1817) and ed. quarto, 2: 278. 1818; Pers., Sp. Pl. 3: 348--349. 1819; Steud., Nom. Bot. Phan., ed. 1, 111, 657, & 873. 1821; Jan, Elench. Pl. 1. 1824; Sweet, Hort. Brit., ed. 1, 1: 324. 1826; G. Don in Loud., Hort. Brit., ed. 1, 246. 1830; Sweet, Hort. Brit., ed. 2, 418. 1830; Loud., Hort. Brit., ed. 2, 552. 1832; G. Don in Loud., Hort. Brit., ed. 2, 246 (1832) and ed. 3, 246. 1839; Sweet, Hort. Brit., ed. 3, 552. 1839; Voigt, Hort Suburb. Calc. 473. 1845; Buek, Gen. Spec. Syn. Candoll. 3: 367, 368, 495, & 507. 1858; Kuntze, Rev. Gen. Pl. 2: 509. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 628. 1894; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Druce & Vines, Dill. Herb. 182. 1907; Loes., Verb. Bot. Ver. Brand. 53: 80. 1912; Kobuski, Ann. Mo. Bot. Gard. 13: 1, 4, 7, 20--21, 24, & 32--[35], pl. 4 & 5, fig. 15 & 24. 1926; Wangerin, Justs Bot. Jahresber. 54 (1): 1170. 1932; Mold., Geogr. Distrib. Avicen. 4, 14, & 15. 1939; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 14, 18, 20, 74, & 99. 1942; Savage, Cat. Linn. Herb. Lond. 4. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 628. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 25, 32, 36, 47, 163, & 195. 1949; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 628. 1960; Rzedowski & McVaugh, Contrib. Univ. Mich, Herb. 9: 39 & 107. 1966; Mold., Phytologia 14: 394--397. 1967; Mold., Résumé Suppl. 15: 22. 1967; Sanchez Sanchez, Fl. Val. Mex., ed. 1, 326--327. 1969; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Gibson, Fieldiana Bot. 24 (9): 219 & 221. 1970; Mold., Phytologia 23: 415 & 416. 1972; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Molina R., Ceiba 19: 96. 1975; López-Palacios, Fl. Venez. Verb. 505 & 652. 1977; Mold., Phytologia 36: 47 & 48. 1977.

Additional illustrations: Kobuski, Ann. Mo. Bot. Gard. 13: [33] & [35], pl. 4 & 5, fig. 15 & 24. 1926; Sanchez Sanchez, Fl. Val. Mex., ed. 1, fig. 261 D. 1969.

Recent collectors describe this plant as a perennial herb or "large bush", virgate, to 1 m. tall, the fruit adherent, "sticky, greenish-blue". They have found it growing in lava fields, gullies, xerophytic matorral, and scrubland on mountainsides, along streams, on Larrea deserts, steep rocky volcanic outcrops, mountain slopes, and the edges of woods, at 600--2600 m. altitude, flowering from June to November, fruiting from July to October.

Bautista encountered it in "pastizal con matorral" and Rzedowski on "ladera andesítica con vegetación de matorral de Eysenhardtia polystachya". The Molinas refer to it as "occasional" on grassy slopes in Guatemala. Reeves found it on desert flats with Opuntia, Agave, Yucca, Prosopis, Tillandsia, and Jatropha.

Henrickson encountered P. mexicana "in lower limestone canyons in Tamaulepian-like scrub, infrequent in shaded margins of arroyos with Quercus, Cercis, Juglans, Croton, Rhus, Baccharis, Amelanchier, etc.", "common in shaded ravines in igneous canyons on disturbed sides of larger canyons with Acacia, Parthenium, Salvia, Dasylirion, Larrea, Perezia, grasses, etc.", "frequent in lower chaparral with Acacia, Bernardia, Mimosa, Mortonia, Bouvardia, Dasylirion, Cordia, Opuntia, and Eysenhardtia", and "frequent along streams in heavily pastured oak-piñon forests with Quercus, Pinus cembroides, Stevia, Salvia, etc." Chiang and his associates report finding it "very local with Larrea tridentata, Acacia neovernicosa, and Dasylirion sp. on steep hills of igneous rock in gravelly sandy soil in matorral desertico inerme y con espinas laterales". The Roes found it growing on moss-covered rocks in Quercus forests on rocky hillsides with many shrub composites, mosses, and ferns. Barkley and his associates encountered it on xeric sunny lava and in moist rich shady pockets in pedregal. Ugent and his associates found it in "Acacia - Senecio - Apontia thickets bordering fields of Pisum sativum with Solanum bulbocastrum."

The corolla of Priva mexicana is said to have been "purple" on Rzedowski 1192, 3854, 4942, & 28601, "pink" on Lundell & Lundell 12351, "pinkish" on Molina R. & Molina 24923, "lavender-pink" on Moore 1459 & 1792, "pale-lavender" on Moore & Wood 4193, and "purple-red, upper lip lined, tube pale" on McVaugh 16665.

Sweet (1826), Don (1830), and Loudon (1832) all assert that P. mexicana was introduced into English garden cultivation from Mexico in 1726. Common names recorded for it include "Mexican priva", "pegaropa", "priva du Mexique", and "verveine du Mexique".

It should be noted here that the H.B.K. publication dates as given in the bibliography above have been verified by Barnhart (1902). The title-page date of Linnaeus' 1759 work is "1760". The specific epithet of P. mexicana is frequently, even now, uppercased. Chiang and his associates note that the species "resembles Verbena runyoni Mold.", but any such resemblance is fanciful! Loesener (1912) cites Seler 1201 & 1221.

The nomenclatural type of Priva mexicana is Herb. Linnaeus 35/4 in the Linnean Herbarium, London, which is inscribed "mexicana" in Linnaeus' own handwriting. His original description (1753) is "VERBENA diandra, spicis laxis, calycibus fructus reflexo-pendulis subglobosis hispidis" and he cites only the Dillenius synonym. In 1762 he modified this to "VERBENA diandra, spicis laxis, calycibus fructu reflexis rotundato didymis hispidis", adding "Caulis tetragonus, marginibus scaber : Rami oppositi superne dichotomi, Racemi dichotomiae longi. Folia cordata, oblonga, scabra, petiolis brevissimis", still citing only the Dillenius synonym.

Material of P. mexicana has been misidentified and distributed in some herbaria as P. lappula Andrews, P. lappulacea (L.) Pers., and Phryma sp. (Phrymaceae).

Additional citations: MEXICO: Aguascalientes: R. McVaugh 16665 (N). Chihuahua: Chiang, Wendt, & Johnston 8935 (Ld); Pringle 1354 (Ms—30929). Coahuila: Barkley, Webster, & Rowell 7213 (Au—123251); Henrickson 11729 (Ld), 13264 (Ld). Federal District: Barkley, Webster, & Rowell 7322 (Au—123249); Bautista s.n. [20/VIII/1967] (Ip); Bopp 0.216 (Ip); J. Rzedowski 1192 (Au—241247, Ip), 28601 (Mi). Hidalgo: Lundell & Lundell 12382 (Ld); H. E. Moore 1459 (Ba), 1792 (Ba); Moore & Wood 4193 (Ba, Mi). México: Cruz Cisneros 277 (Mi); Lundell & Lundell 12351 (Mi). Nuevo León: Flyr 1562 (Au); R. F. Smith M.356 (Au—217531). Oaxaca: Ugent, Ugent, & Flores C. 2699 (Ws). San Luis Potosí: T. Reeves R.6288 (Ld); Roe & Roe 2372 (Ld); J. Rzedowski 4942 (Au—243794), 3800 (Au—243256), 3854 (Ip); Waterfall 15684 (W—2640738). Tamaulipas: Stanford, Lauber, & Taylor 2063 (Se—203277), 2674 (Se—203083), 2680 (Se—161422). Zacatecas: Henrickson 13291 (Ld), 13377 (Ld). GUATEMALA: Guatemala: L. M. Andrews 131 (N), 132 (N). Progreso: Molina R. & Molina 24923 (N). Sacatepéquez: Breedlove 11410 (Ld).

PRIVA MEYERI Jaub. & Spach, Ill. Pl. Orient. 5: [57]. 1855.

Additional synonymy: Priva leptostachya H. H. W. Pearson ex C. A. Sm., Common Names S. Afr. Pl. 601, in syn. 1966 [not P. leptostachya Auct., 1962, nor A. L. Juss., 1806, nor L., 1940].

Additional & emended bibliography: Jaub. & Spach, Ill. Pl. Orient. 5: [57]. 1855; Kobuski, Ann. Mo. Bot. Gard. 13: 9 & 24. 1926; Mold., Geogr. Distrib. Avicen. 30—32. 1939; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 49—52 & 99. 1942; J. Hutchins., Botanist South. Afr. 356. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 116, 117, 119, 122, & 195. 1949; W. G. Wright, Wild Fls. South. Afr. 156 & 158. 1963; R. H. Compton, Journ. S. Afr. Bot. 6: 65. 1966; C. A. Sm., Common Names S. Afr. Pl. 111, 112, & 601. 1966; Mold., Phytologia 14: 397—398. 1967; Amico & Bavazzano, Webbia 23: 280. 1968; Mold., Résumé Suppl. 16: 8 & 25. 1968; Van der Schijff, Check List Vasc. Pl. Kruger Natl. Park 81. 1969; Drar, Publ. Cairo Univ. Herb. 3: 110. 1970; Mold., Fifth Summ. 1: 234, 238, 248, 252, 253, 255, & 257 (1971) and 2: 613 & 906. 1971; Mold., Phytologia 25: 231 (1973) and 43: 331 & 424. 1979.

Additional illustrations: W. G. Wright, Wild Fls. South. Afr. 158 [as P. leptostachya]. 1963.

Recent collectors describe this species as a very glandular, erect or lax-stemmed, small to fairly large herb, to 1 m. tall, the stems herbaceous, single or a few, erect, square, the flowers small, the fruiting-calyx "bur-like", and the "fruit" inflated. They have found it growing in grass, along roadsides, and in sandy soil among coastal vegetation and on savannas, at altitudes of 2000-2800 feet, flowering in February, March, and December, in fruit in December, March, and April. The corollas are said to have been "white" on Bayliss BS.8226 and Leach 11303 and "white, the lower lip striped with purple, as well as the mouth and throat". Compton (1966) records the species from Swaziland. Smith (1966) lists the vernacular names, "blaasklits", "blasieklits", and "blasieklitsbossie".

The "P. leptostachya" of Wright (1963) seems definitely to be P. meyeri instead; the P. leptostachya accredited to "Auct." is P. adhaerens (Forsk.) Chiov., that of Jussieu is P. cordifolia (L. f.) Druce, while that credited to Linnaeus is Phyrma leptostachya L. in the Phrymaceae.

The Jaubert & Spach original reference for this species is often cited as "1853-1856", but the page involved here was issued in 1855.

Wright (1963) notes that the seeds of P. meyeri "are ground up and applied to sores by the Zulus, who also use an infusion of the leaf for inflamed eyes".

Van der Schijff (1969) cites his nos. 1708 & 1945 and "C.5249" from Kruger National Park; Hutchinson (1946) cites his no. 2341; Amico & Bavazzano (1968) cite their no. 394; and Drar (1970) cites his no. 1750.

Material of P. meyeri has been misidentified and distributed in some herbaria as P. cordifolia var. flabelliformis Mold. and P. leptostachya Juss. On the other hand, the Mogg 13522 and Strey 4869, distributed as P. meyeri, actually are P. cordifolia var. australis Mold.

Additional & emended citations: SUDAN: Bahr El Ghazzal: Drar & Mahdi 1750 (Gz, Gz). RHODESIA: Leach 11303 (Mu). MOZAMBIQUE: Lourenço Marques: Marques 2429 (Mu). SOUTH AFRICA: Cape Province: Bayliss BS.8226 (N, W—2831315); Bolus 306 (F—439662); Drège a [Mo. Bot. Gard. photo A.866] (E—118803—cotype, W—photo of cotype); MacOwan s.n. [Boschberg] (F—46279); Stopp M.63 (Mu). Natal: Collector undetermined 2202 [Mo. Bot. Gard. photo A.866] (W—photo). Transvaal: Scheepers 522 (Mu).

PRIVA MEYERI var. MADAGASCARIENSIS Mold., Phytologia 3: 276. 1950.
Additional bibliography: Mold., Phytologia 14: 398. 1967; Mold., Fifth Summ. 1: 262 (1971) and 2: 906. 1974.

PRIVA PEDICELLATA Mold., Geogr. Distrib. Avicen. 32, nom. nud. 1939; Phytologia 1: 429—430. 1940.
Additional & emended bibliography: Mold., Geogr. Distrib. Avi-

cenn. 32. 1939; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 55 & 99 (1942) and ed. 2, 129 & 195. 1949; Mold., Phytologia 14: 398. 1967; Mold., Fifth Summ. 1: 284 (1971) and 2: 906. 1971.

PRIVA PERUVIANA Mold., Feddes Repert. Spec. Nov. 41: 23—24. 1936.

Additional bibliography: Mold., Geogr. Distrib. Avicen. 24. 1939; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 659 & 660. 1960; Mold., Phytologia 14: 398. 1967; Mold., Fifth Summ. 1: 143 (1971) and 2: 906. 1971; Soukup, Biota 11: 16. 1976.

Macbride (1960) distinguishes this species from P. lappulacea (L.) Pers. by the following key:

Stems and petioles pilose; cocci quadrangular.......P. lappulacea.
Stems and petioles puberulent; cocci subspheroid......P. peruviana.

Additional citations: PERU: Amazonas: Mathews 3158 (Pd—isotype).

PRIVA PORTORICENSIS Urb., Symb. Antill. 4: 534. 1903.

Additional bibliography: Kobuski, Ann. Mo. Bot. Gard. 13: 2, 3, 6, 8, 24, & 32—[35], pl. 4 & 5, fig. 7 & 16. 1926; Wangerin, Justs Bot. Jahresber. 54 (1): 1170. 1832; Mold., Geogr. Distrib. Avicen. 8. 1939; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 27 & 99. 1942: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 661. 1960; Mold., Phytologia 14: 398. 1967; Mold., Fifth Summ. 1: 105 (1971) and 2: 778 & 906. 1971.

Illustrations: Kobuski, Ann. Mo. Bot. Gard. 13: [33] & [35], pl. 4 & 5, fig. 7 & 16. 1926.

Emended citations: PUERTO RICO: Sintenis 3597 (E—925408—photo of cotype, W—403990—cotype). MOUNTED ILLUSTRATIONS: Kobuski drawing 7 (E—925406), 16 (E—925405).

PRIVA SOCOTRANA Mold., Feddes Repert. Spec. Nov. 41: 38—39. 1936.

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14358. 1958; Hocking, Excerpt. Bot. A.12: 425. 1967; Mold., Phytologia 14: 398. 1967; Mold., Biol. Abstr. 49: 4199. 1968; Mold., Fifth Summ. 1: 265 (1971) and 2: 906. 1971.

ADDITIONAL NOTES ON THE GENUS SVENSONIA. I

Harold N. Moldenke

Since the publication of my monograph of this genus in 1936 much additional information has come to light and more specimens have been examined, summarized in the present notes. Herbarium acronyms used herein, as in the original monograph and in all my series of paper in the present journal since 1933, are fully explained in my Fifth Summary (1971) 2: 795—801.

SVENSONIA Mold., Feddes Repert. Spec. Nov. 41: 129—130. 1936.

Bibliography: Wall., Numer. List 215, no. 6318. 1832; Hochst., Flora [Bot. Zeit. Regensb.] 24: Intell. 1: 42. 1841; Steud., Nom. Bot. Phan., ed. 2, 2: 750. 1841; Walp., Repert. Bot. Syst. 4: 12, 34, & 794. 1845; Schau. in A. DC., Prodr. 11: 556 & 558—559. 1847; A. Rich., Tent. Fl. Abyss. 2: 166. 1851; Buek, Gen. Spec. Syn. Candoll. 3: 64 & 495. 1858; Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 1, 2: 241. 1861; Bocq., Adansonia 3: [Rev. Verbenac.] 237. 1863; Aschers. in G. Schweinf., Beitr. Fl. Aethiop. 1: 119 & 278. 1867; C. B. Clarke in Hook. f., Fl. Brit. Ind. 4: 566. 1885; Trimen, Journ. Ceyl. Br. Roy. Asiat. Soc. 9: [Syst. Cat. Flow. Pl. Ceyl.] 68. 1885; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 327 & 507 (1893), imp. 1, 2: 564 (1894), and imp. 1, 2: 1179. 1895; Engl., Pflanzenw. Ost-Afr. A: 44 & 57. 1895; Gürke in Engl., Pflanzenw. Ost-Afr. C: 338. 1895; Trimen, Handb. Fl. Ceyl. 3: 347—348. 1895; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 282. 1900; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 61. 1901; M. Kunz, Anatom. Untersuch. Verb. 41. 1911; J. C. & W. Willis, Rev. Cat. Flow. Pl. Ceyl. 68. 1911; Chiov. Result. Scient. Miss. Stef. 1: 143. 1916; Gamble, Fl. Madras 1089. 1924; Grenz., Ann. Mo. Bot. Gard. 13: 71, 75, 78, & 89. 1926; Mold., Torreya 34: 9. 1934; Mold., Feddes Repert. Spec. Nov. 41: 129—143. 1936; Mold., Chron. Bot. 3: 311. 1937; Mold., Geogr. Distrib. Avicen. [1] & 29—33. 1939; Mold., Revist. Sudam. Bot. 6: 16. 1939; Mold., Prelim. Alph. List Inv. Names 8, 15, 36, 46, & 47. 1940; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 61. 1941; Hutchins. & Bruce, Kew Bull. 1941: 176. 1941; Mold., Alph. List Inv. Names 6, 47, & 48. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 45, 50, 53, 55, 56, 74, & 100. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 327 & 507 (1946) and imp. 2, 2: 564 & 1179. 1946; Mold., Alph. List Cit. 1: 31, 36, 37, 54, 71, 98, 153, 220, 250, & 298. 1946; Razi, Journ. Mysore Univ. 7 (4): 63. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 222, 223, & 251. 1947; Mold., Alph. List Cit. 2: 430, 435, & 619 (1948), 3: 877, 901, & 916 (1949), and 4: 997, 1041, 1097, 1102, 1127, & 1128. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 109, 110, 117, 118, 124, 128, 130, 163, & 196. 1949; Gillett, Kew Bull. 1: 131, 132, & 135. 1955; Kassas, Bull. Soc. Géogr. Egypt. 29: 56. 1956; Anon., U. S. Dept. Agr. Bot. Subj.

Ind. 15: 14359. 1958; Angely, Cat. Estat. Gen. Bot. Fan. 17: 6. 1956; Abeywickrama, Ceyl. Journ. Sci. Biol. 2: 217. 1959; Anon., Kew Bull. Gen. Ind. 1929-1956, 47 & 273. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 61. 1959; Mold., Résumé 134, 135, 145, 146, 158, 164, 167, 222, 238, 239, 251, 335, 350, 367, 369, 419, & 470. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 327 & 507 (1960) and imp. 3, 2: 564 & 1179. 1960; Cuf., Bull. Jard. Bot. Brux. 32: Suppl. 793--794. 1962; Santapau & Wagh, Bull. Bot. Surv. India 5: 108. 1963; Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 2, 241. 1964; F. A. Barkley, List Ord. Fam. Anthoph. 76 & 213. 1965; Mold., Phytologia 12: 6. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 1090. 1966; J. L. Ellis, Bull. Bot. Surv. India 8: 337. 1966; Raizada, Indian Forest. 92: 324. 1966; Gunawardena, Gen. Sp. Pl. Zeyl. 146. 1968; Mold., Résumé Suppl. 16: 10 & 27. 1968; Anon., Torrey Bot. Club Ind. Am. Bot. Lit. 3: 306. 1969; Greenway, Journ. East Afr. Nat. Hist. Soc. Nat. Mus. 27: 196. 1969; Quezel, Fl. Veg. Plat. Darfur [Doss. 5 Recherch. Coop. Prog. 45:] 131. 1969; Mold., Fifth Summ. 1: 6, 211, 213, 214, 238, 241, 265, 278, 281, 369, 399--401, & 424 (1971) and 2: 604, 634, 677, 682, 684, 778, & 910. 1971; Lebrun, Kew Bull. 26: 567--568. 1972; Mukherjee, Trans. Bose Res. Inst. 35: 37--42, pl. 1, fig. 6--8. 1972; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 1118. 1973; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Ind. 1972: 56. 1973; Gilbert, Biol. Abstr. 55: 5980. 1973; Mold., Phytologia 26: 511 (1973), 28: 441, 442, & 512 (1974), and 29: 42. 1974; "H. R.", Biol. Abstr. 57: 6940. 1974; Mold., Phytologia 29: 511 (1975), 30: 201, 205, & 511 (1975), 31: 122, 127, & 238 (1975), 34: 271, 279, & 511 (1976), and 40: 414 & 511. 1978.

SVENSONIA HYDEROBADENSIS (Walp.) Mold., Feddes Repert. Spec. Nov. 41: 139. 1936.

Synonymy: Verbena hydorobadensis Rottl. ex Wall., Numer. List 215, no. 6318 hyponym. 1832. Verbena hyderobadensis β maysorensis Wight ex Wall., Numer. List 215, no. 6318b hyponym. 1832. Verbena maysorensis R. Wight ex Wall., Numer. List 215, no. 6318b. 1832. Verbena hyderobadensis Rottl. ex Steud., Nom. Bot. Phan., ed. 2, 2: 750, nom. nud. 1841. Verbena mysorensis Wight ex Steud., Nom. Bot. Phan., ed. 2, 2: 750, in syn. 1841. Verbena hyderobadensis β mysorensis Wight ex Steud., Nom. Bot. Phan., ed. 2, 2: 750, nom. nud. 1841. Verbena mysoorensis Wight ex Walp., Repert. Bot. Syst. 4: 12 & 494, in syn. 1845. Verbena myssorensis Wight ex Walp., Repert. Bot. Syst. 4: 34, in syn. 1845. Bouchea? hyderobadensis Walp., Repert. Bot. Syst. 4: 12. 1845. Bouchea hyderobadensis Walp. ex Schau. in A. DC., Prodr. 11: 559. 1847. Bouchea hyderabadensis Walp. apud Wight, Icon. Pl. Ind. Orient. 4: pl. 1462. 1849. Verbena hyderabadensis Rottl. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1179, in syn. 1895. Chascanum hyderobadense (Rottl.) Mold., Torreya 34: 9. 1934. Bouchea hyderobadensis (Rottl.) Walp. ex Mold., Torreya 34: 9, in syn.

1934. Bouchea hyderabadensis (Rottl.) Walp. ex Mold., Feddes Repert. Spec. Nov. 41: 139, in syn. 1936; Prelim. Alph. List Inv. Names 7, in syn. 1940. Bouchea hyderabadensis Wall. ex Mold., Feddes Repert. Spec. Nov. 41: 139, in syn. 1936; Prelim. Alph. List Inv. Names 7, in syn. 1940. Chascanum hyderobadense (Walp.) Mold., Feddes Repert. Spec. Nov. 41: 139, in syn. 1936. Verbena hyderobadensis var. maysorensis R. Wight ex Mold., Feddes Repert. Spec. Nov. 41: 139, in syn. 1936. Verbena hydrabadensis Rottl. ex Mold., Feddes Repert. Spec. Nov. 41: 139, in syn. 1936; Prelim. Alph. List Inv. Names 46, in syn. 1940. Verbena mysuriensis R. Wight ex Mold., Feddes Repert. Spec. Nov. 41: 139, in syn. 1936; Phytologia 34: 279, in syn. 1976. Bouchea hyderabaadensis Walp. ex Razi, Journ. Mysore Univ. 7 (4): 63 sphalm. 1946.

Bibliography: Wall., Numer. List 215, no. 6318 & 6318b. 1832; Steud., Nom. Bot. Phan., ed. 2, 2: 750. 1841; D. Dietr., Syn. Pl. 3: 605. 1843; Walp., Repert. Bot. Syst. 4: 12, 34, & 794. 1845; Schau. in A. DC., Prodr. 11: 556 & 558--559. 1847; R. Wight, Icon. Pl. Ind. Orient. 4: pl. 1462. 1849; Buek, Gen. Spec. Syn. Candoll. 3: 64 & 495. 1858; Thwaites & Hook. f., Enum. Pl. Ceyl., imp. 1, 241. 1861; Bocq., Adansonia 3: [Rev. Verbenac.] 237. 1863; C. B. Clarke in Hook. f., Fl. Brit. India 4: 564 & 566. 1885; Trimen, Journ. Ceyl. Br. Roy. Asiat. Soc. 9: [Syst. Cat. Flow. Pl. Ceyl.] 68. 1885; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 327 & 507 (1893), imp. 1, 2: 564 (1894), and imp. 1, 2: 1179. 1895; Trimen, Handb. Fl. Ceyl. 3: 348. 1895; Durand & Jacks., Ind. Kew. Suppl., imp. 1, 61. 1901; M. Kunz, Anat. Untersuch. Verb. 39. 1911; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Perad. Man. Bot. 2:] 68. 1911; Gamble, Fl. Presid. Madras 6: 1089. 1924; Grenz., Ann. Mo. Bot. Gard. 13: 71, 72, & 89. 1926; Mold., Feddes Repert. Spec. Nov. 41: 139—143. 1936; Mold., Geogr. Distrib. Avicen. 32 & 33. 1939; Mold., Prelim. Alph. List Inv. Names 8, 15, 36, 46, & 47. 1940; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 61. 1941; Mold., Alph. List Inv. Names 6, 47 & 48. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 55, 56, & 100. 1942; Mold., Alph. List Cit. 1: 31, 36, 54, 220, & 298. 1946; Razi, Journ. Mysore Univ. 7 (4): 63. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 222 & 223. 1947; Mold., Alph. List Cit. 3: 877 (1949) and 4: 997, 1102, 1127, & 1128. 1949; Razi, Journ. Mysore Univ. 11 (2): 26. 1950; Abeywickrama, Ceyl. Journ. Sci. Biol. 2: 217. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 61. 1959; Mold., Résumé 164, 167, 238, 367, 369, 419, & 470. 1959; Santapau & Wagh, Bull. Bot. Surv. India 5: 108. 1963; Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 2, 241. 1964; J. L. Ellis, Bull. Bot. Surv. India 8: 337. 1966; Raizada, Indian Forest. 92: 324. 1966; Gunawardena, Gen. Sp. Pl. Zeyl. 146. 1968; Mold., Résumé Suppl. 16: 10. 1968; Mold., Fifth Summ. 1: 278, 281, 399, & 400 (1971) and 2: 677, 682, 684, 778, & 910. 1971; Mukherjee, Trans. Bose Res. Inst. 35: 38 & 40—42, fig. 3. 1972; Mold., Phytologia 29: 92 (1974) and 34: 272 & 279. 1976.

Illustrations: Mukherjee, Trans. Bose Res. Inst. 35: 40, fig.

3, & pl. 1 (1—8). 1972.

This species is based on Rottler s.n. from Mysore (Hyderabad), India (Herb. Wallich 6318), the original type deposited at Berlin. Razi (1946) also lists the species from Mysore, calling it a nannophanerophyte in Raunkiaer's classification of life-forms. Ellis (1966) records it from Andhra Pradesh where, he says, it occurs at 250 m. altitude, flowering in November and fruiting in February. He cites his nos. 14967 & 15715. Thwaites & Hooker (1861) record it from "an open grassy spot (patana) between Madamahanewera and Alootnewera (C.P.3574) in the Central Province" of Sri Lanka, collected there in February, 1858. It has not since been collected in Sri Lanka.

The anomalous collections mentioned by me under S. hyderobadensis in my original monograph (1936) and referred to Stachytarpheta indica (L.) Vahl are now regarded as Stachytarpheta jamaicensis f. monstrosa (Mold.) Mold., apparently a teratologic form. R. Wight 2289, cited below, is a mixture with the latter form. Wight (1849) says "I have met this plant several times in subalpine jungles, but it is far from common; flowers rose coloured, and from the plant usually growing in clumps, sufficiently conspicuous. The fruit in my specimens are not quite mature. The figure represents a healthy plant, it is only when in a state of monstrosity, so far as I have seen, that the character 'spicibus digitalibus confertiusculis' becomes applicable".

The pollen is described by Mukherjee (1972) as 3-colpate, the colpa short (brevicolporate), slit-like, sometimes provided with a margo, about 27.5 mu x 0.5 mu (range 21.0 mu — 34.0 mu x 0.5 mu). The mean intercolpial distance is about 32.0 mu. The shape is spheroidal, the diameter about 77.0 mu (range 50.0 mu — 94.0 mu). The exine is about 6.0 mu thick, the sexine about 50 mu thick, sometimes the exine forms a lobe at one side of the equatorial region, where it is about 10.0 mu thick and the sexine about 9.0 mu thick. It is punctitegillate, supratectal processes perceptible in LO-analysis. The texture is thick. The bacula is simple, but somewhat heteromorphic in respect to length, which perhaps renders the reticuloid appearance.

Material of Svensonia hyderobadensis has often been misidentified and distributed in herbaria as Stachytarpheta indica (L.) Vahl or as Stachytarpheta sp.

Additional citations: INDIA: Tamil Nadu: R. Wight 2289 in part (L), s.n. (Pd). SRI LANKA: Thwaites C.P.3574 (Bz—17241, Pd, Pd).

SVENSONIA LAETA (Fenzl) Mold., Feddes Repert. Spec. Nov. 46: 5. 1939.

Synonymy: Pleurostigma sulphureum Hochst., Flora [Bot. Zeit. Regensb.] 24, Intell. 1: 42, nom. nud. 1841. Chascanum laetum Fenzl ex Walp., Repert. Bot. Syst. 4: 39. 1845. Bouchea pterygocarpa Schau. in A. DC., Prodr. 11: 558—559. 1847. Bouchea pterygosperma Engl., Pflanzenw. Ost-Afr. A: 44 sphalm. 1895. Bouchea phrygocarpa

Schau. ex Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 154, sphalm. 1895. Svensonia pterygocarpa (Schau.) Mold., Feddes Repert. Spec. Nov. 41: 136. 1936. Bouchea pterigocarpa Schau. ex Mold., Feddes Repert. Spec. Nov. 41: 136, in syn. 1936; Prelim. Alph. List Inv. Names 8, in syn. 1940. Choscanum luetum Fenzl ex Mold., Feddes Repert. Spec. Nov. 41: 136, in syn. 1936; Prelim. Alph. List Inv. Names 15, in syn. 1940. Bouchea pterygocarpa (E. Mey.) Schau. ex Mold., Ptelim. Alph. List Inv. Names 8, in syn. 1940. Svensonia laeta (Fenzl ex Walp.) Mold. apud Gillett, Kew Bull. 1955: 132. 1955. Chascanum africanum Auct. ex Cuf., Bull. Jard. Bot. Brux. 32: Suppl. 793, in syn. 1962 [not C. africanum Mold., 1938]. Svensonia laeta (Fenkl.) Mold. apud Quezel, Doss. 5 Recherch. Coop. Prog. 45: 131, sphalm. 1969. Svensonia laeta (Walp.) Mold. apud Greenway, Journ. East Afr. Nat. Hist. Soc. 27: 196. 1969.

Bibliography: Hochst., Flora [Bot. Zeit. Regensb.] 24, Intell. 1: 42. 1841; Walp., Repert. Bot. Syst. 4: 39. 1845; Schau. in A. DC., Prodr. 11: 558--559. 1847; A. Rich., Tent. Fl. Abyss. 2: 166. 1851; Buek, Gen. Spec. Syn. Candoll. 3: 64. 1858; Aschers. in G. Schweinf., Beitr. Fl. Aethiop. 1: 119 & 278. 1867; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 327 & 507 (1893) and imp. 1, 2: 564. 1894; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 154. 1895; Engl., Pflanzenw. Ost-Afr. A: 44 & 57. 1895; Gürke in Engl., Pflanzenw. Ost-Afr. C: 338. 1895; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 282. 1900; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 61. 1901; M. Kunz, Anatom. Untersuch. Verb. 41. 1911; Chiov., Result. Scient. Miss. Stef. 1: 143. 1916; Grenz., Ann. Mo. Bot. Gard. 13: 71, 75, & 78. 1926; Mold., Feddes Repert. Spec. Nov. 41: 136--139. 1936; Mold., Geogr. Distrib. Avicen. [1] & 29--32. 1939; Mold., Revist. Sudam. Bot. 6: 16. 1939; Mold., Prelim. Alph. List Inv. Names 8, 15, & 36. 1940; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 61. 1941; Hutchins. & Bruce, Kew Bull. 1941: 176. 1941; Mold., Geogr. Distrib. Verbenac., ed. 1, 45, 50, 53, & 100. 1942; Mold., Phytologia 2: 113. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 327 & 507 (1946) and imp. 2, 2: 564. 1946; Mold., Alph. List Cit. 1: 37, 71, 98, 153, & 250. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 49 & 223. 1947; Mold., Alph. List Cit. 2: 430, 435, & 619 (1948), 3: 901 & 916 (1949), and 4: 1041 & 1097. 1949; J. B. Gillett, Kew Bull. 1955: 131, 132, & 135. 1955; Anon., Assoc. Etud. Fl. Afr. Trop. Ind. 1955: 63. 1956; Kasas, Bull. Soc. Géogr. Egypt. 29: 56. 1956; Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14359. 1958; Anon., Kew Bull. Gen. Ind. 1929-1956, 47, 72, & 273. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 61. 1959; Mold., Résumé 135, 146, & 470. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 327 & 507 (1960) and imp. 3, 2: 564. 1960; Cuf., Bull. Jard. Bot. Brux. 32: Suppl. 793. 1962; Mold., Résumé Suppl. 16: 27. 1968; Greenway, Journ. East Afr. Nat. Hist. Soc. Nat. Mus. 27: 196. 1969; Quezel, Fl. Veg. Plat. Darfur [Dess. 5 Recherch. Coop. Prog. 45:] 131. 1969; Mold., Fifth Summ. 1: 211, 213, 238, 241, 265, 369, 400, 401, & 424--426 (1971) and 2: 604, 634, & 910. 1971; Lebrun in Hepper, Kew Bull. 26: 567—568, map 1. 1972; Mukherjee, Trans. Bose Res. Inst. 35: 41. 1972; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Ind. 1972: 56. 1973; M. Gilbert, Biol. Abstr. 55: 5980. 1973; Mold., Phytologia 28: 441 & 442 (1974), 30: 205 (1975), and 31: 127 & 238. 1975.

Recent collectors describe this plant as a stiff erect herb, woody at the base, the branches spreading, and the leaves light olive-green, paler beneath. The corollas are said to have been "cream"-color on Ash 2980. Collectors have found it growing in tall grass and tree acacia woodlands, on hills and steppes, and in "brousse tigrée" vegetation patterns on compacted impervious colluvial soils, at 1100—1600 m. altitudes, flowering in March, April, and June, in fruit in March and June. Ashe reports it "local along roadsides". Getahun encountered it in "mostly stony soils, brown to gray, pH 7.6—8.2". Burger found it growing "in gravel on volcanic soil of flat areas in hilly open woodland on steep hills with open Acacia woodland". Quezel (1969) reports it from "Rocailles, arènes fixées, fréquent partout" in Darfur. Chiovenda (1916) lists it from Somalia.

The species is based on Kotschy 230 from Nubia and Schimper 1012 from Ethiopia — these collections are cotypes also of Bouchea pterygocarpa Schau., although Walpers (1845) erroneously cites Schimper 1012 as "Kotschy 1012". Baker (1900) cites Bent s.n. and Pfund 852 from Nubia, Schimper 424, 1012, & 2210 from Ethiopia, and Volkens 450 from Tanzania. Gillett (1955) cites Kotschy 230 from Sudan, Schimper 1012 from Ethiopia, Bally 6828 from Eritrea, and Gillett 4550 from Somalia, and lists the species also from Yemen, Kenya, and Tanzania. Schauer (1847) cites only the two cotypes, Kotschy 230 and Schimper 1012.

Lebrun (1972) cites Boudet 6692 from Mali. He comments that "This species much resembles Chascanum marrubiifolium Fenzl ex Walp., but it is absolutely glabrous and has fruits which are winged at the apex. This member of the sahol element in new for West Africa; its distribution is close to that of Cadaba glandulosa Forst., among others, being recorded from Chad, Sudan Rep., Ethiopia, Somalia, Kenya, Tanzania and Arabia". Greenway (1969) cites "G. & K. 12886" and Verdcourt 1109 from Tsavo East National Park.

The Lort Phillips s.n. cited by me as Svensonia laeta in my original monograph actually represents Chascanum adenostachyum (Schau.) Mold. The Deflers 1038 should be cited as "in part" because two sheets of this number, collected in Aden, deposited in the Paris herbarium are Chascanum arabicum Mold. Gillett 4550, cited below, was erroneously cited by Hutchinson & Bruce (1941) as Chascanum africanum Mold. [now known as C. hildebrandtii (Vatke) Gillett].

Additional & emended citations: SUDAN: Butana: Kassas, Obeid, & Osman B.56 (Gz). Kassala: V. Täckholm E.155 (Gz, Gz). Kordofan:

Pfund 142 (Gz). Nubia: Kotschy 230 (Bz—cotype, L—cotype, Lu—cotype, Vt—cotype, Vu—cotype). ERITREA: Corradi 3999 (N, S); Pappi 2664 (Ac, S), 3999 (Ca—994346, Ut—6386b, W—1969168). ETHIOPIA: Ash 2980 (W—2819767); Burger 2983 (W—2480766); Getahun s.n. [June 1967] (W—2480913); Schimper 424 (L), 1012 (E—118618—cotype, F—686748—cotype, L—cotype, L—cotype, Mu—245—cotype, Mu—246—cotype, W—945472—cotype, W—945473—cotype), 2210 (L). ARABIA: Yemen: Deflers 958 [39] (Na—19934), 1038 in part (X). CULTIVATED: Russia: Herb. Fischer s.n. (L).

SVENSONIA MOLDENKEI Gillett, Kew Bull. 1955: 132—133. 1955.

Bibliography: Gillett, Kew Bull. 1955: 131—133 & 135. 1955; Anon., Assoc. Etud. Fl. Afr. Trop. Ind. 1955: 63. 1956; Anon., Kew Bull. Gen. Ind. 1929-1956, 273. 1959; Mold., Résumé 135, 146, & 470. 1959; G. Taylor, Ind. Kew Suppl. 12: 138. 1959; Cuf., Bull. Jard. Bot. Brux. 32: Suppl. 794. 1962; Mold., Fifth Summ. 1: 213 & 241 (1971) and 2: 910. 1971.

This species is based on Gillett 13397 from 53 km. southwest of Mandera on the road to El Wak, at about 3°53' N., 41°30' E., at 390 m. altitude, growing in red sandy soil over sandstone in Commiphora-Acacia open scrub, northern Kenya, on May 30, 1952, deposited in the Kew herbarium. The collector says of the plant: "up to 2 mm. tall [??, probably 2 m. is meant], corolla milk white". He also cites Glover & Gilliland 434 from Ethiopia, where the species was found at 600 m. altitude, flowering in November, growing in open places on red sand, and is described as erect, brushy, 60—90 cm. tall, with "spikes of white flowers". Gillett (1955) comments that "There is a slight element of doubt about Glover & Gilliland 434 which has only immature mericarps which are more papillose within than are those of the type. The characteristic outward bending of the wing only appears when the mericarps are fully mature".

ADDITIONAL NOTES ON THE GENUS STYLODON. I

Harold N. Moldenke

Herbarium acronyms employed in this and all other of my papers in this journal since 1929 are full explained in my Fifth Summary (1971) pages 795—801.

STYLODON Raf., Neogenyt. 2. 1825.

Additional & emended bibliography: Michx., Fl. Bor.-Am., imp. 1, 2: 14. 1803; Balbis, Cat. Pl. Hort. Bot. Taur. 48. 1804; Poir. in Lam., Encycl. Méth. Bot. 8: 548. 1808; Balbis, Cat. Stirp. Hort. Acad. Taur. 80. 1813; Pursh, Fl. Am. Sept. 2: 417. 1814; Michx., Fl. Bor.-Am., imp. 2, 2 ["1"]: 14. 1820; S. Ell., Sketch, imp. 1 & 2, 2: 99—100 & 743. 1821; Steud., Nom. Bot. Phan., ed. 2, 2: 750. 1841; D. Dietr., Syn. Pl. 3: 601. 1843; Schau. in A. DC., Prodr. 11: 520 & 545. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 343 & 494. 1858; Darby, Bot. South. States 474. 1866; A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 336 (1878) and ed. 2, 2 (1): 336. 1886; A. W. Chapm., Fl. South. U. S., ed. 2, imp. 2, 307 (1887), ed. 2, imp. 3, 307 (1889), and ed. 2, imp. 4, 307. 1892; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 148. 1894; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 504 (1894) and imp. 1, 2: 1011, 1012, & 1178. 1895; Baerecke, Anal. Key Ferns Flow. Pl. Atl. Sect. Middl. Fla. 114. 1906; Lowe, Miss. State Geol. Surv. Bull. 17: 236. 1921; Perry, Ann. Mo. Bot. Gard. 20: 248—250, 262, 309—310, & 355. 1933; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 1, 188. 1938; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 575. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 504, 1011, 1012, & 1178. 1946; H. N. & A. L. Mold., Pl. Life 2: 30. 1948; Lawrence, Taxon, Vasc. Pl., imp. 1, 687. 1951; Greene & Blomquist, Fls. South 109. 1953; Thorne, 2: 504, 1011, 1012, & 1178. 1946; Lawrence, Taxon. Vasc. Pl., imp. 1, 687. 1951; Greene & Blomquist, Fls. South 109. 1953; Thorne, Am. Midl. Nat. 52: 313. 1954; Angely, Cat. Estat. Gen. Bot. Fan. 17: 6. 1956; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 504, 1011, 1012, & 1178. 1960; Mold., Biol. Abstr. 36: 719. 1961; Hocking, Excerpt. Bot. A.4: 224. 1962; Mold., Phytologia 8: 279, 477, 483, 484, 487, & 489 (1963) and 9: 34, 165, 206, 215, & 220. 1963; Shelford, Ecol. N. Am. 77 & 607. 1963; A. L. Mold., Phytologia 11: 72. 1964; Mold., Phytologia 11: 13 & 117. 1964; Radford, Ahles, & Bell, Guide Vasc. Fl. Carol. 281 & 282. 1964; F. A. Barkley, List Ord. Fam. Anthoph. 76 & 213. 1965; Mold., Phytologia 12: 6. 1965; Mold., Résumé Suppl. 12: 1. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 1085 & 1086. 1966; G. Taylor, Ind. Kew. Suppl. 13: 143. 1966; Rickett, Wild Fls. U. S. 2 (2): 464, 465, & 685, pl. 171. 1967; W. C. Grimm, Recog. Flow. Wild Pl. 228 & 229. 1968; Mold., Phytologia 15: 495. 1968; Pullen, Jones, & Watson, Castanea 33: 332. 1968; Anon., Torr. Bot. Club Ind. Am. Bot. Lit. 3: 309. 1969; Rickett, Wild Fls. U. S. 3 (2): 365. 1969; G. W. Thomas, Tex. Pl. Ecolog. Summ. 77. 1969; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Mold. in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1312, 1321, 1326, & 1872. 1970; Rouleau, Guide Ind. Kew. 182 & 353. 1970; S. Ell., Sketch, imp. 3, 2: 99—100 & 743. 1971; Lawrence, Taxon. Vasc. Pl., imp. 2, 687. 1971; Mold., Fifth Summ. 1: 6, 23, 25, 26, 30, 32, 33, 48, 56, 369, & 402 (1971) and 2: 600, 660, 661, 706, 752, 787, & 910. 1971; Whipple, Journ. Elisha Mitch. Sci. Soc. 88: 9. 1972; Mold., Phytologia 23: 184 (1972) and 26: 511. 1973; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 1114 & 1115. 1973; Michx., Fl. Bor.-Am., imp. 2, 2 [Ewan, Class. Bot. Am. 3]: 14. 1974; Mold., Phytologia 28: 202. 1974; Duncan & Foote, Wildfls. SE. U. S. 150, 294, & 295. 1975; Kooiman, Act. Bot. Neerl. 24: 463. 1975; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 2, 188. 1976; Mold., Phytologia 34: 250 & 511. 1976; Batson, Gen. East. Pl. 147 & 201. 1977; Lelong, Sida 7: [118] & 140. 1977; K. E. Rogers, Sida 7: 78. 1977.

STYLODON CARNEUS (Medic.) Mold., Revist. Sudam. Bot. 5: 2. 1937.

Additional & emended synonymy: Verbena caroliniana, erecta, foliis oblongo-obovalibus, obtusis; spicis filiformibus, longissimis, distinctifloris Michx. apud Poir. in Lam., Encycl. Méth. 8: 548, in syn. 1808. Verbena carolinensis (Walt.) Small, Fl. SE. U. S., ed. 1, 1009. 1903. Verbena caroliniana (Walt.) Michx. ex Mold., Résumé Suppl. 2: 11, in syn. 1960. Verbena caroliniana Gmel. ex Mold., Phytologia 8: 279, in syn. 1962. Stylodon carnea (Medic.) Mold., Résumé Suppl. 4: 13, in syn. 1962. Verbena carnosa Medic. ex Mold., Résumé Suppl. 7: 9, in syn. 1963. Verbena carolinensis var. caroliniana Michx. ex Mold., Résumé Suppl. 7: 9, in syn. 1963. Stylodon carolinensis a. decumbens Murrill, in herb.

Bibliography: see under the genus as a whole.

Illustrations: Greene & Blomquist, Fls. South 109. 1953; Rickett, Wild Fls. U. S. 2 (2): pl. 171 (in color). 1967; Grimm, Recog. Flow. Wild Pl. 220. 1968.

Recent collectors refer to this plant as upright and have found it growing on dry or sandy soil and railroad gravel on railroad rights-of-way, in low sandy ground, at the edges of creeks and roads, on sandy pine-hardwood hills and sandhills, in sandy oak woods and dry pinelands, dry or sandy woods, oak-hickory forests, flat pinewoods, sandy open woods, sandy oak scrub, and upland open pine-oak woodlands, in fields, pinebarrens, barren and open pastures, and sandy low ground along roadsi des, in pineland-hardwood association, open and cutover longleaf pine areas, open sandy woods, on longleaf pine hills, "in semi-shade in sand of grown-over second growth pine" and well-drained longleaf pine forests, flowering and fruiting from April to July.

The corollas are said to have been "pink" on Correll 27417, Dress & Hansen 2032, and Dress & Read 9840, "pink-lavender" on Bougere 1046, "light-lavender" on Smith 57, "light-blue" on Allen 1282, "white" on Graves 621, "white to very pale-lavender" on Tharp & al. 54856, "pale-lavender, almost white" on Bougere 1153, and "white to flesh, drying faint-purple" on Braun 5648.

Tharp and his companions encountered the species "on red gravelly sand upland among well spaced cutover longleaf and shortleaf pine over a thick groundcover of Paspalum and Andropogon" and "in deep loose sand soil beneath large old stands of Pinus palustris, the podsol covered with duff". Allen found it "abundant in open areas with Helenium, Spiranthes, Gaylussacia, and Rudbeckia". Dress and his associates found it "in very sandy soil of rather barren open fields" and at the "edge of low rather open sandy and grassy pine and holly woodland".

Radford, Ahles, & Bell (1964) record Stylodon carneus from sandy, frequently xeric, thin woodlands, in the central parts of the Carolinas north into Wake County, North Carolina, flowering there from April to July. Lelong (1977) asserts that it is "common in dry, open woods" in Mobile County, Alabama. Lowe (1921) avers that it is found "Usually indry pine lands" and lists it from Jones and Lowndes Counties, Mississippi. Pullen and his associates (1968) record it from Clarke, Forrest, George, Greeve, Harrison, Jackson, Jones, Kemper, Lowndes, and Pearl River Counties, Mississippi. Rogers (1977) lists it from Forrest and Perry Counties in the same state. Grimm (1968) tells us that "It grows in open sandy woods and thickets, chiefly in the coastal plain" from North Carolina south to Florida and west to Louisiana. He says that the flowers are "almost 1/4 inch across, pink purplish, or white".

Common names recorded for the species are "Carolina verbena", "Carolina-verbena", and "Carolina vervain".

Green & Blomquist (1953) note that "This is another species which varies somewhat in its flower characters from a true verbena.....However, the habit of the plant is typical of a verbena". Perry (1933) says that it "is probably a relic of some ancient form; the distinctive character of the schizocarp gives no clue to its affinities, but rather emphasizes the anomaly of the species".

The polynomial credited to Michaux by Poiret (1808) is erroneously placed by him in the synonymy of Verbena carolina L., a very different plant.

Material of Stylodon carneus has been misidentified and distributed in some herbaria as Verbena angustifolia Michx., V. carolina L., V. hastata L., V. stricta Vent., Buchnera elongata Sw. [in the Scrophulariaceae], "Lobelia carolina L." [Lobeliaceae], and Lobelia inflata L. [Lobeliaceae]. On the other hand, the Bynum, Ingram, & Jayne s.n. [April 18, 1933] and McAtee 1953, distributed as Stylodon carneus, are actually Verbena halei Small, Cory 54253 and G. L. Fisher 51001 are V. rigida Spreng., F. A. Barkley 13365, Flemming s.n. [Rutledge swamp, Oct. 9, 1934], and Uzzell 17 are V. xutha Lehm., and Godfrey 4643 is Buchnera elongata Sw. in the Scrophulariaceae.

Additional citations: NORTH CAROLINA: Bladen Co.: Bell s.n. [May 18, 1946] (Hi—33705). Brunswick Co.: A. C. Mathews s.n. [May 2, 1935] (Hi—5849). Cumberland Co.: Ahles & Haesloop 29741 (Hi—104892); C. Knox s.n. [June 7, 1942] (Se—202550). Duplin Co.: A. C. Mathews s.n. [June 5, 1932] (Hi—59459). Harnett Co.: R. K. Godfrey 4239 (W—1767334). Hoke Co.: Ahles & Neuber 25000 (Hi—104415); B. E. Smith s.n. [May 20, 1934] (Hi—59458). Montgomery Co.: Radford 14711 (Hi—92859). Pender Co.: Ahles & Haesloop 27915 (Hi—104414, Se—199297); Hyams s.n. [Burgaw, Aug. 1878] (W—144299). Richmond Co.: Radford 19289 (Hi—92860). Robeson Co.: Terrell 3052 (Hi—104413). Scotland Co.: Ahles & Leisner 32864 (Hi—104412); Duke 872 (Hi—122975). Wake Co.: W. B. Fox 3636 (Hi—55469). County undetermined: McCarthy s.n. [North Carolina] (W—72317). SOUTH CAROLINA: Aiken Co.: Duke 1290 (Hi—112972); Ravenel 1164 (W—1323068), s.n. [Aiken] (W—72321). Bamberg Co.: Ahles & Haesloop 25948 (Hi—104891), 30445 (Bl—180864). Beaufort Co.: Mellichamp 137 (W—1323069). Calhoun Co.: Ahles & Haesloop 30287 (Hi—104893). Chesterfield Co.: Swails 41 (Hi—110658). Clarendon Co.: Radford 24564 (Hi—101651). Darlington Co.: Coker s.n. [July 1, 1936] (Hi—59451); J. B. Norton s.n. [May 5, 1921] (Hi—59449); Radford & Stewart 351 (Ca—984508, Hi—23189); Rogers s.n. [April 21, 1910] (Hi—59450); B. E. Smith 57 (Hi—26481), 1457 (Hi—26483), 1739 (Hi—26474). Dorchester Co.: Ahles & Haesloop 26292 (Hi—104416), 26293 (Hi—104417); K. A. Taylor s.n. [Summerville, June '91] (W—308496). Georgetown Co.: Bozeman & Logue 9149 (Ld); Godfrey & Tryon 180 (Ca—956863, W—1837108); Radford 25106 (Hi—101650). Hampton Co.: C. R. Bell 2572 (N). Kershaw Co.: Radford 23650 (Hi—101649). Lee Co.: Radford 24077 (Hi—101648). Lexington Co.: Duke 756 (Hi—112973); Godfrey & Tryon 1202 (W—1837919). Marion Co.: C. R. Bell 7822 (Hi—101647). Witherspoon Island: B. E. Smith 1458 (Hi—26482). County undetermined: Curtiss s.n. [S. Carolina, 1875] (W—72320). GEORGIA: Baker Co.: Thorne 4026 (W—1929872). Chatham Co.: W. M. Canby s.n. [Savannah, May 1858] (Pa). Richmond Co.: Duke & Ahles 2039 (Hi—112974). Screven Co.: Ahles 54322 (Hi—201959). Seminole Co.: Dress & Hansen 2032 (Ba). Tattnall Co.: Ahles 54211 (Hi—201602). FLORIDA: Alachua Co.: O'Neill 986 (W—1325947). Bay Co.: Billington 22 (W—1222437). Clay Co.: W. M. Canby s.n. [Hibernia, March 1869] (Pa, W—72319); Totten s.n. [August 31, 1945] (Hi—28108). Duval Co.: Curtiss 1959 (Ms—30782, Mu—1559, W—72318), 4386 (Ca—58612, W—218279), 4765 (Ca—104828, W—224491); Fredholm 5136 (W—717124). Escambia Co.: G. L. Fisher 9 (Ca—445610). Franklin Co.: A. W. Chapman s.n. [Biltmore Herb. 4761a] (W—332103). Gadsden Co.: F.

H. Sargent 6160 (St). Hernando Co.: Murrill 583 (W—1928403). Jefferson Co.: Godfrey 59506 (Hi—155818). Lake Co.: Nash 601 (Ca—104827, W—228139). Leon Co.: N. C. Henderson 63-1058 (Au—223001). Liberty Co.: A. W. Chapman s.n. [Aspalaga, 1898] (Dt). Orange Co.: Barrows s.n. [Winter Park, 1894] (Dt); Meislahn 135a (W—511392); Pieters 71 (W—511583). Polk Co.: McFarlin 5025 (Mi). Seminole Co.: Lewton s.n. (Ms—50459). Suwannee Co.: Godfrey & Houk 60815 (Hi—201509). Volusia Co.: S. M. Deam 1799 (W—753720); J. R. Perkins s.n. [DeLand, March-April 1918] (Ca—882629). Wakulla Co.: Rugel s.n. [St. Marks, Apr.-Jun. 1843] (Go). County undetermined: A. W. Chapman s.n. [Florida, 1845] (Bm, S), s.n. [W. Florida] (Dt); Rugel s.n. [Late January-Mar. '45] (Bm). ALABAMA: Baldwin Co.: Dress & Read 9840 (Ba). Lee Co.: F. S. Earle s.n. [Auburn, 5/20/99] (Dt). Mobile Co.: Bush 312 (W—318485); E. W. Graves 621 (W—984446); C. Mohr s.n. [Mobile, June 1879] (W—771854). MISSISSIPPI: Harrison Co.: S. M. Tracy 4981 (W—341064), s.n. [Biloxi, 5/8/1895] (W—307751). Jackson Co.: J. Skehan s.n. [Seymour & Earle 118] (Gg—364176, Hi—59447, Lb—16423). Lamar Co.: S. B. Jones 13653 (Au—260961); F. H. Sargent 7743 (Go). LOUISIANA: Natchitoches Par.: E. J. Palmer 7564 (W—ç603331). Orleans Par.: T. Drummond 253 (Au—121551). Rapides Par.: Mayeau s.n. [May 9, 1942] (Lv). Saint Helena Par.: C. M. Allen 725 (Lv), 1282 (Lv). Saint Tammany Par.: Anect 60 [Herb. Leonard 2289] (W—1036677, W—2261413); Arsène 11820 (Lv, W—1033023), 12117 (W—1033046); Bougere 1046 (Lv), 1153 (Lv); C. A. Brown 7698 (Lv). Tangipahoa Par.: H. R. Wilson 151 (Lv). Washington Par.: C. A. Brown 5648 (Lv); R. D. Thomas & al. 14240 (N). TEXAS: Jasper Co.: D. S. Correll 27417 (Ld). Jefferson Co.: McLeod 1156 (Au—184051). Tyler Co.: D. S. Correll 37255 (Ld); Tharp, Turner, & Johnston 54731 (Au—121551), 54856 (Au—121550, St). LOCALITY OF COLLECTION UNDETERMINED: Hiendlmayr s.n. (Mu—1246); J. Torrey s.n. ["New York"] (Lu).

NOTES ON NEW AND NOTEWORTHY PLANTS. CXXVII

Harold N. Moldenke

DIOSTEA SCOPARIA var. *SUBULATA* Mold.

Haec varietas a forma speciei dentibus calicinis longiter subulatis plerumque tortis recedit.

This variety differs from the typical form of the species in having the calyx-teeth definitely and conspicuously long-subulate, often twisted together in age.

The type of the variety was collected by Juan Semper *(no. 631)* in meadows at Pampa de Tabolango, Las Heras, Mendoza, Argentina, at 2000 meters altitude, on April 19, 1945, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collector describes the plant as a shrub, 1 m. tall, with lilac-colored flowers.

ERIOCAULON PELLUCIDUM f. *PUMILUM* (Raf.) Mold., stat. nov.

Eriocaulon pumilum Raf., Atl. Journ., imp. 1, 121. 1832.

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ADDITIONAL NOTES ON THE GENUS *DIOSTEA*. I

Harold N. Moldenke

Since the publication of my monograph of this genus in 1960 much additional material has come to my attention. This is summarized in the present paper. The herbarium acronyms employed, as in all others in my long series of papers in this journal for the past 46 years, are fully explained in my Fifth Summary (1971), pages 795--801.

DIOSTEA Miers

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 2, 2: 750. 1841; D. Dietr., Syn. Pl. 3: 601. 1843; Walp., Nov. Act. Caes. Leopold.-Carol Cur. 19, Suppl. 1: 379. 1843; Schau. in A. DC., Prodr. 11: 544--546, 555, 556, 573, & 614. 1847; C. Gay, Hist. Fis. Chile 1: 20--22 & 30--31. 1849; Buek, Gen. Spec. Syn. Candoll. 3: 104, 266, & 494--496. 1858; Bocq., Adansonia, ser. 1, 3: [Rev. Verbenac.] 203 & 244. 1863; F. Phil., Cat. Pl. Vasc. Chil. 221. 1881; Ball, Notes Nat. S. Am. 202. 1887; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 264, 549, 768, & 777 (1893) and imp. 1, 2: 95 & 96. 1894; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 147. 1894; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1178 & 1179. 1895; Briq. in Chod. & Wilczek, Bull. Herb. Boiss., ser. 2, 2: 543 & 544. 1902; Reiche & Phil., Fl. Chil. 5: 272, 282--283, 297--299, & 303. 1910; Sanzin, Anal. Soc. Cient. Argent. 88: 98, 100, 103, 104, 116--118, 122, 125, & 133, fig. 6. 1919; H. C. Comber, Gard. Chron., ser. 3, 92: 373. 1932; H. F. Comber, Gard. Chron., ser. 3, 92: 413. 1932; Makins, Ident. Trees Shrubs 74 & 259, fig. 62 H. 1936; H. S. Marsh., Kew Bull. Misc. Inf. 1936: 94. 1936; Mold., Geogr. Distrib. Avicen. [1], 28, 29, & 39. 1939; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 264, 549, 768, & 777 (1946) and imp. 2, 2: 95, 96, 1178, & 1179. 1946; Mold., Alph. List Inv. Names Suppl. 1: 9 & 26. 1947; H. N. & A. L. Mold., Pl. Life 2: 31, 43, & 60. 1948; Erdtman, Pollen Morph. Pl. Tax., ed. 1, 448. 1952; Angely, Cat. Estat. Gen. Bot. Fan. 17: 4. 1956; Darlington & Wylie, Chromos. Atl., imp. 1, 322, 323, & 506. 1956; Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14354. 1958; Muñoz Pizzaro, Sin. Fl. Chil. 199. 1959; Encke, Pareys Blumengärtn., ed. 2, 443. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 264, 768, & 777 (1960) and imp. 3, 2: 95, 96, 1178, & 1179. 1960; Muñoz Pizzaro, Espec. Pl. Descr. Philip. 110. 1960; Potztal in Encke, Pareys Blumengärtn., ed. 2, 2: 439. 1960; Darlington & Wylie, Chromos. Atl., imp. 2, 322, 323, & 506. 1961; Mold., Biol. Abstr. 36: 719. 1961; Runner, Rep. Groff Coll. 361. 1961; Hocking, Excerpt. Bot. A.4: 224. 1962; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 430. 1963; Troncoso in Böcher, Hjerting, & Rahn, Dansk. Bot. Arkiv 22: 105 & 109--110. 1963; Hansen, Excerpt. Bot. A.7: 139. 1964: Mold., Résumé Suppl. 10: 5 (1964) and 11: 5. 1964; F. A. Barkley, List Ord. Fam. Anthoph. 75 & 160. 1965; Mold., Phytologia 12: 6, 20, 27, & 36. 1965; Airy Shaw in Willis, Dict. Flow. Pl., ed. 7, 360. 1966; Erdtman, Pollen Morph. Pl. Tax., ed. 2, imp. 1, 448. 1966; Mold., Phytologia 14: 402. 1967; Mold., Résumé Suppl. 15: 21. 1967; Anon., Torr. Bot. Club Ind. Am. Bot. Lit. 3: 309. 1969; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 1, 715 & 716. 1969; Anon., Biol. Abstr. 51 (16): B.A.S.I.C. S.63. 1970; Mold., Biol. Abstr. 51: 9025. 1970; Rouleau, Guide Ind. Kew. 61 & 352. 1970; Erdtman, Pollen Morph. Pl. Tax., ed. 2, imp. 2, 448. 1971; Heusser, Pollen Spores Chile 62 & 81, pl. 59-672. 1971; Mold., Fifth Summ. 1: 5, 10, 191, 195, 362, 395, 428, 429, 431, 433, 476, & 477 (1971) and 2: 532, 549--551, 557, 565, 613, 663, 678, 694, 696, 709, 754, 774, & 876. 1971; Thanikaimoni, Inst. Franç. Pond. Trav. Sect. Scient. Techn. 12: 80. 1972; Airy Shaw in Willis, Dict. Flow. Pl., ed. 8, 369. 1973; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 675. 1973; Gibbs, Chemotax. Flow. Pl. 3: 1752 & 1754. 1974; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 2, 715 & 716. 1974; Mold., Phytologia 28: 109, 453, & 508. 1974; Troncoso, Darwiniana 18: 296, 301, 302, 306, 310, 313, 352--355, 409, 411, & 412, fig. 15 & 353. 1974; Mold., Phytologia 30: 181 & 507. 1975; L. H. & E. Z. Bailey, Hortus Third 1149. 1976; A. R. Mold. in Thrower & Bradbury, Chile-Calif. Medit. Scrub Atl. 211. 1977; Markgraf & D'Antoni, Pollen Fl. Argent. 20, 32, 98, 114, 122, & 207, pl. 42-358 & 42-3-9. 1978.

Gibbs (1974) reports tannins and leucoanthocyanin not present in this genus. Darlington & Wylie (1956) give the chromosome number as x = 5.

The *Zöllner 5533,* distributed as *Diostea,* actually is *Junellia pseudo-juncea* (C. Gay) Mold.

DIOSTEA CINERASCENS (Schau.) Mold.

Additional synonymy: *Citharexylum? alpinum* Poepp. ex Walp., Repert. Bot. Syst. 4: 16, in syn. 1845. *Lippia cinerascens* F. Phil., Cat. Pl. Vasc. Chil. 219. 1881. *Verbena cinerascens* Gill. &

Hook., in herb.

Additional & emended bibliography: C. Gay, Hist. Fis. Chile Bot. 5: 21. 1849; Buek, Gen. Spec. Syn. Candoll. 3: 104 & 494. 1858; F. Phil., Cat. Pl. Vasc. Chil. 219. 1881; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 549 (1893) and imp. 1, 2: 1178. 1895; Reiche & Phil., Fl. Chil. 5: 282--283. 1910; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 549 (1946) and imp. 2, 2: 1178. 1946; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. Chile 25: 41 & 70. 1951; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 549 (1960) and imp. 3, 2: 1178. 1960; Mold., Fifth Summ. 1: 191, 428, & 431 (1971) and 2: 663 & 876. 1971; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 675. 1973; Troncoso, Darwiniana 18: 310, 313, & 411. 1974.

My good friend, Otto Zöllner, has found this plant growing at 2000 m. altitude, flowering in September and November, and in fruit in November. Reiche (1910) asserts that it grows "En las cordilleras de las provincias de Coquimbo (Ovalle, Illapel), Aconcagua i Santiago; perece planta escasa". Gay (1849) notes that the "Especie muy afin de la *V[erbena] scoparia* Hook. y que se halla en las cordilleras de Santiago y en el camino de la Guardia". Troncoso (1974) cites *Jiles 1535* from Ovalle, Chile, deposited in the San Isidro herbarium.

A reference to "Poepp. Syn. Pl. Am. Austr. 558" occurs in the literature of this taxon, but as yet has not been located by me -- possibly it is an exsiccatae number.

Material of *D. cinerascens* has been misidentified and distributed in some herbaria as *D. juncea*(Gill. & Hook.) Miers and as *Junellia* sp. On the other hand, the *Poeppig II.85*, distributed as *D. cinerascens* in some herbaria, actually is *D. juncea*.

Additional citations: CHILE: Aconcagua: *Zöllner 7938* (Ld). Atacama: *Poeppig 9* [Macbride photos 7855 in part] (W--photo of cotype). Coquimbo: *C. Gay 944* [Macbride photos 7855 in part] (W--photo of cotype); *Zöllner 5350* (Z). Province undetermined: *C. Gay s.n.* [Chile] (W--1706333).

DIOSTEA JUNCEA (Gill. & Hook.) Miers

Additional & emended synonymy: *Verbena juncea* α *foliis integerrimis, spicis pubescentibus* Gill. & Hook. in Hook., Bot. Misc. 1: 162. 1829. *Verbena juncea* β *foliis grosse serratis, spicis glabriusculis* Gill. & Hook. in Hook., Bot. Misc. 1: 162. 1829. *Lippia scirpea* R. A. Phil., Anal. Univ. Chile 2: 402. 1862; Linnaea 33: 196. 1864. *Diostea juncea* Miers apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 768, in syn. 1893. *Baillonia iuncea* Benth. & Hook. apud M. Kunz, Anatom. Untersuch. Verb. 37. 1911. *Baillonia juncea* Briq. ex Metcalfe & Chalk, Anat. Dicot. 1034, fig. 247 F & H. 1950. *Diostea scirpea* (Phil.) Miers apud Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. Chile 25: 42--44. 1951. *Lippia baillonia* Darlington & Wylie, Chromos. Atl., imp. 1, 323, in syn. 1955. *Baillonia juncea* (Gill. & Hook.) Briq. ex Encke, Pareys Blumengärtn., ed. 2, 443, in syn. 1960. *Lippea juncea* Gay ex Mold., Résumé Suppl. 3: 33, in syn. 1962. *Diostea juncea* (Schau.) Miers ex Mold., Résumé Suppl. 10: 5, in syn. 1964.

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 2, 2: 750. 1841; D. Dietr., Syn. Pl. 3: 601. 1843; C. Gay, Hist. Fis. Chile 5: 30--31. 1849; Buek, Gen. Spec. Syn. Candoll. 3: 266 & 495. 1858; Bocq., Adansonia, ser. 1, 3 [Rev. Verbenac.] 244. 1863; R. A. Phil., Anal. Univ. Chil. 27: 339 (1865) and 35: 193. 1870; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 264, 768, & 777 (1893), imp. 1, 2: 95 & 96 (1894), and imp. 1, 2: 1179. 1895; Briq., Ann. Conserv. Jard. Bot. Genèv. 4: 22. 1900; Wilczek & Chod., Bull. Herb. Boiss., ser. 2, 2: 544. 1902; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 23, 61, & 106. 1904; Reiche & Phil., Fl. Chil. 5: 272, 297--299, & 303. 1910; M. Kunz, Anatom. Untersuch. Verb. 37. 1911; C. K. Schneid., Illustr. Handb. Laubholzk. 2: 590. 1912; Sanzin, Anal. Soc. Cient. Argent. 88: 98, 100, 103, 104, 133, & 134, fig. 6. 1919; H. F. Comber, Gard. Chron., ser. 3, 92: 413. 1932; Makins, Ident. Trees Shrubs 74 & 259, fig. 62 H. 1936; H. S. Marsh., Kew Bull. Misc. Inf. 1936: 94. 1936; Mold., Geogr. Distrib. Avicenn. 29 & 39. 1939; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 264, 768, & 777 (1946) and imp. 2, 2: 95, 96, & 1179. 1946; H. N. & A. L. Mold., Pl. Life 2: 60. 1948; Metcalfe & Chalk, Anat. Dicot. 1032 & 1034, fig. 247 F & H. 1950; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. Chile 25: 41--44, fig. 2. 1951; Erdtman, Pollen Morph. Pl. Tax., ed. 1, 448. 1952; Darlington & Wylie, Chromos. Atl., imp. 1, 323. 1955; Muñoz Pizarro, Sin. Fl. Chil. 199. 1959; Encke, Pareys Blumengärt., ed. 2, 443. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 264, 768, & 777 (1960) and imp. 3, 2: 95. 96, & 1179. 1960; Muñoz Pizarro, Espec. Pl. Descr. Philip. 109--110. 1960; Darlington & Wylie, Chromos. Atl., imp. 2, 323. 1961; Mold., Phytologia 9: 114. 1963; Mold., Résumé Suppl. 10: 5 (1964) and 11: 5. 1964; Erdtman, Pollen Morph. Pl. Tax., ed. 2, 448. 1966; Mold., Phytologia 14: 402. 1967; Mold., Résumé Suppl. 15: 21. 1967; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 1, 716. 1969; Erdtman, Pollen Morph. Pl. Tax., ed. 2, imp. 2, 448. 1971; Heusser, Pollen Spores Chile 62, pl. 59-672. 1971; Mold., Fifth Summ. 1: 191, 195, 362, 395, 429, 433, 476, & 477 (1971) and 2: 532, 549, 551, 557, 565, 613, 678, 694, 696, 774, & 876. 1971; Bolkh., Grif, Matvej., & Zakhar., Chromos. Num. Flow. Pl., imp. 2, 716. 1974; Troncoso, Darwiniana 18: 353--355, 409, & 412, fig. 15. 1974; Mold., Phytologia 30: 181. 1975; A. R. Mold. in Thrower & Bradbury, Chile-Calif. Medit. Scrub Atl. 211. 1977; Markgraf & D'Antoni, Pollen Fl. Argent. 20, 32, 98, 114, 122, & 207, pl. 42-358. 1978.

Additional & emended illustrations: Sanzin, Anal. Soc. Cient. Argent. 88: 104, fig. 6. 1919; Makins, Ident. Trees Shrubs 74, fig. 62 H. 1936; Metcalfe & Chalk, Anat. Dicot. 1034, fig. 247 F & H. 1950; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. Chile 25: 42--44, fig. 2. 1951; Heusser, Pollen Spores Chile 62, pl. 59-672. 1971; Troncoso, Darwiniana 18: 353, fig. 15. 1974; Markgraf & D'Antoni, Pollen Fl. Argent. 98, pl. 42-358. 1978.

[to be continued]

BOOK REVIEWS

Alma L. Moldenke

"BIOLOGY" Third Edition by Helena Curtis, xxvii & 1043 pp.,.17 maps, 97 tab., 190 b/w fig., 508 b/w photo. Worth Publishers, Inc., New York, N. Y. 10016. 1979. $18.95.

Outstanding! This text is outstanding for content that is both modern and historically accurate, that receives well balanced effective presentation, that shows logical transitions from topic to topic, that has summaries and review questions that are stimulating rather than just repetitive, that has straightforward biological treatment of human reproduction, that adds a personalized glow of individual humanity to scientists mentioned with their contributions and that has 60 boxed essays on such topics as "Darwin's Long Delay" and "Predaceous Fungi". It is outstanding for the highly selective, helpfully realistically short, annotated bibliography. It is outstanding for its use of illustrative material that is always attractive, germane. helpful, accurate and abundant. Many electron micrographs have labeled copy drawings next to them for clarification.

The first two editions of this text were landmarks of success in their times - 1966, 1975, but this one pleases me most because of a tendency toward fuller treatment of major biological/ecological problems. I found myself virtually automatically reading it from cover to cover as though preparing to use it as a text for the coming semester even though I have been retired from the classroom for well over a decade! Figure 38-7 has the phrase "with tears in their eyes" dangling in the wrong place. On p. 535 are not the "three leaves" of the broad bean plant actually the three leaflets of one typical compound leaf? On p. 373 if "bite" is going to be used for the mosquito's piercing and sucking mouthparts, should not the word be put between quotes at least? On p. 665 the mirror image difference of the bird and mammal hearts is not shown. Perhaps plant geneticists and plant taxonomists are more in accord with the species definition for their organisms on p. 344 than the author realizes. The warm and cold current lines on map 46-30 are not visible even with knowing where they should appear. These mentionings are only of minutiae that cannot detract from the outstanding quality of this text. "The most important undertaking of this revision has been to modernize the basic chemistry in the early chapters and to show throughout the remainder of the book how this knowledge of events at the molecular level deepens our understanding of biological phenomena. The goal has been to make the chemistry more coherent, more relevant to biology, but no more difficult."

"STUDY GUIDE to accompany BIOLOGY Third Edition" (by Helena Curtis) by Vivian Manns Null, viii & 348 pp. & 36 b/w diag. Worth Publishers, Inc., New York, N. Y. 10016. 1979. #5.95 paperbound.

Each chapter of the "Study Guide" first lists the important concepts to master. Recall sections provide completion-sentences following the text and other types of questions. The next section requires organizing facts within principles in order to draw conclusions. The next part involves application to a related topic not in the text chapter. Answers are printed in this guide so that the students can check themselves. This a a better than average study guide because it stresses steps in reasoning. It should be particularly helpful to the unorganized or weak student.

"LABORATORY TOPICS IN BIOLOGY to accompany BIOLOGY Third Edition" (by Helena Curtis) by Ray F. Evert, Barbara W. Saigo & Susan E. Eichhorn, vi & 218 pp., 42 b/w fig, 117 photo & 10 tab. Worth Publishers, Inc., New York, N. Y. 10016. 1979. $7.95 spiral/paperbound.

Of course, this lab manual closely follows the text. "Throughout.....there is emphasis on basic facts and principles with an intent always to provide a sound foundation in biology. The experiments range from the 'tried and true' to those incorporating recent advances in biology." This is an efficient, better than average arrangement and content. Fig. 31-5 is so dark that no details are discernable.

"INSTRUCTOR'S MANUAL to accompany BIOLOGY Third Edition" (by Helena Curtis) by Helena Curtis, xi & 126 pp. Worth Publishers, Inc., New York, N. Y. 10016. Free to teachers using the text.

Here are the suggested answers to the 398 questions that appear at the ends of chapters in the text. Perhaps more valuable are the most recent sources of good audio-visual materials. One hundred of the illustrations in "Biology" Third Edition are available on TRANSPARENCY MASTERS for use in overhead projectors, free to instructors who adopt the textbook.

"PREPARATION GUIDE to accompany LABORATORY TOPICS IN BIOLOGY" by Susan E. Eichhorn, James W. Perry & Ray F. Evert, viii & 151 pp, 14 b/w fig & 7 tab. Worth Publishers, Inc., New York 10016. 1979. Free to adopters of the text.

This guide is useful in procuring and preparing laboratory materials and in the allocation of time divisions for the syllabus. On p. E.42 the name for the blackberry is misspelled.

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PINYONS OF THE CHIHUAHUAN DESERT REGION

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In the course of preparing a chapter on the PINACEAE for a flora of the Chihuahuan Desert Region[1] the distribution and taxonomic rank of the pinyons of the region were found to be inadequately described. The pinyon studies relevant to the Chihuahuan Desert Flora are part of a more general investigation, begun in 1973 and still in progress, of all the pinyons (*Pinus* subsection *Cembroides*). Two taxa, hitherto of the rank of variety, require elevation to species level for reasons given below. In addition a third taxon has recently been described at the species level (Robert 1978). The superficial similarity of these three taxa, and *P. cembroides sensu stricto*, should not obscure their important and consistent differences.

PINUS REMOTA (Little) Bailey & Hawksworth, comb. nov.

paper-shell pinyon

Pinus cembroides Zucc. var. *remota* Little, Wrightia 3:183, 1966. *Holotype*: US, as *P. cembroides* var. *remota*, Val Verde County, Texas, 13 miles south of Loma Alta, 1 April 1963, *Little & Correll 18991*.

Pinus remota as defined by Little (1966) differs from *Pinus cembroides* Zucc. *sensu stricto* - henceforth referred to as *Pinus cembroides* - in its much thinner seed shells, needle fascicles mainly in 2's, but with some 3's and slender gray twigs. We have found several additional differences. Two of these are especially important for determination of herbarium specimens. First is the frequent presence of more than 2 resin ducts per needle, the number invariably associated with *P. cembroides* and with *P. edulis* var. *edulis*. *P. remota* has occasionally been taken to be *P. edulis* var. *edulis* in northern Mexico and west Texas because it has somewhat thicker needles in these areas than

[1]"A Chihuahuan Desert Flora", M. C. Johnston, compiler, in preparation at the University of Texas at Austin.

either P. remota from the Edwards Plateau population or nearby P. cembroides. Second ~~are~~ is the abbreviated open fascicle sheaths. The curl-back of the fascicle sheaths, which make conspicuous rosettes around the bases of fascicles that are about a year old in the case of P. cembroides, is much less for P. remota. For the latter, the curl-back is typically of the order of 90^{o} or less, in contrast with P. cembroides and all other pinyons (except Pinus nelsonii with persistent fascicle sheaths) for which the curl-back is typically 270^{o} or more. This difference seems to be a consequence of weaker fascicle-sheaths for P. remota, the distal portions of which are deciduous almost as soon as curl-back begins. Significant differences in altitude are also found between P. cembroides and P. remota; the latter usually occurs at lower elevations. The main range of P. remota is in Coahuila, but it reaches parts of adjacent Nuevo León, southeastern Chihuahua and Texas (Bailey & Wendt 1979).

A particularly important feature of P. remota, not mentioned by Little, is its occurrence (near its upper elevational limit) sympatrically in west Texas with P. cembroides (near its lower elevational limit) without evidence of hybridization--a strong justification for its specific rank.

PINUS DISCOLOR Bailey & Hawksworth, stat. et nom. nov.

border pinyon

Pinus cembroides Zucc. var. bicolor Little, Phytologia 17:336, 1968. Holotype: US, as P. cembroides var. bicolor, Santa Cruz County, Arizona, Madera Canyon, Santa Rita Mountains, 20 May 1968, Little 23011 (female plant) and 23010 (male plant).

The varietal name bicolor (Little 1968) is not used, in this instance, as the specific epithet because of prior use (Pinus bicolor Maxim. ex Parl. in DC. Prod. xvi, II, 418, 1868). Pinus bicolor was a creation of Parlatore and it was from the first a synonym for a Picea, although Maximowicz himself in creating Abies (not Pinus) bicolor (Maximowicz 1866) assigned it to Abies. While Article 34 of the International Code of Botanical Nomenclature might permit us to use bicolor, Article 32, Recommendation 32c, states that "Authors should avoid adoption of a name or epithet which has been previously, but not validly, published for a different taxon." The epithet discolor which we have chosen instead preserves Little's descriptive intentions in the varietal epithet bicolor. Both refer to the usually conspicuous difference in color between the green dorsal and glaucous ventral needle surfaces.

Pinus discolor differs from *P. cembroides* in its lack of dorsal stomata, 2-colored needles and smaller cones (Little 1968). We have found several additional differences. Thus, *P. discolor* has fascicles on a given tree almost entirely in 3's, but with occasional 4's. Fascicles of 2 are significantly less frequent than 4, although similar counts in the past have reported the reverse--probably the result of including incomplete fascicles in hasty counting. Fascicles of 5 are occasionally found. In contrast, *P. cembroides* has fascicles of both 2 and 3 needles on the same tree. When the entire geographical distribution is sampled no marked tendency is found toward either 2 or 3. In addition, needle retention is usually longer for *P. discolor* (typically 4-7 years) than for *P. cembroides* (typically 2-5 years). Moreover, on older trees, highly distinctive bark differences have been noted. These differences are obvious on common sites where the 2 taxa occur side by side. The bark of *P. discolor* is somewhat thinner than that of otherwise comparable specimens of *P. cembroides* and consists of ragged, concave, grayish platelets of variable size and shape, typically 2- 5 cm wide, with intervening, more or less longitudinal fissures, some of which exhibit a conspicuous orange to yellow color. In contrast, the bark of old trees of *P. cembroides* tends to exhibit thick, roughly polygonal plates of charcoal black, giving no impression of raggedness and having obvious transverse as well as longitudinal fissuring or cross-checking, and without the orange to yellow color deep in the furrows as in *P. discolor*. Unlike *P. remota*, *P. discolor* has seed shells as thick or even thicker than those of *P. cembroides*. Little confirmed the subdioecious character of *P. discolor* in southeastern Arizona (McCormick & Andresen 1963). We reaffirm this finding, but in extending the range of *P. discolor* into the Sierra Madre Occidental from Chihuahua through Durango to the San Miguelito Mountains of southern San Luis Potosí, we note that the dioecious tendency grows less obvious toward the southern part of the range.

Chemical analyses of wood cores collected by us of most pinyons and including *P. cembroides* and *P. discolor* have revealed striking differences in the monoterpene constituents between the latter two (analyses by E. Zavarin and K. Snajberk, pers. comm.). For *P. cembroides*, nine sites were sampled, 10 trees each, distributed from west Texas and northern Chihuahua south to Querétaro. For *P. discolor*, 12 sites were sampled, 10 trees each, distributed from southeast Arizona and southwest New Mexico, to San Luis Potosí. *Pinus cembroides* is high in α-pinene (89±5%) and low in both sabinene (2±2%) and p-cymene (1±1%), whereas *P. discolor* is low in α-pinene (35±10%) and high in both sabinene (22±14%) and p-cymene (12±7%). The percentages are means and standard deviations for 90 trees of *P. cembroides* and 120 trees of *P. discolor*.

In geographical regions where both P. cembroides and P. discolor occur, P. cembroides always appears first on ascending into hilly or mountainous habitats. There exists, however, a common elevational range where the two have been found growing together in Chihuahua, Durango, and San Luis Potosí. On none of these common sites is there any suggestion of hybridization between the two taxa. This may be related to a significant difference in their times of anthesis. Pinus cembroides sheds its pollen about 4 to 6 weeks earlier than P. discolor. These facts constitute a strong justification for specific rank of the two taxa.

The common name, border pinyon, is proposed for P. discolor, because its principal range lies along both sides of the international boundary between Mexico and the United States, extending about 200 km into each country. Specifically, the principal range comprises southeast Arizona, extreme southwest New Mexico, northeast Sonora, and northwest Chihuahua. P. cembroides reaches its northern limit in the Sierra Madre Occidental at about 30°N, barely reaching the southern limit of the principal range of P. discolor. Thus, the only pinyons significantly sharing the principal range of P. discolor are P. edulis var. edulis, and P. edulis var. fallax Little. Both are easily recognized and are found only in the northern portions of the principal range. The few stations presently known for P. discolor south of 30°N seem to be outliers from the main population of the border region. In Arizona and elsewhere, this tree is commonly called Mexican pinyon, a name which should be used only for Pinus cembroides. The latter is the most widely distributed pinyon in Mexico and enters the United States only in west Texas.

The recently described Pinus johannis M.-F. Robert, while lacking dorsal stomata and having fascicles mainly of 3 needles, differs conspicuously from P. discolor in growth form. It is a multi-stemmed shrub resembling Pinus culminicola Andresen & Beaman. In monoterpene chemistry, it is essentially identical with P. cembroides and P. remota and shares with them a shorter needle retention than that of P. discolor. Moreover, its geographical distribution is given as solely in the mountains just west of Concepción del Oro, Zacatecas (Robert 1978). However, pinyons with both small tree and shrub forms, with needles in fascicles mainly of 3 and lacking dorsal stomata, have been found elsewhere in some of the more important but isolated mountain ranges of Coahuila, and in the Sierra Madre Oriental farther east. Only one of these isolated populations (Sierra de la Madera, Coahuila) has thus far been tested chemically. Its monoterpene composition is identical with that of P. johannis. These populations are similar in needle anatomy to P. johannis, and different from P. discolor. For these reasons, and pending further field and laboratory studies, it is convenient to regard them as P. johannis sensu lato.

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NOTES ON NEW AND NOTEWORTHY PLANTS. CXXVIII

Harold N. Moldenke

ERIOCAULON DECANGULARE f. *LATIFOLIUM* (Chapm.) Mold., stat. nov.
Eriocaulon decangulare var. *latifolium* Chapm. ex Mold., N. Am. Fl. 19: 21. 1937.

ERIOCAULON LINEARE f. *GIGAS* (Mold.) Mold., stat. nov.
Eriocaulon lineare var. *gigas* Mold, Phytologia 27: 444. 1974.

VERBENA BRACTEATA f. *BREVIBRACTEATA* (A. Gray) Mold., stat. & comb. nov.
Verbena bracteosa var. *brevibracteata* A. Gray, Syn. Fl. N. Am. 2 (1): 336. 1878.

VERBENA BRACTEATA f. *IMBRICATA* (Woot. & Standl.) Mold., stat. nov.
Verbena imbricata Woot. & Standl., Contrib. U. S. Nat. Herb. 16: 166. 1933.

VERBENA URTICIFOLIA f. *SIMPLEX* (Farwell) Mold., stat. nov.
Verbena urticifolia var. *simplex* Farwell, Papers Mich. Acad. Sci. 3: 103. 1924.

VITEX AGNUS-CASTUS f. *CAERULEA* (Rehd.) Mold., stat. nov.
Vitex agnus-castus var. *caerulea* Rehd. in L. H. Bailey, Cycl. Am. Hort. 4: 1947 [as "Hort."]. 1902.

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ADDITIONAL NOTES ON THE GENUS *DIOSTEA*. II

Harold N. Moldenke

DIOSTEA JUNCEA (Gill. & Hook.) Miers
Additional bibliography: Thanikaimoni, Trav. Sect. Scient. Techn. Inst. Franç. Pond. 13: 80. 1976; Mold., Phytologia 44: 125--126. 1979.

Recent collectors describe this species as a many-branched bush or virgate shrub, 1--6 m. tall, resembling a *Cytisus*, or a perennial subaphyllous herb, the branches pendulous, and the flowers tubular, slightly fragrant. They have encountered it on lakeshores, in sunny places, on open dry river terraces and partially shaded slopes, and on steep, dry, rocky, west-facing slopes in sparse chaparral, at 394--2000 m. altitude, flowering from October to March, as well as in May and June, fruiting in February and June. Morrison reports it "not common", but both King and Mexia speak of it as "common"; Burkart and Zöllner report it "abundant". Our son, Dr. Andrew R. Moldenke, in response to a query regarding his encountering it during his work on pollination ecology in Argentina and Chile, says "I know it well - it is a prominent species in many places".

The corollas are said to have been "white" on *Behn s.n.*, *Blake s.n.*, *Mexia 7878*, *Morrison 16781*, and *Morrison & Wagenknecht 17509*, "whitish-lavender" on *McClintock MEX.2.1076*, "lilac" on *Burkart 19871*, "light-lilac" on *Lourteig 2543*, "blue" on *Meyer 7472*, "rose" on *Ruiz Leal 23948*, and "very bright-violet" on *Cordini 107*, while Makins (1936) describes them as "pale-lilac". The only vernacular name recently reported for the species is "retama". Darlington & Wylie (1956) list the chromosome number as "x = 8?..9?" on the authority of Junell (1934), who, however, reports it as 32.

Makins (1936) lists the species as "*Diostea (Baillonia) juncea*" and refers to the fruit as a "berry enclosed in a persistent calyx, regarding it as endemic to Chile. Gay (1849) comments that "Esta planta se cria en las cordilleras de Acancagua ẽ igualmente en la provincia de Valdivia, cerca del rio Negro" in Chile. Macloskie (1905) found it in "Valdivia to N. Patagon., Mts. in Chubut".

The Hooker (1829) reference in the bibliography of *D. juncea* is often incorrectly cited as "1830". Hooker divides the taxon into two forms: "α foliis integerrimis, spicis pubescentibus" and "β foliis grosse serratis, spicis glabriusculis".

Erdtman (1966) has examined the pollen of *Morrison 16781* and *Werdermann 545* and describes the grains as very verbenoid, 3-colporate, suboblate-oblate spheroidal, 32 x 36 mu. Heusser (1971) describes the pollen as "Monad, isopolar, radiosymmetric; tricolporate, colpi long and narrow, constricted equatorially, with costae, colpi pores transverse constricted or more or less circular, variable in size, generally conspicuous; prolate spheroidal-subprolate, amb triangular with sides concave; exine 1--1.4 mu thick, tectate, more or less psilate; 36--48 x 34--43 mu", based on *Kuschel SGO 68389* from Bĩo-Bĩo, Chile. Markgraf & D'Antoni (1978) describe the pollen as "Tricolporate, scabrate. Grain prolate-spheroidal, 31 x 29 um. Exine 2 um thick. Pore lalongate 13 x 4 um. Costae colpi narrow. Polar A 0.34 amb sub-angular", based on *Markgraf s.n.* from Rĩo Negro. He also cites *Heusser 672* and Erdtman p. 448 (1966). It is assumed that by "um" he means "mu".

Encke (1960) says of this species: "Interessanter, an *Spartium junceum* erinnernder Kalthausstrauch von ähnlicher Kultur wie *Carmichaelia*. Vermehrung durch Aussaat oder reife Sommerstecklinge in Juil, August unter Glas."

Briquet (1902) cites *Wilczek 39*. Troncoso (1974) cites *Castellanos 20493* from Neuquẽn and *Soriano 2905* from Rĩo Negro, Argentina, and *Riccardi 14588* from Linares & *Cuming 225* from Province undetermined, Chile. She regards the genus as monotypic, this the type and only species. Acevedo de Vargas (1951) maintains *D. scirpea* (R. A. Phil.) Miers as valid. She says: "Se menciona esta planta argentina aquĩ, descripta originalmente de Chile por el Dr. R. A. Philippi porquẽ, segũn las publicaciones, no ha sido vista por los botanicos, siendo por tal motivo confundida con *Diostea juncea*. Según mi opinión debería ser subordinada a *Diostea scoparia*. Material estudiado: Portillo, lado de Mendoza, *W. Diaz, 186162* (Typus et isotypus a *Lippia scirpea*: Sgo. *42407* et *54830*). Planta de aspecto semejante a *Diostea scoparia* y *D. juncea*. Obs. - En la sinonimia de *Diostea juncea*, establecida por el Dr. Moldenke en Lilloa V: 386. 1940, figura *Verbena scirpea* R. A. Phil. ex Moldenke (previamente citada par esta mismo botánico en List Alf. Prelim. 48. 1940), combinación que, según mi parecer, se refiere a *Lippia scirpea* Phil., por ser esta planta, sin duda alguna, la única descripta por el Dr. Philippi de epíteta específico *scirpea* y que posteriormente sirvió de base a Miers para establecer su *Diostea scirpea*. Del estudio comperado del material tipo, dibujos y diagnosis originales de esta especie con sus congéneres chilenas se deduce que se trata de plantas distintas, cuyos caracteres diferenciales podrían resumirse así:

A. Arbusto ceniciento-peludo, con ramas prismaticas. *D. cinerascens*.
A'. Arbusto lampiños, con ramas cilíndricas.
  B. Planta poco foliosa; hojas mayores de 1 cm. de largo; corola de más o menos cuatro veces la longitud del cáliz. *D. juncea*.
  B'. Plantas subáfilas; hojas menores de 1 cm. de largo; corola más o menos 3 veces o el doble de la longitud del cáliz.
    C. Cáliz cortamente dentado, más o menos pubescente; corola blanca. *D. scoparia*.
    C'. Cáliz con dientes subulados, casi glabro; corola amarilla (en seco, según su autor). *D. scirpea*.

Material of *D. juncea* has been misidentified and distributed in some herbaria as *D. cinerascens* (Schau.) Mold., *Citharexylon alpinum* Poepp., *Neosparton aphyllum* (Gill. & Hook.) Kuntze, and *Verbena cinerascens* Gill. & Hook. On the other hand, the *Zöllner 5350*, distributed as *D. juncea*, actually is *D. cinerascens* (Schau.) Mold., while *Eyerdam 10073* and *Negrete s.n.* are *D. scoparia* Gill. & Hook.) Miers.

Additional citations: CHILE: Aconcagua: *D. O. King 715* (Bm); *Poeppig II.85* (Mu--304); *Zöllner 766* (Ac), *3074* (Ac), *9873* (Ld). Cautin: *Morrison & Wagenknecht 17509* (Ba). Curicó: *Grau & Grau 1586* (Mu); *Mexia 7878* (W--1707408); *Werdermann 545* (Mu); *Zöllner 8447* (N). Linares: *Zöllner 3072* (Ld). Malleco: *Sparre & Smith 183* (Z). Nuble: *Lourteig 2543* (W--2797792). Santiago: *Morrison 16781* (Ba). Valdivia: *Hollermayer s.n.* [Werdermann 1376] (Bm, Ut--91221). Province undetermined: *Behn s.n.* [Cordillera de los Andes, 22 Novbr. 1929] (Mu). ARGENTINA: Chubut: *Burkart 19871* (N, W--2567993); *Castellanos s.n.* [Herb. Inst. M. Lillo 118404] (Gg--406029). Mendoza: *Ruiz Leal 23948* (Tu--162423). Río Negro: *Buchtien 1346* (Mu--4036); *Cordini 107* (W--1702959); *De Borba 416* (Ca--M165563); *Fabris 2178* (Mu); *T. Meyer 7472* (N), *7495* (Ca--166062); *Pedersen 323* (W--2122369); *Rentzell 14650* (Ca--3319); *Soriano 176* (Ca--M004156), *2905* (W--2595175);. CULTIVATED: California: *Mrs. A. S. Blake s.n.* [May 19, 1952] (Ba, Gg--373710); *Jerabek s.n.* [March 1945] (Sd--35406); *McClintock MEX-2.1076* (Ba).

DIOSTEA SCOPARIA (Gill. & Hook.) Miers

Emended synonymy: *Verbena scoparia* Hook. apud Schau. in A. DC., Prodr. 11: 555 in nota. 1847; Mold., Alph. List Inv. Names Suppl.

1: 26, in syn. 1947. *Baillonia spartioides* Ball, Notes Nat. S. Am. 202. 1887.

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Additional & emended illustrations: Sanzin, Anal. Soc. Cient. Argent. 88: 123, fig. 26. 1919; Markgraf & D'Antoni, Pollen Fl. Argent. pl. 42-359. 1978.

Recent collectors describe this species as a bush or shrub, 0.5--1 m. tall, the leaves tiny, borne on *Ephedra*-like shoots, and the flowers aromatic. They have found it growing on steep rocky slopes in association with *Valeriana, Tropaeolum, Euphorbia, Phacelia, Acaena, Verbena, Oxalis, Calceolaria, Sisyrinchium, Nassauvia, Lardizabala,* etc. or with *Nothofagus obliqua* and *Schizanthus hookeri* at altitudes of 1600--3500 m., flowering from November to April, fruiting in January and February.

The corollas are said to have been "blue" on *Venturi 6970,* "bluish-white" on *Ricardi 2910*, "lilac" on *Semper 631*, "pale-violet or blue" on *Hutchison 42*, and the "tube pink, lobes dingy-white" on *Worth & Morrison 16692*.

Markgraf & D'Antoni (1978) describe the pollen of this species as "Tricolporate, psilate. Grain oblate-spheroidal, 47 x 39 um. Exine 2.5 um thick. Pore lalongate 13 x 2.5 um. Polar A 0.4, amb sub-angular", based on *Markgraf s.n.* from Mendoza. It is assumed that by "um" this author means "mu". Darlington & Wylie (1956), as well as Bolkhovskikh and his associates (1969), give the chromosome number as 20.

It should be noted that Troncoso limits the genus *Diostea* to *D. juncea*, the type species, regarding *D. cinerascens* and *D. scoparia* as belonging to the genus *Verbena*. In this connection Miers (1871) comments that "Schauer, in his Monograph of the family, places *D. juncea* in *Lippia* and *D. scoparia* in *Verbena*, stating erroneously that its fruit is a 4-coccous capsule".

Reiche (1910) says: "De *Lippia aphylla* (de la Campana de Quillota) existe solamente un fragmento. En la cordilleras de las provincias centrales, en el lado chileno i arjentina. Enero, Febrero." Walpes (1843) lists it from the Cordillera de S. Fernando, flowering there in March. Skottsberg (1916) encountered it on arid steppes, at 1300 m. altitude, at Arroyo Chacaihuerruca, Río Negro, in subandean Patagonia, giving its overall distribution as the Andes of middle Chile, Argentina, and northern Patagonia, citing *Skottsberg 911*.

Vernacular names reported for *D. scoparia* are "chavelillo del campo" and "escobilla del campo".

Troncoso (1974) cites *Werdermann 788* from Santiago, Chile, and *Ruiz Leal 1023* from Mendoza, Argentina, both deposited in the San Isidro herbarium.

It should be noted that Schauer's work, cited in the bibliography of this species, was published in 1847, not "1849" as is sometimes cited. Similarly, Hooker's work appeared in 1829, not "1830" as it is sometimes cited.

Material of *D. scoparia* has been misidentified and distributed in some herbaria as *D. juncea* (Gill. & Hook.) Miers, *Glandularia* sp., *Lippea juncea* Gay, *Lippia juncea* Gill. & Hook., *Neosparton aphyllum* (Gill. & Hook.) Kuntze, *Verbena aphylla* Gill. & Hook., and *V. ephedroides* Cham.

Additional citations: CHILE: Aconcagua: *Buchtien s.n.* [Juncal, Uspallata Pass, 2200 m., 2/2/1903] (Mu); *s.n.* [Juncal, 2300 m., II. 1903] (W--1177977); *Marticorena & Matthei 613* (Z); *Ricardi 2910* (Ac); *Simon 477* (Mi). Colchagua: *Ricardi 3177* (Ac). Coquimbo: *Worth & Morrison 16692* (Ba). Santiago: *Claude-Joseph 814* (W--1058772); *Marticorena & Matthei 595* (Ac); *Werdermann 488* (Mu). Valparaiso: *Eyerdam 10073* (W--2371847); *Hutchison 42* (Ca--143640, W--2321562). Province undetermined: *Dessauer s.n.* [Cerro de la Viscacha] (Mu); *Gillies s.n.* [Pantanillo & San Isidro, Nov. 13, 1825] (Bm), *s.n.* [unarranged coll.] (Bm). ARGENTINA: Catamarca: *Ellenberg 4638* (Ld), *4641a* (Ac); *Jörgensen 1403* (W--921938); *Venturi 6970* (W--1591511). Mendoza: *Cuezzo & Balegno 1900* (Au, Du--374452, Go), *1923* (Au, Du--374515, Go); *Lourteig 813* (N); *Negrete s.n.* (Mu); *Ruiz*

Leal 12741 (Tu--137896).

DIOSTEA SCOPARIA var. *PUBERULA* (Troncoso) Mold., Phytologia 19: 319. 1970.

Synonymy: *Verbena scoparia* var. *puberula* Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22: 109--110. 1963. *Diostea scoparia* var. *puberuca* Anon., Biol. Abstr. 51 (16): B.A.S.I.C. S.63, sphalm. 1970.

Bibliography: Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22: 109--110. 1963; Hansen, Excerpt. Bot. A.7: 139. 1964; Anon., Biol. Abstr. 51 (16): B.A.S.I.C. S.63. 1970; Mold., Biol. Abstr. 51: 9025. 1970.

According to Troncoso (1963) this variety "Differt a typo caulibus rhachidibus bracteis calyce subdense puberulis; bracteis maioribus, dimidium calycis aequantibus vel superantibus; corollarum tubo minus curvato, lobis parce maioribus". It is based on *Böcher, Hjerting, & Rahn 1143* from among dry rocks northwest of Cuesta de los Terneros, San Rafael, Mendoza, Argentina, at 1200 m. altitude, on October 30, 1962, where it, together with *Hyalis argentea*, dominated the vegetation.

DIOSTEA SCOPARIA VAR. *SUBULATA* Mold., Phytologia 44: 123. 1979.

Bibliography: Mold., Phytologia 44: 123. 1979.

This variety differs from the typical form of the species in having the calyx-teeth definitely and conspicuously long-subulate, often twisted together in age.

It is based on *Semper 631* from sand-dunes at Pampa de Tabolango, Las Heras, Mendoza, Argentina, at 2000 meters altitude, collected on April 19, 1945, and deposited in the Britton Herbarium at the New York Botanical Garden. The collector notes that the flowers, in April, were aromatic, the corollas pink.

It is of interest to note here that Acevedo de Vargas (1951), in describing the differences between what she calls *Diostea scirpea* Miers and *D. juncea* (Gill. & Hook.) Miers, maintains that *D. scirpea* also has subulate-toothed calyxes, but the calyx itself is "casi glabra" and the corolla yellow.

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ADDITIONAL NOTES ON THE GENUS *DIPYRENA*. I

Harold N. Moldenke

Information and specimens which have come to my attention since the publication of my original paper on this genus in 1961 are hereinafter summarized. Full explanation of the herbarium acronyms used in this and in all others of my long series of papers in the present journal since 1933 is given in my Fifth Summary of the *Verbenaceae*...etc. (1971), pages 795--801.

DIPYRENA Hook.

Additional synonymy: *Wilsonia* Gill. & Hook. in Hook., Bot. Misc. 1: 172, pl. 49. 1829 [not *Wilsonia* R. Br., 1810, nor Raf., 1814]. *Wilsonia* Hook. apud Spach, Hist. Nat. Vég. 9: 227. 1840. *Wilsonia* Hook. & Gill. apud Schau. in A. DC., Prodr. 11: 535, in syn. 1847. *Dipyrema* Bocq., Adansonia, ser. 1, 2: 155, sphalm. 1862.

Additional & emended bibliography: Meisn., Pl. Vasc. Gen. 1: 290 (1839) and 2: 199. 1840; Spach, Hist. Nat. Vég. 9: 227. 1840; D. Dietr., Syn. Pl. 3: 371. 1843; Walp., Nov. Act. Acad. Nat. Caes. Leopold.-Carol. Cur. 19, Suppl. 1: 379. 1843; Schnitzl., Iconogr. Fam. Nat. 2: 137 Verbenac. [3]. 1856; Buek, Gen. Spec. Syn. Candoll. 3: 144. 1858; Bocq., Adansonia, ser. 1, 2: 87 & 155 (1862) and 3: 180 & 212. 1863; Bocq., Rév. Verbenac. 87, 116, 155, 180, & 212, pl. 18. 1863; Miers, Trans. Linn. Soc. Lond. Bot. 27: 103. 1871; Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: [Sert. Sanjuan.] 66. 1881; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 777 (1893), imp. 1, 2: 628 (1894), and imp. 1, 2: 1231. 1895; Reiche & Phil., Fl. Chile 5: 303. 1910; M. Kunz, Anatom. Untersuch. Verb. 55--56. 1911; Nienburg, Justs Bot. Jahresber. 39 (2): 1051. 1916; Sanzin, Anal. Soc. Cient. Argent. 88: 96, 98, 99, 104--106, 133, & 134, fig. 9. 1919; Metcalfe & Chalk, Anat. Dicot. 1031--1033 & 1040. 1950; Angely, Cat. Estat. Gen. Bot. Fan. 17: 4. 1956; Muñoz Pizarro, Espec. Pl. Descr. Phil. 109 & 110. 1960; Mold., Biol. Abstr. 36: 2311. 1961; Hocking, Excerpt. Bot. A.4: 224. 1962; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 431. 1963; Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22: 105. 1963; Langman, Select. Guide Lit. Flow. Pl. Mex. 208 & 1010. 1964; F. A. Barkley, List Ord. Fam. Anthoph. 75 & 160. 1965; Mold., Phytologia 12: 6. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 368 & 1195. 1966; Mold., Résumé Suppl. 16: 30. 1968; Anon., Torr. Bot. Club Ind. Am. Bot. Lit. 3: 309. 1969; J. Hutchins., Evol. Phylog. Flow. Pl. 469 & 681. 1969; Rouleau, Guide Ind. Kew. 62 & 352. 1970; Mold., Fifth Summ. 1: 5, 195, 476, & 477 (1971) and 2: 613, 670, 735, 755, & 876. 1971; Whipple, Journ. Elisha Mitch. Sci. Soc. 88: [1]. 1972; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 376 & 1225. 1973; Troncoso, Darwiniana 18: 296, 301, 302, 364--366, & 409, fig. 21. 1974.

It should be noted here that the *Wilsonia* of Brown is a genus in the *Convolvulaceae*, while *Wilsonia* Raf. is probably a synonym of *Epacris* J. R. & G. Forst. in the *Epacridaceae*.

Bentham (1876) remarks concerning *Dipyrena*: "Bocquillon....hoc genus *Privae* adjunxit, habitu tamen longe recedit, facileque limitatur calyce brevi fructifero patente 5-fido nec accreto ore clauso foliis alternis aliisque notis. Species 2 Chilenses a Philippi.... descriptae, foliis oppositis drupa 2-pyrena pyrenis 1-locularibus, verisimiliter ad *Bailloniam (Diosteam*, Miers) referendae". Schauer (1847) says of *Dipyrena:* "A *Priva* vix distinctum". Gay (1849) comments that "Este jénero es muy afin del jénero *Priva* por sus frutos, pero se distingue fácilmente de el por su traza, la pequeñez de su cáliz, y sobre todo por sus tallos y ramos leñosos".

The Endlicher (1838) reference cited in the bibliography above is often mis-cited by the title-page date "1836-1856", but the page involved here was actually issued in 1838.

This is a monotypic genus, the type species being *Wilsonia glaberrima* Gill. & Hook. [=*Dipyrena glaberrima* (Gill. & Hook.) Hook.].

DIPYRENA GLABERRIMA (Gill. & Hook.) Hook.

Emended synonymy: *Dipyrena glaberrima* Hook. apud Walp., Nov. Act. Acad. Nat. Caes. Leopold.-Carol. Cur. 19, Suppl. 1: 379. 1843. *Wilsonia glaberrima* Hook. apud Walp., Nov. Act. Acad. Nat. Caes. Leopold.-Carol. Cur. 19, Suppl. 1: 379, in syn. 1843. *Dipyrena glaberrima* Hook. & Gill. apud Schau. in A. DC., Prodr. 11: 535. 1847. *Dipyrena glaberrima* Gill. & Hook. ex Mold., Résumé 278, in syn. 1959; Troncoso, Darwiniana 18: 366. 1974. *Dipyrena glaberrima* (Gill. & Hook.) Mold., Phytologia 26: 372, in syn. 1973.

Bibliography: see under the genus as a whole.

Emended illustrations: Sanzin, Anal. Soc. Cient. Argent. 88: 105, fig. 9. 1919; Troncoso, Darwiniana 18: [365], fig. 21. 1974.

Recent collectors describe this plant as a shrub, 1.2 m. tall, with fragrant flowers, and have encountered it at altitudes of 2000 to 2500 meters, flowering in April and December. The corollas are said to have been "cream"-color on *Semper 245 & 588*.

Gay (1849) says of this plant: "Se cria en las cordilleras centrales entre Santiago y Mendoza y á una altura de 5 a 6000 piés. Es muy parecida á una verbena y el cáliz ofrece la misma forma, rompiéndose en un lado á proporcion que el fruto se acerca de la madurez".

The Hooker (1829) reference in the bibliography of this species is sometimes erroneously cited as "1830".

Troncoso (1963) cites *Böcher, Hjerting, & Rahn 2114* and (1974) *Boelcke & al. 9967* from Mendoza, Argentina. Briquet (1894) lists it as only found in Mendoza. The "*Dipyrena (Wilsonia) glaberrima*" of Walpers (1843) is a misidentification of a specimen of *Junellia aspera* (Gill. & Hook.) Mold.

Material of *D. glaberrima* has also been misidentified and distributed in some herbaria as *Junellia asparagoides* (Gill. & Hook.) Mold.

Additional citations: ARGENTINA: Mendoza: *Cáceres & Paci 283* (Au--243309, Du--375259); *Cuezzo & Balegno 1943* (Ba); *Ruiz Leal 20695* (Tu--137881); *Semper 245* (W--2049689), *588* (N).

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ADDITIONAL NOTES ON THE GENUS *HIEROBOTANA*. IV

Harold N. Moldenke

Information from new literature and herbarium specimens received since the publication of my last previous notes on this genus in 1972 is hereinafter summarized. The herbarium acronyms employed in this and all others in my long series of papers in the present journal since 1929 are fully explained in my "Fifth Summary of the *Verbenaceae*....." etc. (1971), pages 2: 795--801.

HIEROBOTANA Briq.

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 873 (1821) and ed. 2, 2: 750. 1841; Schau., Linnaea 20: 477. 1847; Buek, Gen, Spec. Syn. Candoll. 3: 495. 1858; Barnhart, Bull. Torr. Bot. Club 29: 500. 1902; Macloskie in W. B. Scott, Rep. Princeton Univ. Exped. Patag. 8 (2): 682 & 686. 1905; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 598. 1927; Dalla Torre & Harms, Gen, Siphonog., imp. 2, 430. 1963; Rouleau, Guide Ind. Kew. 92 & 352. 1970; Mold., Fifth Summ. 1: 5, 6, 136, & 140 (1971) and 2: 527, 662, 674, 678, 752, & 880. 1971; Mold., Phytologia 24: 499 & 509. 1972; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 559. 1973; Anon., Biol. Abstr. 55 (9): B.A.S.I.C. S.115. 1973; Hocking, Excerpt. Bot. A.21: 115 & 116. 1973; Rogerson, Bull. Torr. Bot. Club 100: 192. 1973; Hocking, Excerpt. Bot. A.23: 292. 1974; Mold., Phytologia 28: 256 & 509. 1974; Soukup, Biota 11: 2, 11--12, & 21. 1976; Mold., Phytologia 36: 33 & 506 (1977) and 40: 414 & 508. 1978.

HIEROBOTANA INFLATA (H.B.K.) Briq.

Additional & emended synonymy: *Verbena inflata* Humb. & Bonpl. apud Steud., Nom. Bot. Phan., ed. 1, 873. 1821. *Verbena inflata* Kunth apud Spreng. in L., Syst. Veg., ed. 16, 2: 749. 1825.

Bibliography: see under the genus as a whole.

Recent collectors describe this plant as a small, low-growing, decumbent, spreading herb, with ascending branches, growing in clumps, and have found it growing in dry meadows, in dry or very dry ground, and in open areas with very dry volcanic-ash soil on the interandean highlands, at 2100--3185 m. altitude, flowering from March to July and in September, in fruit from April to June and in September. The corollas are said to have been "white" on *Asplund 17069* & *20464* and *Rimbach 176*, while on *Asplund 16145* it is said that the petals were "white, faintly flushed with violet along the margins" and on *Soejarto & Hernández 1339* the sepals were "green with dark-purple tinge, petals white". The latter collectors report the plant "common on roadsides".

Briquet (1894), Knuth (1927), Junell (1934), and Dalla Torre & Harms (1963) all assert that the genus occurs only in Colombia, but Macloskie (1905) reports it collected in wet ground by Hatcher at Río Santa Cruz in southern Patagonia on June 9, 1897, claiming to have verified this difficult-to-believe identification by comparison at the Gray Herbarium at Cambridge, Massachusetts. He gives the overall distribution of the genus as "Quito and southwards in the Andes. I know it only from Ecuador and Peru.

Junell (1934) claims a close affinity of *Hierobotana inflata* with *Verbena canadensis* (L.) Britton, but Briquet (1894) much more correctly compares it with "*V. canescens* Kunth" [and, less correctly, with "*V. pinnatifida* Schau."].

The only common or vernacular name recently reported for *H. inflata* is the widely applied "verbena". Material has been misidentified and distributed in some herbaria as *Verbena microphylla* H.B.K. and *Verbena* sp.

Additional citations: ECUADOR: Chimborazo: *Asplund 20464* (Ld, N); *Fagerlind & Wibom s.n.* [X.1952] (Ld); *Rimbach 176* (E--1030440);

Schimpff 746 (Mu). Cotopaxi: *Collector undetermined s.n.* [1838] (Mu), *s.n.* [1858] (Mu). Pichincha: *Asplund 16145* (Ld, N), *17069* (N, W--2652457); *Herb. Univ. Cent. Quito 2347* (Mu), *2348* (Mu), *2349* (Mu); *Humbles 6199* (Ac); *Jameson 228* (Pd). Tunguragua: *Soejarto & Hernández 1339* (Oa). PERU: Ica: *Ellenberg 4915* (Ld).

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ADDITIONAL NOTES ON THE GENUS *VITEX*. XI

Harold N. Moldenke

The considerable amount of information which has come to my attention from literature and from herbarium specimens since the publication of my last previous paper on this genus in 1968 is hereinafter summarized. Herbarium acronyms used herein, as also in my long series of paper in this journal since 1929, are fully explained in previous papers and in my "Fifth Summary of the *Verbenaceae*...." etc. (1971), volume 2, pages 795--801.

VITEX Tourn, ex L., Gen. Pl., ed. 1, 186. 1737; Sp. Pl., ed. 1, imp. 1, 2: 635. 1753; Gen. Pl., ed. 5, imp. 1, 285. 1754.

Additional & emended synonymy: *Allasia* Lour., Fl. Cochinch., ed. 1, 84. 1790. *Tripinna* Lour., Fl. Cochinch., ed. 1, 476. 1790. *Vitex* Willd. ex Moon, Cat. Indig. Exot. Pl. Ceyl. 1: 36. 1824. *Chrysomallum* Petit-Thou. ex Spach, Hist. Nat. Vég. Phan. 9: 226. 1840. *Nephrandra* Cothen ex Spach, Hist. Nat. Vég. Phan. 9: 226. 1840. *Walrothia* Hassk., Cat. Pl. Hort. Bot. Bogor. Cult. Alt. 134. 1844. *Ephialum* Soland. apud Wittst., Etymol.-bot. Handwörterb. 325. 1852. *Agnus castus* Carr., Rev. Hortic. 42: 415. 1871. *Stereosperma* Hook. f & Thoms. ex C. B. Clarke in Hook. f., Fl. Brit. India 4: 585 & 774, in syn. 1885. *Ephielis* Banks & Soland. apud Dalla Torre & Harms, Gen. Siphonog., imp. 1, 432. 1904. *Mailelou* Adans. apud Dalla Torre & Harms, Gen.Siphonog., imp. 1, 432. 1904. *Psilogyne* DC. apud Dalla Torre & Harms, Gen. Siphonog., imp. 1, 432. 1904. *Vitex* [Tourn. ex L.] L. apud Dalla Torre & Harms, Gen. Siphonog., imp. 1, 432. 1904. *Viter* Aubréville, Ann. Acad. Sci. Colon. 9: 237, sphalm. 1938. *Agnus castus* Tourn. ex Mold., Alph. List Inv. Names 4, in syn. 1940. *Pistaciovitex* L. apud Fedde & Schust., Justs Bot. Jahresber. 60 (2): 574, in syn. 1941. *Vitex* (Tourn.) L. ex Fournier, Quat. Fl. France 807. 1961 *Mithrudatea* Hort. ex Mold., Fifth Summ. 2: 572, in syn. 1971. *Crysomallum* [Thou.] apud López-Palacios, Fl. Venez. Verb. 648, in syn. 1977. *Nephandra* [Willd.] apud López-Palacios, Fl. Venez. Verb. 651, in syn. 1977. *Psilogine* [A. DC.] apud López-Palacios, Fl. Venez. Verb. 652, in syn. 1977. *Vetex* Kurup, Journ. Bomb. Nat. Hist. Soc. 75: 325, sphalm. 1978.

Additional & emended bibliography: Nicolaus, Antidot. Nicol. in Mesue, Canon. Univ. leaf 328 recto. 1510; Bartholom. Angl. [transl. Trevisa], Propriet. Rer. 1535; Dod., Pempt. 762. 1583; J. P. Camus, Achemin Dévot. 286. 1624;; J. P. Camus, Homél. Festiv. 201. 1625; Cast., Hort. Mess. 24. 1640; J. Schröder, Pharm. Med. 4: 10. 1649; W. Coles, Adam Eden. 1657; Lonic., Kreuterb., imp. 1, 77. 1679; Culpepper, Eng. Physit. Enlarg. 1681; Rheede, Hort. Malab. 2: pl. 10 & 11, 1685; Breyn., Prod. Fasc. Rar. Pl., ed. 1, 2: 105--106. 1688; Rivin., Introd. Gen. Rem Herb. Ord. Pl. Irreg. Monop. [26]. 1690; Cup., Hort. Cath. 4. 1696; Cup., Hort. Cath. Suppl. Alt. 6. 1697; P. Hermann, Mus. Zeyl., ed. 2, 47. 1726; L., Syst. Nat., ed. 1, [7]. 1735; J. Burm., Thes. Zeyl. 229, [238], [248], & [250], pl. 109. 1737; L., Crit. Bot. 55, 111, & [306]. 1737; L., Gen. Pl., ed. 1, 186 & [402]. 1737; L., Meth. Sex. Gen. Pl. 55, 111, & [304]. 1737; Breyn., Prod. Fasc. Rar. Pl., ed. 2, 2: 105--106. 1739; L., Gen. Pl., ed. 2, 304 & [549] (1742) and ed. 3 ["2"], 233 & [433]. 1743; Blackwell, Cur. Herb. 1: pl. 139. 1751; L., Gen. Pl., ed. 4, 233 & [464]. 1752; L., Sp. Pl., ed. 1, imp. 1, 2: 632 & 638. 1753; L., Gen. Pl., ed. 5, imp. 1, 140, 285, [520], & [521]. 1754; L. in Stickm., Herb. Amb. 15. 1754; Sloane, Civil Nat. Hist. Jamaic., ed. 1, 267. 1755; L., Amoen. Acad. 4: 126. 1759; L., Syst. Nat., ed. 10 [Stockh.], 2: 1122. 1759; Adans., Fam. Pl. 2: 12, 200, & 573. 1763; L., Gen. Pl., ed. 6, 326 & [603]. 1764; Hasselq., Voy. Trav. Levant 280 & 282. 1766; N. L. Burm. [Burm. f.], Fl. Ind. 137 & 138, pl. 43 [fig. 2 sup.]. 1768; J. Burm., Fl. Malab. 3 & 4. 1769; Scop., Ann. Hist. Nat. 4: 72. 1770; [Retz.], Nom. Bot. 155--156 & [296]. 1772; Ginanni, Isor. Civ. Nat. Pinet. Ravenn. 251. 1774; Planer, Gatt. Pfl. 2: 577 & 1075. 1775; Plenck., Icon. Pl. Med. 6: 13, pl. 510. 1778; Reichard in L., Gen. Pl., ed. 8, 327--328. 1778; All., Fl. Ped. 1: 124. 1783; Gaertn., Fruct. 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[to be continued]

MISCELLANEOUS NEW SPECIES IN THE PLEUROTHALLIDINAE (ORCHIDACEAE)

*Carlyle A. Luer**

Dracula leonum Luer, sp. nov.

Inter species generis *Draculae* Luer sepalis albis in cupulam connatis intus breviter pubescentibus purpureo punctatis et labello albo bruneolo-suffuso cum epichilio ovato rotundato concavo trilamellato margine multidenticulato distinguitur.

Plant medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems narrow, channeled, unifoliate, 2.5 cm long or longer, enclosed by 2 loose, tubular sheaths. Leaf erect, thinly coriaceous, narrowly obovate-linear, 13 cm long, 1.5 cm wide (in an undersized specimen), the apex acute, tridenticulate, carinate dorsally along the midrib, gradually narrowed below to a conduplicate base. Inflorescence a congested, successively few-flowered raceme borne by a more or less horizontal, slender, sparsely bracted peduncle ca. 10 cm long from the base of a secondary stem; floral bract and pedicel each ca. 1 cm long, green; ovary 6 mm long, green, lightly verrucose; sepals glabrous and dull white externally with a few dull purple dots, white within with short white hairs tipped with purple and with numerous evenly spaced purple dots somewhat larger toward the bases, the dorsal sepal rhombic, 13 mm long, 13 mm wide, connate to the lateral sepals for 7 mm to form a broad, sepaline cup, the free portion broadly triangular, the obtuse apex contracted into a slender tail 28 mm long, purple externally, yellowish white anteriorly, the lateral sepals connate 13 mm into a broad, rectangular synsepal 14 mm long, 21 mm wide spread out, the obtuse apices contracted into tails similar to that of the dorsal sepal; petals ivory marked with brownish purple, spatulate, 3 mm long, 1.75 mm wide, the apex rounded, bivalvate, the inner lamina irregular, apiculate, papillose between the laminae, the base contracted, channeled, unguiculate; lip white suffused with light brown, obovate, 7.5 mm long, 4 mm wide, the hypochile 3.5 mm long, 2.5 mm wide, with subacute, erect, marginal angles, cleft centrally, the concave base hinged to the column-foot, the epichile ovate, 4 mm long, 4 mm wide, the apex rounded, concave with erect, denticulate margins, trilamellate within; column stout, yellowish white, 3.5 mm long, with a thick foot equally long.

Etymology: Named in honor of Mr. and Mrs. Chesley Lyon of Knoxville, Tenn., who submitted the plant to the Orchid Identification Center of the American Orchid Society at the Marie Selby Botanical Gardens, Sarasota, Florida for identification.

Type: *PERU*: without locality or collector, purchased from an importing company, cultivated by Mr. & Mrs. C. Lyon 51, OIC-3040, flowered in cult. 27 June 1979, *C. Luer 4070* (Holotype: SEL).

Distribution: Peru.

Dracula leonum, the second species of *Dracula* to be discovered from Peru, is very similar to several others of the smaller-flowered species of the

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genus, e.g. *D. fuliginosa* (Luer) Luer. Instead of forming a flat flower, the sepals are connate to produce a white cup, shortly pubescent within with multiple purple dots. The concave epichile of the lip contains three well-developed lamellae and the margins are conspicuously denticulate.

Dracula rezekiana Luer & Hawley, sp. nov.

Inter species generis *Draculae* Luer species haec floribus parvis, cupula sepalorum alba caudis brevibus rubris, labello obovato niveo epichilio obtuso lato non-limitato venis paucis percursato et hypochilio profunde et late fisso distinguitur.

Plant small to medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems channeled, unifoliate, 2-3 cm long, enclosed by 2-3 loose, tubular sheaths. Leaf erect, thinly coriaceous, narrowly elliptical, subpetiolate, 7-14 cm long, 1.8-2.7 cm wide, the apex acute, tridenticulate, sharply carinate dorsally, gradually narrowed below into the conduplicate base. Inflorescence a successively few-flowered raceme borne by a more or less horizontal peduncle to 13 cm in length, sparsely bracted, from a node low on the secondary stem; floral bract tubular, 5 mm long; pedicel 10 mm long; ovary 5 mm long, verrucose, purple; sepals white, glabrous externally, densely pubescent within with a few red-purple dots toward the bases, the dorsal sepal rhombic, 11 mm long, 15 mm wide, connate to the synsepal for 8 mm to form a cup, the free portion broadly triangular, the obtuse apex produced into an erect, red tail 27 mm long, the lateral sepals connate 11 mm to form a rectangular synsepal 12 mm long, 22 mm wide spread out, shallowly concave below the lip, the apices subacute, contracted into red tails 25 mm long; petals thick, ivory marked with brown, oblong-spatulate, 3.5 mm long, 2 mm wide, bivalvate at the apex, the inner lamina acute, the outer rounded, papillose between; lip white, obovate, 5.5 mm long, 3.5 mm wide, the hypochile without demarcation, ca. 2.5 mm long and broad, the basal margins erect, subacutely rounded, broadly and deeply cleft centrally between thick lamellae, the base concave, hinged to the column-foot, the epichile obtuse, ca. 3 mm long, 3.5 mm wide, shallowly concave, coursed by elevated branching veins on either side of the central carina; column greenish white, stout, semiterete, 3.5 mm long, with a thick foot.

Etymology: Dedicated to Sra. Maria Friedrich de Rezek of Quito, Ecuador, for many years an ardent enthusiast of the local flora.

Type: *ECUADOR*: without locality, purchased in 1975 from J. Brenner in Puyo by R. Hawley and R. Levi, cultivated in Mill Valley, California, flowered in cult. 30 July 1979, *C. Luer 4080* (Holotype: SEL).

Distribution: Ecuador.

I first saw this species in flower in cultivation by Joe Brenner in Puyo in 1975, but the flower was already past and it looked like *D. velutina* (Rchb. f.) Luer. Finally, re-examination of a fresh flower reveals that *D. rezekiana* may be distinguished by the white sepaline cup, densely pubescent within, with short red tails. The white lip is obovate with a broad, obtuse, shallowly concave epichile narrowed gradually without demarcation into the deeply and broadly cleft hypochile.

Masdevallia invenusta Luer, sp. nov.

Species haec *M. delphinae* Luer affinis sed sepalis intus glabris caudis purpureis crassioribus, petalis unidentatis et lobo antico labelli minore integro notabilis.

Plant small, epiphytic, caespitose, the rhizomes ascending; roots slender, flexuous. Secondary stems abbreviated, unifoliate, 1.5-2.5 cm long, enclosed by 1-2 close, thin, tubular sheaths. Leaf erect to suberect, coriaceous, narrowly obovate, 5-8 cm long, 11-14 mm wide, the subacute apex tridenticulate, gradually narrowed below into a slender, sulcate petiole 2-3 cm long. Inflorescence an erect, loose, 3- to 4-flowered raceme borne by a slender peduncle 18-23 cm long including the rachis, with a bract on the lower third, from a node low on the secondary stem; floral bract 4 mm long; pedicel purple, 4-5 mm long; ovary with purple dots, 1 mm long; sepals glabrous, light dull red-purple speckled with dark red-purple, the dorsal sepal oblong, concave, 8.5 mm long, 4 mm wide spread out, connate to the lateral sepals for 5 mm to form a slightly curved sepaline tube, the lateral sepals connate for 3.5 mm above the gibbous base into an oblong, bifid lamina 8.5 mm long, 4 mm wide, the free portions of all 3 sepals produced into thick, red-purple, obtuse apices 2.5 mm long, 1.5 mm thick; petals translucent white, oblong, 2.5 mm long, 0.6 mm wide, the apex shortly acuminate, acute, with a low carina along the lower margin; lip red-purple, oblong, 3-lobed, 3.5 mm long, 1.5 mm wide, arcuate, the anterior lobe rounded, entire, the lateral lobes above the middle, suberect, rounded, the base retuse, hinged to the column-foot; column red, semiterete, 3 mm long, the foot 2 mm long with a minute extension.

ETYMOLOGY: From the Latin *invenustus*, "not pretty," in allusion to the drab, little flowers.

TYPE: *ECUADOR*: without locality, collected by B. Malo, cultivated by M. & O. Robledo at La Ceja, Colombia, flowered in cult. 12 Oct. 1977 *C. Luer 1998* (HOLOTYPE: SEL; ISOTYPE : JAUM).

DISTRIBUTION: Ecuador.

This little species is related to *M. delphina*, but differs in the glabrous sepaline tube with short, thick, dark purple "tails." The petals are acute, and the small anterior lobe of the lip is entire.

Masdevallia mezae Luer, sp. nov.

Planta mediocris caespitosa, caulibus secundariis abbreviatis canaliculatis, foliis erectis longis carnosis coriaceis anguste obovatis, pedunculo triquetro folio breviore, racemo paucifloro congesto bracteis imbricatis, sepalis albo-virescentibus intus minute verrucosis sepalis lateralibus rubro-punctatis in tubum brevem connatis, caudis sepalorum gracilibus divergentibus, petalis oblongis callo longitudinali, labello rubro-punctato ligulato ad medium bicarinato apice rotundato callo humili centrali.

Plant medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems erect, stout, channeled, unifoliate, 3-6.5 cm long, enclosed below by 2 loose, tubular sheaths. Leaf erect, fleshy-coriaceous, narrowly obovate, 9-20 cm long, 1.5-2.5 cm wide, the apex subacute to obtuse, tridenticulate, gradually narrowed below into the sulcate petiole. Inflorescence a congested, untidy raceme of 3-6 flowers, 2-3 produced simultaneously, at the apex of the erect, triquetrous peduncle 13-18 cm long, with a basal sheath, from a node low on the secondary stem; floral bracts brown, ribbed, imbricating, 1-2 cm long; pedicel 1.5-2.5 cm long; ovary green, 4 mm long; dorsal sepal pale green, obovate, 8 mm long, 5 mm wide, connate to the lateral sepals for 5 mm to form a short, cylindrical tube, the free portion triangular, minutely verrucose within, the apex acuminate into a slender, suberect, orange tail ca. 3.5 cm long; lateral sepals pale green, minutely verrucose with transverse red dashes within, oblong, each 12 mm long, 5-6 mm wide, connate for 6 mm, the apices acuminate into diverging tails similar to that of the dorsal sepal; petals white, oblong, 5.5 mm long, 1.5 mm wide, the subacute apex minutely irregular, slightly dilated above the base, with a thick, low, rounded callus above the base on the labellar half and extending toward the apex as a smooth, longitudinal thickening; lip yellowish with purple dots, oblong-ligulate, 6 mm long, 1.5-2 mm wide, the apex rounded, minutely irregular, with a low, rounded callus in the center, with a pair of low, oblique marginal carinae near the middle, the base truncate, hinged beneath; column yellow-white suffused with rose, semiterete, 5 mm long, the foot 2.5 mm long with a short extension.

Etymology: Named in honor of Sr. Jorge B. Meza y Torres of Lima, Peru, who discovered this species.

Type: *PERU*: Amazonas: epiphytic between Chachapoyas and Pomacochas, alt. 2000 m, Nov. 1974, J. Meza s.n., cultivated by J & L Orchids, Easton, Ct., flowered in cult. 8 Nov. 1977, *C. Luer 2126* (Holotype: SEL).

Distribution: Peru.

This species is similar to *M. cinnamomea* Rchb. f., but *M. mezae* may be identified by the larger leaves that stand higher than the triquetrous peduncle. Instead of cinnamon-colored, the flowers are pale green with orange tails, and the apex of the lip is rounded with a low, central callus.

Masdevallia picea Luer, sp. nov.

Species haec *M. angulatae* Rchb. f. persimilis sed flore atropurpureo guttato caudis sepalorum fere piceis, petalis apicibus rotundatis et basi labelli sine lacunis differt.

Plant robust, medium-sized to large, epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, channeled, 4-8.5 cm long, unifoliate, enclosed by 3 large, loose, tubular sheaths. Leaf erect, thickly coriaceous, narrowly elliptical, subpetiolate, 10-18 cm long, 1.5-2.5 cm wide, the obtuse to rounded apex tridenticulate, gradually narrowed toward the base into an indistinct, short, channeled petiole. Inflorescence a large, fleshy, foul-smelling, solitary flower borne by a stout, suberect, purple-dotted peduncle 1.5-3 cm long, from a node low on the secondary stem; floral bract 1-2 cm long, flecked with purple; pedicel stout, 2.5-3 cm long, flecked with purple; ovary green, 5-8 mm long; sepals thick, fleshy, rigid, green toward the bases, becoming increasingly spotted with dark purple that coalesces toward the purple-black apices and tails, shining and glabrous externally, verrucose within, connate about 15 mm into a thick, sepaline tube with a broad, rounded mentum below, the dorsal sepal obovate, 26 mm long, 16 mm wide, the free portion triangular, the subacute apex contracted into an erect to recurving tail 25-28 mm long, the lateral sepals obliquely obovate, similar to the dorsal sepal including the reflexed tails, connate to above the middle; petals ivory, lightly marked with red-purple, oblong, 12 mm long, 5 mm wide, rounded at the apex, thickened to either side of the sulcate center above the middle, the lower half greater than the upper half; lip white, marked with red-purple, cartilaginous, oblong-ligulate, 15 mm long, 7 mm wide, papillose at the rounded apex, the disc with a pair of low, parallel calli above the middle, the base subcordate, hinged to the column-foot; column greenish white, stout, 10 mm long with a foot 8 mm long terminated by an incurved extension.

ETYMOLOGY: From the Latin *piceus*, "pitch-black," alluding to the purple-black color of the apices of the sepals and their tails.

TYPE: *PERU.* without locality, exported by R. Stumpfle of Lima, Peru, cultivated at La Ceja, Colombia by M. & O. Robledo, flowered in cult. 29 Sept. 1977, *C. Luer 1865* (HOLOTYPE: SEL; ISOTYPE: JAUM); cultivated by Black River Orchids, Mich., flowered in cult. 8 Nov. 1977, *C. Luer 2124* (SEL).

DISTRIBUTION: Peru.

This large, foul-smelling, black-flowered species is very similar to the Ecuadorian *M. angulata* Rchb. f., but the apices of the petals of the Peruvian *M. picea* are rounded and the lip lacks the well-formed "nectiferous" concavities at the base.

Masdevallia scabrilinguis Luer, sp. nov.

A *Masdevallia attenuata* Rchb. f. floribus nimoribus glabris et labello verrucoso differt.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems abbreviated, unifoliate, 1-1.5 cm long, enclosed by 2 close, thin, ribbed, tubular sheaths. Leaf erect to suberect, coraiceous, narrowly obovate, 6-10 cm long, 9-12 mm wide, the apex subacute, tridenticulate, gradually narrowed below into an ill-defined, sulcate petiole between 0.5-1.5 cm long. Inflorescence a solitary, small flower borne by an erect to suberect, slender, terete peduncle 4-8 cm long, with a bract on the lower portion, from a node low on the secondary stem; floral bract tubular, 5 mm long; pedicel 9 mm long; ovary 4 mm long, smooth, green; sepals white, glabrous (microscopically cellular-glandular within), the dorsal sepal obovate-oblong, 19-21 mm long, 4 mm wide, connate to the lateral sepals for 6 mm to form a cylindrical tube, the free portion triangular, acuminate into a suberect, slender, yellow tail 9-11 mm long, the lateral sepals obovate-oblong, 18 mm long, 4 mm wide, connate 6 mm into a bifid lamina, the free portions ovate, the apices contracted into tails 8-9 mm long, similar to that of the dorsal sepal; petals white, oblong, 5 mm long, 2 mm wide, green at the subacute apex, slightly thickened along the labellar margin, ending in an obtuse angle above the base; lip yellow-white, oblong-ligulate, 5 mm long, 2.1 mm wide, the disc with a pair of verrucose, converging calli above the middle, broadly sulcate centrally, the apical half markedly verrucose including the rounded, yellow apex; column greenish white, semiterete, 4 mm long, the short foot 1 mm long with a minute extension.

Etymology: From the Latin *scaber*, "rough," and *-linguis*, "-tongued," referring to the verrucose lip.

Type: *PANAMA*: Chiriqui: Cerro Gordo, collected by R. L. Dressler s.n., 1977, cultivated at SEL, greenhouse acc. no. 77-1707, flowered in cult. 6 March 1978, *C. Luer 2788* (Holotype: SEL).

Distribution: Western Panama.

The small species is similar to *M. attenuata*, but differs in the smaller flowers glabrous within, and a lip markedly verrucose above the middle.

Masdevallia utriculata Luer, sp. nov.

Planta parva caespitosa, caulibus secundariis abbreviatis, foliis anguste oblongis breviter petiolatis, pedunculo tereti brevi, flore successivo carnoso luteo intus rubro verrucoso, sepalis in tubum cylindricum connatis, cauda sepali dorsalis erecta clavata compressa, sepalis lateralibus late expansis ecaudatis, petalis oblongis bicarinatis, labello oblongo apice rotundato subverrucoso basi bi-utriculato, disco supra medium cum carinis humilibus semicircularibus.

Plant small, epiphytic, caespitose; roots coarse, flexuous. Secondary stems terete, unifoliate, ca. 1 cm long, enclosed by 2 tubular sheaths. Leaf erect, coriaceous, narrowly oblong-obovate, shortly petiolate, 6-8.5 cm long including the 1-1.5 cm long petiole, 1.2-1.5 cm wide, the apex subacute, tridenticulate, cuneate below into the petiole. Inflorescence a contracted, few-flowered raceme of successive, rigidly fleshy flowers borne by a stout, suberect to horizontal, terete peduncle 1.5-2 cm long, with a bract near the base, from a node low on the secondary stem; floral bract 4 mm long, pedicel 7 mm long; ovary subverrucose, 3-4 mm long; dorsal sepal yellow, rectangular, 8 mm long, 4.5 mm wide, connate to the lateral sepals for 5 mm to form a cylindrical tube, the free portion broadly triangular, the obtuse apex produced into an erect, recurved, clavate, laterally compressed tail ca. 11 mm long; lateral sepals pale yellow, studded with multiple, red excrescences within, connate 15 mm into an ovate, coarsely verrucose, expanded, bifid lamina above the cylindrical basal portion with a broadly rounded mentum at the base, the apices, triangular, acute, free for 5-6 mm, the total length 20 mm, the width 15 mm spread out; petals oblong, 5.5 mm long, 2 mm wide, the apex broad, bifid, with a longitudinal carina along both margins, the upper overhanging at the apex; lip yellow, intensely marked with red-purple, oblong-obovate, 6.5 mm long, 2-3 mm wide, the apex rounded, subverrucose, the base bilobed, each lobe deeply saccate, the disc with a pair of low, semicircular folds above the middle; column semiterete, 5 mm long, the foot equally long with an incurved extension.

Etymology: From the Latin *utriculatus*, "with small bladders," (*uter, utris*, "bag, or bladder"), referring to the configuration of the base of the lip.

Type: *PANAMA*: Chiriqui: epiphytic in cloud forest on Cerro Pate Macho, alt. ca. 2200 m, 27 Feb. 1979, *R. L. Dressler & J. Kuhn s.n.* (Holotype: SEL). Illustration *C. Luer 4073.*

Distribution: Western Panama.

Only a few plants of this species were discovered by Dr.Robert L. Dressler on a recent field trip with Janet Kuhn. The fleshy flower is borne from a short, horizontal peduncle. From the cylindrical sepaline tube, the red-verrucose lateral sepals expand broadly and end in a bifid, tailless lamina. The erect tail of the dorsal sepal is clavate. The lip is remarkable in the deeply saccate development of the pair of "nectaries" at the base.

Pleurothallis masdevalliopsis Luer, sp. nov.

Herba parva dense caespitosa, caulibus secundariis abbreviatis, foliis carnosis linearibus semiteretibus, flore grandi albovirescenti solitario, pedunculo brevi, ovario multicristato, sepalo dorsali libro ovato caudato, sepalis lateralibus anguste ovatis caudatis, petalis membranaceis orbicularibus, labello obovato trilobato, lobo antico suborbiculari deflexo verrucoso lacerato, lobis lateralibus parvis erectis, disco bicalloso, basi concavo pedem columnae elongatum continenti.

Plant small, epiphytic, caespitose; roots fine, flexuous. Secondary stems terete, abbreviated, 5-10 mm long, unifoliate, concealed by 2-3 basal, tubular sheaths. Leaf suberect, thickly coriaceous, semiterete, linear to very narrowly obovate, 3-5 cm long, 4-5 mm wide, the apex obtuse, tridenticulate, gradually cuneate at the base. Inflorescence a proportionately large, greenish white, solitary flower borne by a suberect, slender peduncle 15-20 mm long, from a node on the secondary stem; floral bract thin, 5 mm long; pedicel 18-20 mm long; ovary 4 mm long with 12 irregular, undulating crests; dorsal sepal ovate, concave, the apex acuminate into a slender, erect tail, 35 mm long including the tail, 8 mm wide, connate basally to the lateral sepals for 1 mm; lateral sepals connate 4 mm, narrowly ovate, the apices attenuated into slender tails, 38 mm long, 8 mm wide together; petals translucent yellowish white, membranous, suborbicular, 6.5 mm long, 5 mm wide; lip yellow-green, white toward the base, obovate, 5 mm long, 2.75 mm wide, 3-lobed, the anterior lobe deflexed, suborbicular, verrucose, minutely lacerate, the lateral lobes below the middle, small, erect, obtuse, the disc with a pair of flat calli below the middle, cleft between, the base concave, attached to the under surface of the column-foot; column white, stout, 1.5 mm long, with a pair of narrow wings, the foot incurved, narrow, elongated, 2 mm long.

ETYMOLOGY: Named for the resemblance of the species to the genus *Masdevallia*.

TYPE:*ECUADOR*: LOJA : epiphytic in cloud forest in the Cordillera de Sabanilla, alt. ca. 2500 m, B. Malo, s.n., cultivated near Cuenca, flowered in cult. 12 Feb. 1979, *C. Luer 3965* (HOLOTYPE. SEL).

DISTRIBUTION : Southern Ecuador.

This species appears deceptively similar to a species of *Masdevallia* Ruiz & Pav., and it was believed to belong to that genus until the flowers were closely examined. The sepals of the solitary, large, greenish white flowers are long-candate, but the membranous petals are round without any callus or other thickening. The base of the lip is concave to accomodate the slender, incurved prolongation of the column-foot.

Pleurothallis stonei Luer, sp. nov.

Species haec *P. lappiformis* Heller & L. O. Wms. affinis sed sepalo dorsali libro elliptico, petalis claviformibus rugosis, lobis lateralibus labelli anguste uncinatis et lobo antico rugoso notabilis.

Plant medium in size, epiphytic, shortly repent, the rhizome stout, 1-3 cm long between secondary stems, sheathed at short internodes, rooting at the nodes; secondary stems stout, erect, terete, 3-9 cm long, unifoliate, enclosed by 3-4 large, loose, tubular, imbricating sheaths, soon fragmented. Leaf erect, thickly coriaceous, elliptical, 7-15 cm long, 3-4 cm wide, the acute apex tridenticulate, the base cuneate, conduplicate. Inflorescence a solitary flower produced from a lower node of the secondary stem or from the axil with the rhizome; peduncle ca. 1 cm long, with 2 ribbed sheaths; floral bract ca. 1 cm long, ribbed; pedicel 8-9 mm long, pubescent; ovary 3-4 mm long, densely villous; sepals fleshy, dark red-purple, covered externally by thick, white hairs from wart-like bases, covered by tall, lamellate tubercles within, the dorsal sepal elliptical, 20 mm long, 8 mm wide, the subacute apex free, the lateral sepals connate into a concave, obtuse synsepal, 22 mm long, 12 mm wide unspread; petals purple, oblong, clavellate, 11 mm long, 4 mm wide, the rounded apical portion transversely rugose; lip red-purple, fleshy, oblong, 9 mm long, 4.5 mm wide, the rounded apex rugose, with forwardly projecting, narrowly uncinate, marginal lobes below the middle, the truncate base broadly and inflexibly attached to the column-foot, the disc with a smooth, transverse callus just above the base and a parallel pair of high, smooth, rounded calli near the middle; column dark red, terete, 6 mm long, with a thick foot 3 mm long.

ETYMOLOGY: Named in honor of Richard L. Stone of Los Altos Hills, California, who discovered this species.

TYPE: *COSTA RICA*: SAN JOSE: epiphytic in cloud forest southeast of San Jose, cultivated in California, flowered in cult. 3 March 1978, submitted to the OIC, no. 2022, *C. Luer 2781* (HOLOTYPE: SEL).

DISTRIBUTION: Costa Rica.

This rare species is closely allied to *Pleurothallis lappiformis* from which it is indistinguishable vegetatively. Single, dark-red, densely pubescent flowers are borne by short peduncles from the rhizome or low on the secondary stem. The flowers of *P. stonei* may be distinguishable by the broader dorsal sepal the apex of which is free from the synsepal, the clavellate, rugose petals, and the narrowly uncinate lateral lobes of the lip.

BOOK REVIEWS

Alma L. Moldenke

"LICHEN ECOLOGY" edited by Mark R. D. Seaward, x & 550 pp., 24 b/w fig., 58 tab., 13 maps & 21 photo. Academic Press Ltd., New York, San Francisco & London NW1 7DX. 1977. £23.00 or $44.90.

"This [outstanding] book essays a compilation of current knowledge on lichens in relation to the physical and biological components of their environment......[sensibly] without undue encroachment on material in recently published books and major papers, which this volume is designed [very effectively] to complement". There are papers by 14 authors mostly from the British Commonwealth on such topics as lichens of arctic and antarctic cold deserts and of hot arid and semi-arid lands and of the boreal coniferous zone, lichens and their invertebrate and vertebrate associations and of man-made substrates such as ubiquitous discarded plastic, lichen colonization, growth, succession and competition, lichen conservation and phytosociological communities in the British Isles in carefully developed form, and lichen taxonomy and environmental modification. The last paper is by the only American author, William A. Weber, who emphasizes that many of the divergent kinds of lichens lately receiving separate taxonomic identification are demonstrating only non-transmissible environmental modifications. "Must the lichenologist regard all morphological manifestations of lichen variability as worthy of formal taxonomic rank, or maybe attribute some of this variability to environmental modification? I believe that he can and must, even if some of his interpretations later prove false. In some genera, such as *Aspilicia, Staurothele, Verrucaria* and *Acarospora*, the pyramid of names based on what I interpret as environmental modifications has become so massive that it becomes difficult to apply species concepts".

One appendix provides a selected glossary and the other "A Bibliographic Guide to the Lichen Floras of the World"arranged by geographic areas and world monographs. Further valuable sources of information include journals, exsiccatae and herbaria, and the warning quote that "Lists of records that cannot be verified are mere waste paper".

"ECOLOGICAL DIVERSITY" by E. C. Pielou, viii & 164 pp., 21 b/w fig. & 12 tab. A Wiley Interscience Publication of John Wiley & Sons, London, Toronto, & New York, N. Y. 10016. 1975. $16.75.

In the introduction the author, who is highly competent as both a mathematical ecologist and as a field biologist, makes this important statement: "no amount of mathematical or statistical expertise is any use if it is misapplied, and only an ecologist with considerable field experience can recognize good questions and good answers". Scientists and advanced students have been giving increased attention to the nature and problems of ecological diversity. This fine book succinctly considers indices of diversity and evenness, species abundance distributions and testing hypotheses about them, and spatial pattern, environmental gradients and local as well as global determinants of diversity. "Diversity waxes and wanes at different levels -- different levels in the hierarchy of spatial areas, different levels in the hierarchy of time periods, and different levels in the taxonomic hierarchy".

"VIROIDS AND VIROID DISEASES" by T. O. Diener, xvi & 252 pp., 35 b/w photo, 45 fig. & 30 tab. A Wiley Interscience Publication of John Wiley & Sons, Toronto, Chichester, Brisbane, & New York, N. Y. 10016. 1979. $19.95.

This book is a first in this field, although scientific papers have already been presented with the first from the author's lab in the U.S.D.A. Plant Virology Laboratory in Beltsville, Maryland. "Viroids are the smallest known agents of infectious disease", pathogenic in some cultivated plants, as in potato spindle tuber disease, not yet found in animal tissue, of low molecular weight, single-stranded RNA that does not transfer messages, that may produce disease symptoms by interference with gene regulation in the infected host cells, probably not derived from degenerative or primitive viruses but more likely from normal cellular RNAs, associated with diseases of recent origin and protracted incubation and associated with man and his agricultural activities. This is a carefully prepared first survey done in interesting and effective style.

"ATLAS OF UNITED STATES TREES - Volume 2 - Alaska Trees and Common Shrubs" by Leslie A. Viereck & Elbert L. Little, Jr., iv & 105 pp., 28 general & 82 distribution map plates. United States Department of Agriculture Miscellaneous Publication No. 1293, Forest Service, U. S. Government Printing Office, Washington, D. C. 20402. 1975. $3.10 paperbound.

These well detailed, large page maps indicate the native distribution of 32 trees, or 6 smaller shrubs and of 44 more common, larger and economically important shrubs. These "species maps summarize distribution both by dots and by lines and indicate the reliability of the limits drawn, also gaps in the record and where more information is needed.....Localities of trees and shrubs planted for forestry, shade, or other uses and of escapes from cultivation purposely have been omitted". The brief text translates the maps into place names. The general maps contain "significant environmental factors related to plant distribution and forestry, especially in land-use planning". They include national forests and parks and wildlife refuges, topography, physiography, geology, glaciation, permafrost, climate, hydrology, precipitation, fire seasons, plant hardiness, vegetation, and forests. This information will be of considerable value to botanists, foresters and other scientists.

Let us also hope that this and other valuable scientific information is used to direct the future "development" of this great state, rather than in political "trade offs".

"ATLAS OF UNITED STATES TREES - Volume 3 - Minor Western Hardwoods" by Elbert L. Little, Jr., vi & 230 pp., 4 general & 210 distribution map plates. United States Department of Agriculture Miscellaneous Publication No. 1314 Forest Service. U. S. Government Printing Office, Washington, D. C. 20402. 1976. $9.10.

Added to Volume I on "Conifers and Important Hardwoods" this Volume III completes the maps of the tree species native within the 11 far western contiguous states, making a combined total of ca. 312 natives for the area. The included large perennial monocots, *Yucca, Nolina, Washingtonia* and *Sabal*, are "woody" in appearance only, of course. For native woody plants that range beyond this area their distribution is marked in in color on two facing maps -- one of these states and one of this continent. Among the 25 species with limited local distribution are 9 on the endangered list and 5 on the threatened list. This is of very great value for content and use to many kinds of botanists, foresters, land management officials, etc. and is a great bargain as to price.

"TREES AND SHRUBS OF THE UNITED STATES -- A Bibliography for Identification" by Elbert L. Little, Jr. & Barbara H. Honkala, ii & 56 pp. United States Department of Agriculture Miscellaneous Publication No. 1336 Forest Service. U. S. Government Printing Office, Washington, D. C. 20402. 1976. $1.00 paperbound.

This is a handy publication that can direct readers to aid in identifying wild and cultivated trees, shrubs and woody vines through bibliographies, check lists, atlases, systematic works, works on cultivated woody plants, regional, continental, and for our 50 individual states works from simple to detailed. Special lists with cross references give works on identification in winter, of seeds and seedlings and in our national parks.

"FLORA OF BUCK ISLAND REEF NATIONAL MONUMENT (U. S. Virgin Islands) by Roy O. Woodbury & Elbert L. Little, Jr. U. S. Forest Service Research Paper ITF-19, 27 pp., 5 b/w photo & 1 map. Institute of Tropical Forestry, Rio Piedras, Puerto Rico. 1976. Paperbound.

Introductory comment relates, among other things, that this island is a mile long and a half mile wide, volcanic in origin and surrounded by coral reefs, has no fresh water supply, and is administered now by the U. S. National Park Service. The annotated list of species (228 in 171 genera and 63 angiosperm families) includes the historical collections and those made by the authors.

"FLORA OF VIRGIN GORDA (British Virgin Islands) by Elbert L. Little, Jr., Roy O. Woodbury & Frank H. Wadsworth, United States Forest Service Research Paper ITF-21, 36 pp., 2 b/w maps & 1 photo. Institute of Tropical Forestry, Rio Piedras, Puerto Rico. 1976. Paperbound.

This small volcanic island, the farthest east in the Greater Antilles chain, is described and its early history given briefly in the introduction. The centrally located Virgin Gorda Peak is preserved as the Gorda Peak National Park. The 403 native and introduced vascular plants in the annotated list include 154 not previously reported. A list of 57 cultivated species is appended.

"RARE TROPICAL TREES OF SOUTH FLORIDA" by Elbert L. Little, Jr., 20 pp., 4 b/w photo & 5 line-draw. pl. Conservation Research Report No. 20, United States Department of Agriculture Forest Service. United States Government Printing Office, Washington, D. C. 20402. 1976. 45¢ paperbound.

This descriptive inventory illustrated by several excellent line drawings "aims to list the rare tropical trees of South Florida and to summarize their natural distribution and their occurrence within preserves" and the need to make inviolate the habitats of others not now protected.

"INDEX BIBLIOGRAPHIQUE SUR LA MORPHOLOGIE DES POLLENS D'ANGIOSPERMES" by G. Thanikaimoni, Institut Français de Pondichéry Travaux de la Section Scientifique et Technique, Tome XII, Fascicule 1, 339 pp. 1972; Fascicule 2, 164 pp. 1973; Tome XIII, Supplement 2, 386 pp. 1976. Paperbound.

The first part of Volume XII has not been received: 1556 references for 6575 genera are recorded for it. The second part of this volume records 646 references for 643 additional genera. The genera are listed alphabetically. Synonyms that appear in the literature are also listed and equated with accepted names. Authors and publication dates follow each genus entry. The next section is the bibliography arranged alphabetically by author. Volume XIII comprises the second supplement to this bibliographic index and consists of three sections: the generic index, a family index of 541 slots for 7748 genera with alternate choices indicated where involved, and additional bibliographic references including mentioned electron and optical micrographs.

Grateful (or they should be) users of this valuable compendium of information will find much time and energy saved by this organization and will be led to new sources of material that seems to be very carefully and accurately assembled.

"DICTIONARY OF BIOCHEMISTRY" by J. Stenesh, viii & 344 pp. A Wiley Interscience Publication of John Wiley & Sons, London, Sydney, Toronto, & New York, N. Y. 10016. 1975. $25.25.

This useful dictionary, "written to provide scientists and students in the life sciences with a reference work on the terminology of biochemistry,......contains approximately 12,000 entries drawn from over 200 textbooks", reference sources and biochemical journals published since 1962 and follows the recommendations of the Commission on Biochemical Nomenclature of the International Union of Pure and Applied Chemistry and the International Union of Biochemistry. It should prove a handy source of information if kept in scientific laboratories.

"WEED SCIENCE: Principles and Practices" by Glenn C. Klingman, Floyd M. Ashton and Lyman J. Noordhoff, viii & 431 pp. & b/w 94 photo, 36 fig. & 64 tab. A Wiley Interscience Publication of John Wiley & Sons, New York, N. Y. 10016. 1975. $16.75.

"This textbook is designed principally for classroom instruction in the principles and practices of weed science. It will also be helpful to research scientists, extension specialists, county agents, vocational agriculture teachers, herbicide development representatives, and farmers." Since it is "intended for worldwide usage", it should use both the more uniform scientific as well as the common names of plants instead of one or the other here and there. This text clearly and directly explains the history and contributions of weed science, the biology of weeds, the selective nature of herbicides in its first third. The next is devoted to about one hundred specific herbicides with their properties, soil effects and modes of action. The last third of the book is oriented toward major crops -- vegetables, fruits, nuts, ornamentals, pasture and range -- and presents the special techniques and practices for desired results. "This [carefully prepared] book is a revision of 'Weed Control As A Science' originally published by the senior author in 1961". The text, tables and diagrams are efficiently modernized but the photographic plates are mostly of the older genre.

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NOTES ON BARBULA AND PSEUDOCROSSIDIUM (BRYOPSIDA) IN NORTH AMERICA AND AN ANNOTATED KEY TO THE TAXA

Richard H. Zander

Clinton Herbarium, Buffalo Museum of Science, Buffalo NY 14211

This preliminary study of Barbula s. lato was prepared in the course of work on taxa of Pottiaceae for the proposed moss floras of Mexico (ed. A.J. Sharp) and of Arctic North America (ed. W.C. Steere, G.S. Mogensen & R.R. Ireland). It is a synthetic treatment based on representative specimens from a wide geographic area and is offered as an alternative to the usual floristic evaluation of species based only on regional collections. In adopting a broader species concept in this and in recent work (Zander, 1977, 1978a, 1978b), I feel that the taxa recognized have gained in biological meaningfulness. Nomenclatural designations for some extreme expressions, permutations of character states, and geographic variants have been lost. But these morphs, in any case, cannot be dealt with by type methodology and the principle of priority, because of lack of clear discontinuities, and must be designated, if at all, by informal names. Gained, hopefully, is a sense of proportion in the recognition of patterns of variation, within and between taxa, that are often interpretable as evolutionary trends or adaptations; the realization that many genera and species of Pottiaceae are widely distributed in the world in geographic patterns often correlating with certain climates or topographic features; and, the practical value of being able to use good technical characters to fairly easily name distinguishable entities in a moss family whose taxonomy has long been reputed to be "cursed" and "difficult and nasty" (Anon., pers. comm.). It is often said that overly broad species concepts are more difficult to correct, at a later time, than overly narrow concepts. However, this is a simplistic view in that most of the effort of present-day revisionary work is in making sense of the overly analytical results of past one-character or regional taxonomy. Such difficultities are discussed as length by Best (1905) who invoked a kind of botanical Manichaeism in early rebellion against atomistic taxonomic attitudes similar to those espoused by Grout (1938a).

"Andro-" and "gynogametophyte" are terms used here instead of "male" and "female plant" because the former terms ought to be used to distinguish sexually differentiated gametophytes (dioicy) while the latter terms refer to sexual differentiation of sporophytes (dioecy). Sporophytes of mosses are always sexless, but the gametophytes may be dioicous or monoicous. Sporophytes of seed-bearing plants may be monoecious or dioecious, but the gametophytes are always dioicous. Dioicy and monoicy are associated with homospory and the production of gynandrogametophytes, or of both andro- and gynogametophytes, from the same sporangium, but dioecy and monoecy are associated with heterospory and the production of andro- and gynogametophytes from different sporangia. Although I consider the substitution of the terms "phyllidium" and "caulidium" for the moss "leaf" and "stem," respectively, to be an unnecessary nicety that does not reflect major genetic differences, the above sexual distinctions are of evolutionary importance and should not be confused or minimized by false homology.

In a study of the very closely related genus Didymodon (Zander, 1978a), I supported the use of Saito's (1975) distinctions between Didymodon and Barbula, which are based largely on gametophyte characters. These were presented in a table. The North American representation of species previously recognized in Barbula are here placed in two genera and included in the same key to facilitate identification.

KEY TO PSEUDOCROSSIDIUM AND SUBGENERA AND SECTIONS OF BARBULA IN NORTH AMERICA

1. Upper leaf margins broadly revolute to spiral-revolute, with cells often more strongly chlorophyllose than medial leaf cells; abaxial stereid band of costa usually strong but adaxial band weak or commonly absent; costa usually excurrent as a stout mucro or short awn.......... Pseudocrossidium Williams

1. Upper leaf margins narrowly recurved to plane, with cell chlorophyll content equal to that of medial cells; both stereid bands usually clearly differentiated, the adaxial usually present though occasionally weak or absent; costa ending below leaf apex, percurrent or excurrent as a mucro................ 2.

2. Leaves spathulate, costa excurrent as a sharp mucro, laminal cells smooth, adaxially bulging and abaxially nearly plane, annulus revoluble.................................... .... Barbula subg. Hyophiladelphus (C. Müll.) Zander

2. Leaves lanceolate to ligulate or ovate, costa subpercurrent to excurrent, laminal cells papillose to nearly smooth, either similar on both sides of leaf or more strongly convex adaxially than abaxially but then costa percurrent, annulus persistent.. 3.

3. Leaves flaccid when wet, upper laminal cells rectangular, usually epapillose, often adaxially more convex than abaxially... .... Barbula sect. Hydrogonium (C. Müll.) K. Saito

3. Leaves firm when wet, upper laminal cells quadrate, papillose, both exposed surfaces similar................................. 4.

4. Upper leaf margins usually recurved, propagula (when present) small, of 1-10(15) cells; perichaetial leaves seldom strongly differentiated, with cells mostly parenchymatous.............. Barbula Hedw. sect. Barbula

4. Upper leaf margins plane, propagula (when present) often large, of 4-50 or more cells; perichaetial leaves often convolute-sheathing, with cells highly prosenchymatous..... .... Barbula sect. Convolutae B.S.G.

KEY TO SPECIES AND VARIETIES OF BARBULA AND PSEUDOCROSSIDIUM IN NORTH AMERICA

1. Leaves spathulate; upper laminal cells adaxially bulging and abaxially flat, epapillose; costa sharply excurrent; annulus revoluble; U.S.A. (Gulf Coast states), Mexico.................... .... 11. B. agraria Hedw.

1. Leaves lanceolate to ligulate or ovate; upper laminal cells superficially similar on both sides of leaf, or adaxially more strongly convex than abaxially but then costa percurrent, usually papillose, seldom smooth or nearly so; costa ending variously; annulus persistent... 2.

2. Upper laminal cells often lax, quadrate to rectangular, usually not or weakly papillose, leaves rather flaccid when wet.. 3.

2. Upper laminal cells firm, quadrate, usually distinctly papillose, leaves usually firm when wet................. 4.

3. Leaves ovate-lanceolate, margins usually plane, laminal cells 11-15 µm wide, 1(-2):1; U.S.A. (southcentral and southwestern states), Mexico........ 9. B. ehrenbergii (Lor.) Fleisch.

3. Leaves narrowly lanceolate to long-triangular, margins narrowly recurved to near apex, laminal cells 8-12 µm wide, 1-2:1; Mexico................. 10. B. arcuata Griff.

4. Abaxial costa surface doubly prorulose (i.e. with both ends of rectangular superficial cells protruding) near apex, often with coarsely mamillose or very rough appearance; leaf base not sheathing; Canada (Alberta), U.S.A. (southeastern and southwestern states), Mexico............................ .... 5. B. indica (Hook.) Spreng.

4. Abaxial costa surface with hollow or solid papillae or epapillose, seldom distinctly prorulose near apex (but then leaf base is strongly sheathing), leaf base occasionally sheathing...................................... 5.

5. Leaf apex acute to somewhat blunt, margins plane or weakly recurved below.. 6.

5. Leaf apex rounded, margins plane to revolute (apex occasionally acute but then margins recurved above midleaf)............... 8.

6. Costa stoutly short-excurrent, leaf base sheathing; propagula usually present, axillary; Canada (Northwest Territories), U.S.A. (Alaska, Arizona)...................... .... 6. _B_. _amplexifolia_ (Mitt.) Jaeg.

6. Costa 1-6 cells subpercurrent, leaf apex entire or occasionally apiculate by a clear or weakly papillose conical cell, leaf base not sheathing; propagula often present, borne on basal rhizoids......................... 7.

7. Perichaetial leaves acute to abruptly subulate, loosely sheathing; western Canada, western U.S.A. south to Texas.................. .... 8. _B_. _eustegia_ Card. & Thér.

7. Perichaetial leaves obtuse to broadly acute, convolute-sheathing; Canada, U.S.A., Mexico............................... .... 7a. _B_. _convoluta_ Hedw. var. _convoluta_

8. Leaves muticous... 9.

8. Leaves apiculate, mucronate, or awned.................. 12.

9. Leaf margins plane or recurved to midleaf, propagula multicellular... 10.

9. Leaf margins recurved to near apex, propagula unicellular... 11.

10. Propagula borne on basal rhizoids, leaves ligulate to oval, costa usually subpercurrent by 4-8 cells; Canada, U.S.A.. Mexico......... 7a. _B_. _convoluta_ Hedw. var. _convoluta_ p.p.

10. Propagula borne in upper leaf axils, leaves oval, costa subpercurrent by 2-4 cells; Canada (Northwest Territories), U.S.A. (Alaska).. 7b. _B_. _convoluta_ var. _gallinula_ Zander

11. Leaves ovate, marginal cells not differentiated as a border; propagula common, yellow-brown, borne in axillary masses; U.S.A. (North Carolina), Mexico..... 4. _B_. _inaequalifolia_ Tayl.

11. Leaves ligulate, marginal cells often thick-walled in 2-3 rows; propagula uncommon, red-brown, few in leaf axils; Mexico....... .... 3. _B_. _calcarea_ Thér.

12. Leaves short-awned; U.S.A. (southwestern states), Mexico........... 14. P. aureum (Bartr.) Zander

12. Leaves apiculate or mucronate........................ 13.

13. Leaf margins plane or weakly recurved below midleaf; Canada, U.S.A., Mexico... 7a. B. convoluta Hedw. var. convoluta p.p.

13. Leaf margins recurved to spiral-revolute, usually to near apex.. 14.

14. Costa with adaxial stereid band distinct; leaf margins narrowly recurved, marginal cells not differentiated.. 15.

14. Costa usually lacking adaxial stereid band; leaf margins broadly recurved to spiral-revolute, cells often weakly papillose on exposed portions of margins, and thin-walled, highly chlorophyllose within the spiralled portion.... 16.

15. Leaf apex obtuse to broadly acute, margins recurved in lower 1/2-2/3; propagula apparently not produced in nature; Canada, U.S.A., Mexico......... 1. B. unguiculata Hedw.

15. Leaf apex abruptly rounded to emarginate, margins recurved to near apex; propagula spherical, in leaf axils; Mexico....... .... 2. B. orizabensis C. Müll.

16. Leaf margins strongly recurved to once (seldom more) revolute, propagula occasionally present on adaxial surface of costa, inner perichaetial leaves convolute-sheathing; Canada (British Columbia, Yukon and Northwest Territories), U.S.A. (Oregon, California)................. .... 12. P. revolutum (Brid. in Schrad.) Zander

16. Leaf margins strongly spiral-revolute, propagula absent, inner perichaetial leaves not or little differentiated; U.S.A. (southwestern states), Mexico...................... .... 13. P. replicatum (Tayl.) Zander

BARBULA Hedw., Spec. Musc. 115. 1801, nom. cons.
Type species: Barbula unguiculata Hedw. (lectotype fide Steere, 1938).

The genus Barbula is commonly distinguished from Tortula Hedw. by the presence of two stereid bands in its costa rather than only one. However, the adaxial stereid band is often absent in certain species of Barbula. In such cases, the presence of a differentiated epidermis of large-lumened or at least larger-sized cells on the abaxial surface of the costa will distinguish Barbula species. Such an epidermis is not or is only poorly differentiated in Tortula. The North American taxa of Barbula are distinctive and fairly easy to identify by diagnostic characters, although some of the species are polymorphic.

BARBULA Hedw. sect. BARBULA

Synonyms: Barbula sect. Unguiculatae B.S.G., Bryol. Eur. 2: 80. 1842 (fasc. 13-15 Mon. 18) (nom. illeg. incl. typ. gen.). — Barbula sect. Eubarbula C. Müll., Syn. Musc. 1: 623. 1849 (nom. illeg.). — Barbula sect. Senophyllum C. Müll., Syn. Musc. 1: 606. 1849 (nom. illeg. incl. typ. gen.). — Barbula sect. Helicopogon (Mitt.) Chen, Hedwigia 80: 215. 1941 (nom. illeg. incl. typ. gen.).

Additional synonymy is given by van der Wijk, et al. (1959-1969).

Sect. Barbula is characterized by firm leaves; upper leaf margins generally narrowly recurved, occasionally plane; laminal cells papillose; perichaetial leaves seldom strongly differentiated; and, propagula (when present) small, each composed of 1-10(15) cells.

1. **Barbula unguiculata** Hedw., Spec. Musc. 118. 1801.

Synonymy is given by Podpěra (1954), Saito (1975) and Steere (1938).

This well-known, common species of ruderal habitats is described and illustrated by most authors of moss identification manuals for temperate zone areas. Barbula unguiculata fo. propagulosa Crum is a synonym of B. indica, q.v. I agree with Cardot (1899) and subsequent authors that Barbula stricta Hedw., Spec. Musc. 119, 1801 (type: U.S.A., Pennsylvania, Muehlenberg s.n., G—holotype) is a synonym of B. unguiculata.

This species is readily distinguished from the similar B. indica by the usually stoutly mucronate costa, which has scattered simple papillae abaxially above midleaf, and the leaf margins more strongly recurved. Barbula unguiculata is rare in Mexico, apparently replaced by the closely related B. orizabensis.

Propagula have never been observed in herbarium collections of B. unguiculata, although occasional swollen ends of rhizoids ("galls" fide Whitehouse, 1973) may mimic rhizoidal propagula (= "tubers" or "brood bodies"). However, specimens cultivated on nutrient agar by D.V. Basile at NY and on moistened perlite by myself at BUF have produced unicellular, green or brown, elliptical propagula, each ca. 20–25 µm long, borne in clusters of uniseriate chains on the ends of long, brown rhizoids arising from the bases of the stems.

2. **Barbula orizabensis** C. Müll., Linnaea 38: 638. 1874.
Type: Mexico, Veracruz, Orizaba, Mohr, 1874 (NY--topotype).

Synonyms: Barbula recurvicuspis C. Müll., Bull. Herb. Boiss. 5: 557. 1897. Type: Jamaica, Bridge Hill, Harris 11038 (BM--lectotype), Contenti Road, Harris 10082 (BM--syntype).

Barbula stenotheca Ther., Smiths. Misc. Coll. 85(4): 21. 1931, syn. nov. Type: Mexico, Distrito Federal, Río Frío, Amable 1726 (PC--holotype).

Barbula orizabensis is easily distinguished from B. unguiculata by the characters in the key, although I agree with Theriot (1931) that the two species are closely related. It is described and illustrated by Bartram (1949) and is known from many states in Mexico (Crum, 1951) and from Guatemala (Bartram, 1949) and Jamaica (Crum & Bartram, 1958). It occurs on soil or rock, usually at high elevations. The synonym B. stenotheca was described as a species of Barbula sect. Streblotrichum (= sect. Convolutae) on account of the convolute-sheathing perichaetial leaves of the type specimen. Species of sect. Barbula occasionally have rather differentiated perichaetia while those of sect. Convolutae occasionally have undifferentiated perichaetia. On the basis of evaluation of all characters ("Summe der Merkmale" of Loeske, 1910), however, B. orizabensis belongs in sect. Barbula.

3. **Barbula calcarea** Thér., Smiths. Misc. Coll. 85(4): 20. 1931.
Type: Mexico, Distrito Federal, Desierto, Amable 1620 (PC--lectotype, NY--isotype); Michoacán, Morelia, Loma Santa María, Arsène 4891 (PC--syntype).

Synonym: Barbula linguaefolia Bartr., Bryologist 50: 204. 1947, syn. nov. Type: Guatemala, Suchiate, Finca El Naranjo, Svihla 2879a (FH--holotype).

Barbula calcarea was described and illustrated by Theriot (1931) and, as B. linguaefolia, by Bartram (1949). This species is closely related to B. inaequalifolia, from which it differs by the characters in the key. The upper leaf margins are occasionally bistratose in small patches and the perichaetial leaves convolute-sheathing in the lower 1/3-2/3. The original description of the synonym B. linguaefolia is incorrect in ascribing plane margins to the type. Propagula were seen only in the lectotype and syntype of B. calcarea. These were found, unattached, in leaf axils, 2-4 per axil, not borne in massive axillary clumps as in B. inaequalifolia. I have seen collections of B. calcarea from Mexico (Distrito Federal, Mexico, Michoacán) and Guatemala; these occurred on soil or calcareous rock at 2600-2800 m elevation.

4. **Barbula inaequalifolia** Tayl., London Jour. Bot. 5: 49. 1846. Type: Ecuador, Jameson, 1863 (FH--isotype).

For complete synonymy see Zander (1968).

A description and illustrations were given by Zander (1968), who cited specimens from U.S.A. (North Carolina), Colombia, Ecuador, China, and Java. An additional station has been noted (Zander, 1976) in Chiapas, Mexico. The following collections extend the geographic range of this species: Mexico: México, between Mexico and Puebla, Dull, 1966 (BUF); Michoacan, Uruapan, Frye & Frye 3051a (TENN); Panama: Chiriqui, Volcan Baru, Pineda 964 (MO); Venezuela: Trujillo, Bocono, Paramo de Guirigay, López & Rodríguez 8788-a (FLAS); India: Uttar Pradesh, Kumaun, Debidhura, Pithoragarh, Srivastava 4348 (BUF). The habitat includes roadsides, banks, páramos, on soil, rock, walls, from 700-3100 m elevation. Husnotiella revoluta Card. occasionally has axillary masses of unicellular propagula (Bartram, 1926; Zander, 1977) and when sterile may be confused with B. inaequalifolia. The former species differs in the following combination of characters states: leaves short-oval to deltoid oval, laminal cell walls evenly thickened, laminal papillae solid, low, broad, simple to multiplex, usually lens-like, and costa with only one stereid band.

In spite of the peristome being red, well developed and twisted 1-4 turns, B. inaequalifolia may be better placed in Bryoerythrophyllum Chen because of its red coloration and closely hollow-papillose, thin-walled upper leaf cells. It has much the same general appearance as does Bryoerythrophyllum bolivianum (C. Müll.) Zander, which, however, has plane margins, lacks propagula, and has the rudimentary peristome typical of Bryoerythrophyllum species (Zander, 1978b). This is another confounding example of a moss species with a gametophyte matching the characters of one genus and a sporophyte those of another.

BARBULA sect. CONVOLUTAE B.S.G., Bryol. Eur. 2: 91. 1842 (fasc. 13-15 Mon. 29). Lectotype: Barbula convoluta Hedw.

Synonyms: Streblotrichum P. Beauv., Mag. Enc. 5: 317. 1804. — Barbula sect. Streblotrichum (P. Beauv.) Limpr., Laubm. Deutsch. 1: 626. 1888. — Barbula subg. Streblotrichum (P. Beauv.) K. Saito, Jour. Hattori Bot. Lab. 39: 499. 1975. Type: Barbula convoluta Hedw.

This section is distinguished by the combination of the following character states: leaves firm when wet; plane or weakly recurved leaf margins; papillose laminal cells; adaxial stereid band of costa usually distinct; perichaetial leaves usually convolute-sheathing; and, propagula (when present) often large, composed of 4-50 or more cells.

5. **Barbula indica** (Hook.) Spreng. in Steud., Nomencl. Bot. 2: 72. 1824. [Sensu amplo.]

Basionym: Tortula indica Hook., Musci Exot. 2: 135. 1819, nom. nov. for Trichostomum indicum Schwaegr., Spec. Musc. Suppl. 1(1): 142, 1811, hom. illeg. non Trichostomum indicum Willd. ex Schrad., 1803. Type: India, Madras, Tranquebar, Röttler s.n. (NY—isotype).

Synonyms: Trichostomum orientalis Web., Arch. Syst. Naturgesch. 1(1): 129. 1804. — Barbula orientalis (Web.) Broth., Nat. Pfl. 1(3): 403. 1902, non B. orientalis Brid., 1819. — Semibarbula orientalis (Web.) Wijk & Marg., Taxon 8: 75. 1959.

Barbula cruegeri Sond. ex C. Müll., Syn. Musc. 1: 618. 1849, syn. nov. Type: Trinidad, La Ventille, Crueger, 1846 (SPA—isotype).

Tortula gregaria Mitt., Jour. Linn. Soc. Bot. London Suppl. 1: 29. 1859, syn. nov. Type: Nepal, Tambar R., Hooker 166 (NY—syntype). — Barbula gregaria (Mitt.) Jaeg., Ber. S. Gall. Naturw. Ges. 1871-72: 424. 1873 (Ad. 1: 272).

Barbula erosa Hampe in C. Müll., Bot. Zeit. 20: 348. 1862, syn. nov. Type: Venezuela, Baruta, Trumpff, 1857 (BM—isotype).

Barbula rufipes Schimp. ex Besch., Mém. Soc. Nat. Sci. Nat. Cherb. 16: 180. 1872, syn. nov. Type: Mexico, Verzcruz, Orizaba, Mueller, 1853 (BM—holotype). — Semibarbula rufipes (Schimp. ex Besch.) Hilp., Beih. Bot. Centralbl. 50(2): 622. 1933.

Barbula cancellata C. Müll., Flora 56: 483. 1873.

Barbula wrightii Sauerb. in Jaeg., Ber. S. Gall. Naturw. Ges. 1877-78: 409. 1880 (Ad. 2: 673), syn nov., nom. nov. for Barbula obscura Sull., Proc. Amer. Acad. Arts Sci. 5: 277. 1861, non B. obscura Mitt., 1859. Type: Cuba, Wright 31 (BM, NY--isotypes). -- Tortula obscura (Sull.) Mitt., Jour. Linn. Soc. Bot. 12: 150. 1869.

Barbula purpuripes C. Müll., Bull. Herb. Boiss. 5: 558. 1897, syn. nov. Type: Jamaica, Cinchona, Harris 11022 (BM, NY--isotypes).

Barbula microglottis C. Müll., Hedwigia 37: 232. 1898, syn. nov. Type: Haiti, "Cape Haytien," Eggers, 1887 (NY--isotype).

Barbula hypselostegia Card., Rev. Bryol. 36: 84. 1909, syn. nov. Type: Mexico, Puebla, Honey Station, Pringle 10653 (PC--holotype, TENN--isotype). -- Streblotrichum hypselostegium (Card.) Hilp., Beih. Bot. Centralbl. 50(2): 635. 1933.

Barbula muenchii Card., Rev. Bryol. 36: 84. 1909, syn. nov. Type: Mexico, Chiapas, San Cristóbal, Muench, 1907 (NY--isotype).

Barbula pringlei Card., Rev. Bryol. 36: 85. 1909, syn. nov. Type: Mexico, Morelos, Cuernavaca, Pringle 10637 (PC--lectotype, BM, FH, TENN--isotypes), 15177 (PC--syntype). -- Streblotrichum pringlei (Card.) Hilp., Beih. Bot. Centralbl. 50(2): 635. 1933.

Hyophila uliginosa E.G. Britt., Bull. Torrey Bot. Cl. 42: 4. 1915. Type: St. Jan, Bethania, Britton & Shafer 367 (NY--holotype).

Barbula unguiculata fo. propagulosa Crum, Bryologist 72: 241. 1969, syn. nov. Type U.S.A., Tennessee, Montgomery Co., Clebsch 581 (MICH--holotype).

Barbula horrinervis K. Saito, Jour. Hattori Bot. Lab. 39: 486. 1975, syn. nov. Type: Japan, Tokyo, Okutama, Saito 4936 (MICH--isotype).

Additional synonymy is given by Crum and Steere (1957), Saito (1975) and Steere (1938).

Plants turf-forming, yellow-green to brown; stems seldom branching, to 1.2 cm tall, in transverse section pentagonal, central strand distinct, cortex of smaller, darker cells, epidermis not differentiated; axillary hairs usually of 4-8 uniseriate cells, all clear or the basal 1(-2) with somewhat thickened walls and yellow-brown coloration; tomentum absent. Leaves crowded to rather distant, about equal in size from base to apex, when dry incurved-appressed, often infolded above, occasionally catenulate, when wet erect-spreading, incurved to plane, ovate to ligulate, occasionally lanceolate or long-trangular, 0.5-1.8 mm long, with a deep, narrow groove adaxially along the costa, margins plane to weakly recurved at midleaf, entire; leaf apex somewhat incurved or weakly cucullate to nearly plane, rarely reflexed, rounded to bluntly acute, apiculate by a clear, not or little papillose, conical cell, rarely muticous; leaf base scarcely differentiated to much broadened, square to rectangular or oval, basal margins not or shortly decurrent; costa usually percurrent or ending 1-4 cells below apex or occasionally excurrent in a short, sharp mucro, abaxial superficial cells near apex long- to short-rectangular or quadrate, doubly prorulose (distal and proximal ends of cells protuberant), occasionally nearly smooth or both prorulose and simply papillose, adaxial superficial cells long- to short-rectangular, smooth, or quadrate and papillose in patches above midleaf; costa in transverse section semicircular to elliptical, ventrally flat to convex, lamina inserted at about 90° angle, adaxial epidermis often differentiated as one layer of thin-walled cells, adaxial stereid band absent or weak, guide cells in one layer of 2-4 cells, abaxial stereid band strong, abaxial epidermis undifferentiated or represented by one layer of thick-walled cells with semicircular lumens or with thin walls and circular lumens. Upper laminal cells quadrate, 7-9(10) µm wide, walls thin to evenly thickened, superficially weakly bulging to conic-protuberant, lumens angular, arranged in a weak pattern of longitudinal rows, papillae low-multiplex, mostly hollow, with 4-8 salients per lumen, occasionally coroniform above strongly protuberant cell walls; basal laminal cells medially smooth, 8-12 µm wide, 2-5:1, rectangular, evenly thickened or thin-walled, usually bordered on the margins by 1-4 rows of short-rectangular cells. Propagula often present, borne on stalks in leaf axils issuing just above the axillary hairs, obovoid, clavate, spindle-shaped, elliptical, or spherical, smooth, colliculate or armed with 1-several short, pointed branches, 70-300 µm long, of 8-50 or more cells, green to brown. Dioicous; perichaetia terminal, leaves ovate, entirely prosenchymatous and convolute-sheathing grading to lanceolate, prosenchymatous only in the lower 1/3 of the leaf and weakly sheathing, 0.8-2.5(3.0) mm long; perigonia terminal on smaller plants, gemmate, leaves oval.

Seta 0.7-1.3 cm long, red-brown, twisted clockwise; urn 0.8-1.8 mm long, red-brown, smooth when dry, elliptical to ovoid, occasionally curved, neck little differentiated, exothecial cells 18-25 µm wide, 3-6:1, thin- or thick-walled, evenly thickened, stomates present at base of urn, phaneropore, annulus weakly differentiated; peristome inserted on mouth of capsule, of 32 teeth weakly fused in 16 pairs, 0.7-1.7 mm long, teeth linear, densely spiculose, red to orange, with many articulations, little to strongly twisted 0.25-3.0 times, counterclockwise; spores (8)9-12 µm in diameter, smooth to weakly papillose, light brown to yellow-brown; operculum 0.8-1.7 mm long, long- to short-conic, cells twisted counterclockwise. Calyptra 2.0-2.2 mm long, cucullate, usually rough apically with prorulose cells.

The habitat of B. indica includes soil, clay, limestone, coral walls, roadbanks, riverbanks, walls, limepit, tree trunks, from near sea level to 3900 m. I have examined specimens from Canada (Alberta), U.S.A. (southeastern and southwestern states and Hawaii), Bermuda, Mexico (Chiapas, Durango, Hidalgo, Jalisco, Morelos, Oaxaca, San Luis Potosí, Sonora, Veracruz), Guatemala, British Honduras, Cuba, Jamaica, Dominican Republic, Haiti, Puerto Rico, St. Lucia, Barbados, St. Jan, New Providence, Martinique, Trinidad, Venezuela, Surinam, Colombia, Peru, Nepal, India, Hong Kong, Japan, Philippines, and New Guinea.

Barbula indica (Fig. 1-14) is a polymorphic species, occurring mainly in tropical and warm temperate areas, and includes a profusion of variants with various permutations of character states. Under this name or its synonyms, it is illustrated and described by Saito (1975) and Steere (1938) among others. On account of the Considerable synonymy accepted here, a redescription is given above, based on New World specimens. Certain characters that are usually conservative in other species, e.g. length and degree of twisting of peristome teeth, degree of differentiation of perichactial leaves, size, shape and position of propagula, vary markedly. For this reason, synonyms include combinations in other generic names such as Hydrogonium (C. Müll.) Jaeg., Semibarbula Herz. ex Hilp. and Streblotrichum P. Beauv.

Previous authors have treated the Old World and New World representations as separate entities, although variation is similar throughout the tropics. Saito (1971) reduced certain Asian names to synonyms of the New World B. cruegeri, but later (1975) referred these to B. indica instead. In North America north of Mexico, B. indica has been known under the synonym B. cruegeri, as discussed by Steere (1938). Recently, the checklist of Crum et al. (1973) replaced B. cruegeri (sensu North American authors) with the name B. cancellata, because (H. Crum, pers. comm.) the Texan type of the latter has the small, obovoid propagula characteristic of most collections in North America north of Mexico, while there were indications that B. cruegeri (with a type from Trinidad) represents a different, tropical taxon.

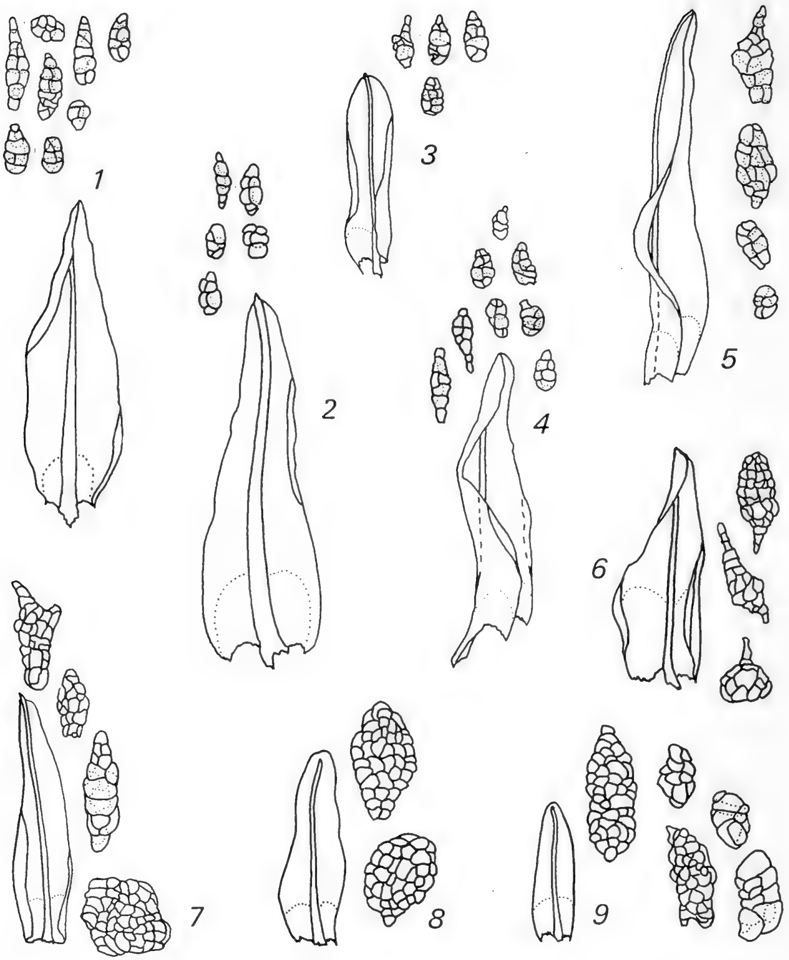
There appear to be two major trends in morphological appearance in B. indica. Barbula indica s. str. has narrowly oval to elliptical leaves, with margins plane or weakly recurved at midleaf, and small, green, obovoid propagula occurring in masses in upper leaf axils. The type from India has propagula 70-90 µm long. This expression is found throughout the range of the species. A somewhat different-looking plant in extreme form is B. indica facies "B. gregaria," which was well illustrated by Saito (1975) under the synonym B. horrinervis. This morph has broadly oval leaves with plane margins and massive, brown, elliptical to spherical, many-celled propagula occurring singly or very few together in upper leaf axils. Facies "B. gregaria" is seldom found in temperate areas although it is known from Japan (type of B. horrinervis) and from Canada

Vitt 24189--ALTA, Horton 15697--ALTA). A third, less distinctive trend that is widespread in the tropics is the production of propagula, these usually massive, on basal rhizoids, but uncorrelated with leaf morphology. Some of these propagula are apparently formed from an apical cell with two cutting faces and are similar to the "bilateral tubercles" of Leptobryum pyriforme (Hedw.) Wils. illustrated by Berthier (1978). The type of B. cruegeri has elliptical, plane to recurved leaves, and brown tubers borne on rhizoids from lower leaf axils or buried in the soil, ranging from 95-300 µm in length, from 15 to many cells in composition, and obovoid, spindle-like, elliptical or spherical in shape, superficially smooth to colliculate (raspberry-like).

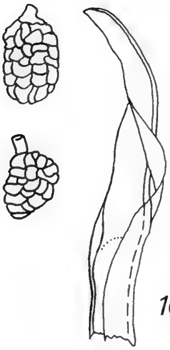
Because of considerable intergradation in characters between these variants, infraspecific categories are not recognized. Individual collections were mostly stenomorphic between plants in expression of particular character states. The characters of the propagula were, however, variable within some collections. In certain specimens, massive propagula on basal rhizoids occurred together with either small, obovoid or massive axillary propagula or with intermediate-sized axillary propagula. Saito (1975) illustrated the Japanese synonym B. horrinervis as having massive, elliptical, apiculate propagula. In fact, in tropical and subtropical areas worldwide, specimens of B. indica may be found with propagula of various sizes and shapes that have one or more apiculi or spines, apically or laterally, resulting in spindle shapes, "ocarina" shapes and "mine" shapes. Saito (1975) also indicated that, in Japan, plants with massive propagula have plane leaf margins (B. horrinervis) and those with small propagula have recurved leaf margins (B. indica), but this correlation is only poorly reflected on a worldwide basis.

Although intergrading variants that are distinctive in the extreme are often recognized, and although the two major variants of B. indica may be biological entities deserving infraspecific scientific names, satifactory disposition of the multiplicity of taxonomic synonyms following non-discontinuous, non-exclusive criteria (e.g. the "75 percent convention" discussed by Mayr, 1942) is impossible or at least arbitrary, if type methodology is rigorously followed. This is a rather subtle, non-biological, bookkeeping limitation of the Code to practicality of specific and infraspecific concepts.

The term "prorula" referring to a protrusion of the distal or proximal ends of superficial cell walls, or of both (doubly prorulose), was coined by Argent (1973) as pointed out by Manuel (1974). Weber and Simone (1977) suggested the term "scindula" for the same feature, and During (1977, p. 15) further discussed this morphological trait. Above midleaf, the abaxial costal surface of B. indica is usually distinctly doubly prorulose; however, some specimens may have relatively smooth costal surfaces or be covered with quadrate, hollow-papillose cells. Usually, such collections



Figures 1-14. Variation in leaf and propagulum morphology in Barbula indica (Hook.) Spreng. Leaves, X32; propagula (which are axillary unless noted), X82. 1. U.S.A. Kentucky, Zander 4640 (BUF). 2. Mexico: Frye 2143 (NY). 3. Mexico: Richards et al. 629 (FH). 4. Mexico: McGregor 5314 (NY). 5. Venezuela: Griffin & Lopez 415 (FLAS). 6. Venezuela: Dall'Aglio 367 (BUF). 7. Canada: Alberta, Vitt 24189 (ALTA). 8. Cuba: Ekman 8267 (NY). 9. Puerto Rico: Britton 5157 (NY)--mixture of rhizoidal and axillary propagula.



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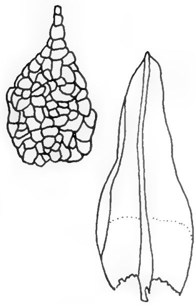

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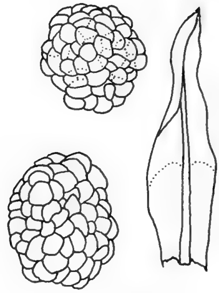

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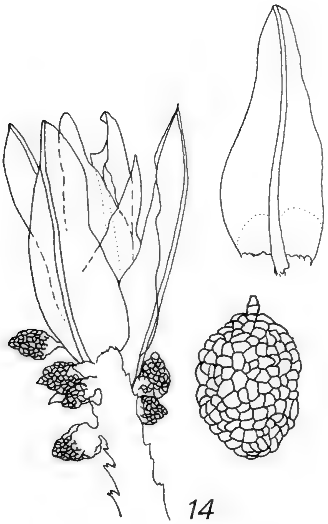

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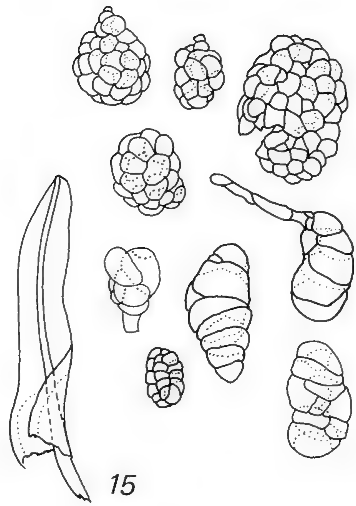

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10. Peru: Mexia 62589 (MO). 11. Jamaica: Hermann 22919 (BUF). 12. Haiti: Bartlett 17583 (NY). 13. Mexico: Sharp 4665 (FH). 14. Trinidad: Crueger, s.n. (SPA--type of Barbula creugeri Sond. ex C.Müll.)--axillary and rhizoidal propagula.

may be referred to B. indica by the following combination of gametophyte characters: leaves ligulate to oval, base not sheathing, margins plane or weakly recurved at midleaf, apex rounded-obtuse to bluntly acute, apiculate with a clear cell, upper laminal cells papillose, quadrate, mostly 7-9 µm wide, and costa ending 1-4 cells below apex.

In Leptobryum pyriforme, environmentally triggered switch mechanisms apparently control the formation of the three possible kinds of propagula found in this species (Berthier, 1978). However, variation in propagula size, number, ornamentation and position in B. indica may be genetically based, possibly as the result of selection for certain modes of diaspore dispersal appropriate in different habitats. The small axillary propagula are abundant, usually 50-100 µm long, of 3-6 cells, thin-walled, clavate to spindle-shaped, have few or no internal oil globules, and may be interpreted as an adaptation for colonization through wide dispersal by water and immediate regeneration. However, the massive axillary or rhizoidal propagula are few, usually 100-230 µm long, many-celled (to 50 or more), thick-walled, elliptical to spherical and often branching, have abundant oil and may well be a specialization for very local dispersal or non-dispersal. In the large size, anchoring arms, and position often buried in the soil, massive propagula may be examples of "atelochory" (van der Pijl, 1972) or "precinctiveness" (Carlquist, 1966, 1974) of diaspores of vascular plants in insular situations. Intermediate-sized propagula are common, however, and many collections lack propagula altogether. That plants of B. indica with numerous, small propagula are typically Temperate Zone in distribution while those with few, large propagula are typically tropical indicates the possibility of a response to a north-south cline in selection for the above features, perhaps corresponding to the temperate and tropic regional differences in r- and K-selection discussed by Pianka (1970). Studies in cultivation and the correlation of propagula size with environmental parameters need to be done before the above suggestions can be considered anything more than hypotheses. Large, buried propagula are found in other species of Barbula sect. Convolutae as well as elsewhere in the Pottiaceae and in other moss families (Whitehouse, 1966, 1976).

There are several additional regional variants with unusual or locally stenotypic character states that may be geographic races. Two collections from Canada (Alberta: Vitt 24184--ALTA, Horton 15697--ALTA) are geographically isolated, have massive elliptical propagula in the upper leaf axils and all leaves are muticous, lacking the characteristic clear apiculus; however, many plants of the type of the synonym B. hypselostegia, from Mexico, match those of the Albertan collections exactly. Some specimens that I have seen from India have unusually thin, collapsed leaf cell walls that do not regain their original shapes after thorough wetting. Most specimens from the Philippines have the abaxial costal surface extremely rough with strongly protruding prorulae. Many collections from the West Indies show an unusual development of an epidermis of sub-quadrate, hollow-papillose cells on the distal abaxial surface of the costa; others have leaves that are long-ligulate and have capitulate, massive laminal papillae. These variants are not given infraspecific names because of abundant intergradation of character states and because most would be necessarily based on "one-character taxonomy," which I eschew.

Anoectangium aestivum (Hedw.) Mitt. when sterile may be confused with forms of B. indica; however, in the former the leaf base is usually poorly differentiated, the costa has only one stereid band and abaxial prorulae are lacking.

6. Barbula amplexifolia (Mitt.) Jaeg., Ber. S. Gall. Naturw. Ges. 1871-72: 424. 1873.

Basionym: Tortula amplexifolia Mitt., Jour. Linn. Soc. Bot. Suppl. 1: 29. 1859. Type: India, Uttar Pradesh, Kumaun, western Himalayas, Strachey & Winterbottom 15/37 (NY—holotype).

Synonyms: Hydrogonium amplexifolium (Mitt.) Chen, Hedwigia 80: 240. 1941.

Barbula haringae Crum, Southw. Naturalist 1(1): 36. 1956, syn. nov. Type: U.S.A., Arizona, Cochise Co., Huachuca Military Reserve, Goodding Cry. 85 (Haring 10000) (CANM—holotype, MICH—isotype); South Huachuca Game Preserve, Goodding Cry. 285 (Haring 10285a), Goodding Cry. 293 (Haring 10293) (CANM—paratypes).

Barbula amplexifolia has been described and illustrated by Gangulee (1972) as Hydrogonium amplexifolium and by Crum (1956) as B. haringae. Barbula coreensis (Card.) K. Saito, described and illustrated by Saito (1975), is doubtfully distinct. In addition to the type specimens of the synonym B. haringae that were reported from Arizona by Crum (1956) and the arctic Alaska collection reported as B. coreensis (det. R. Zander) by Steere (1978), the following collections represent the known New World distribution: Canada: Northwest Territories, District of Mackenzie, Liard Range, 12.8 km SW of Mt. Flett, 60° 34'N, 123°45'W, Vitt 20521 (ALTA); Nahanni National Park, South Nahanni R., Virginia Falls, 61° 38'N, 125° 42'W, Steere 76-605 (NY); U.S.A.: Alaska, Chandalar Quad., Yukon R.-Prudhoe Bay Haul Rd., Wiehl Mt., 67° 39'N, 149° 40'W, Murray 76-691B (ALA). The habitat includes mountain slopes, wet limestone cliffs, tundra, on or under damp rocks, mist zone of waterfall, at 760-1800 m elevation.

The short-ovoid to nearly spherical propagula of B. amplexifolia are found in masses in the leaf axils. The propagula are similar in and between most collections in the red-brown coloration and the size, usually 40-90 µm long. However, the very ample collection Steere 76-605, which includes many small sods, has propagula generally similar within each sod but heterogeneous between sods, grading from the normal size in some sods up to 150 µm long, short-elliptical, mostly only 3-4 in each axil, in other sods. Plants of sods with unusually large propagula have broader leaves than usual, these ovate-triangular, and approach the morphology of B. convoluta var gallinula (see below). Plants of this latter taxon may also be found in this collection and hybridization amy be the cause of intergradation in propagula characters in the Virginia Falls station; however, sporophytes of neither B. amplexifolia nor B. convoluta var. gallinula have been seen in the New World. A more probable explanation might be a plastic response on the part of certain sods of B. amplexifolia to unusual environmental factors, but there is no evidence at present to support this.

The abaxial costal surface is usually smooth in B. amplexifolia but in some specimens double prorulae similar to those of B. indica may be found. The former species differs from the latter in the stout costa, which is commonly short-excurrent, the sheathing leaf base and the propagula borne only in the leaf axils, subspheric, red-brown, and usually 40-90 µm long.

7a. **Barbula convoluta** Hedw. var. **convoluta**, Spec. Musc. 120. 1801.

Synonyms: *Tortula convoluta* (Hedw.) Gaertn., Meyer & Scherb., Oek. Techn. Fl. Wetterau 3(2): 92. 1802. — *Streblotrichum convolutum* (Hedw.) P. Beauv., Prodr. 89. 1805.

Additional synonymy is given by Podpera (1954) and Steere (1938).

Barbula convoluta is a well-known, common, widely distributed, Temperate Zone species described and illustrated by Saito (1975), Steere (1938) and others. The shape of the leaf apex is quite variable. It is known from Mexico from a single report from southern Baja California (Koch & Crum, 1950). Spherical to elliptical, red-brown multicellular propagula, often massive, are found on rhizoids buried in the soil in most collections. Rhizoidal propagula are seldom mentioned in descriptions although illustrated for B. convoluta by Hilpert (1933), Moenkemeyer (1927) and Wilczek & Demaret (1976). When present, such propagula allow this species to be distinguished with ease from the similar B. unguiculata, in which propagula have never been found in nature.

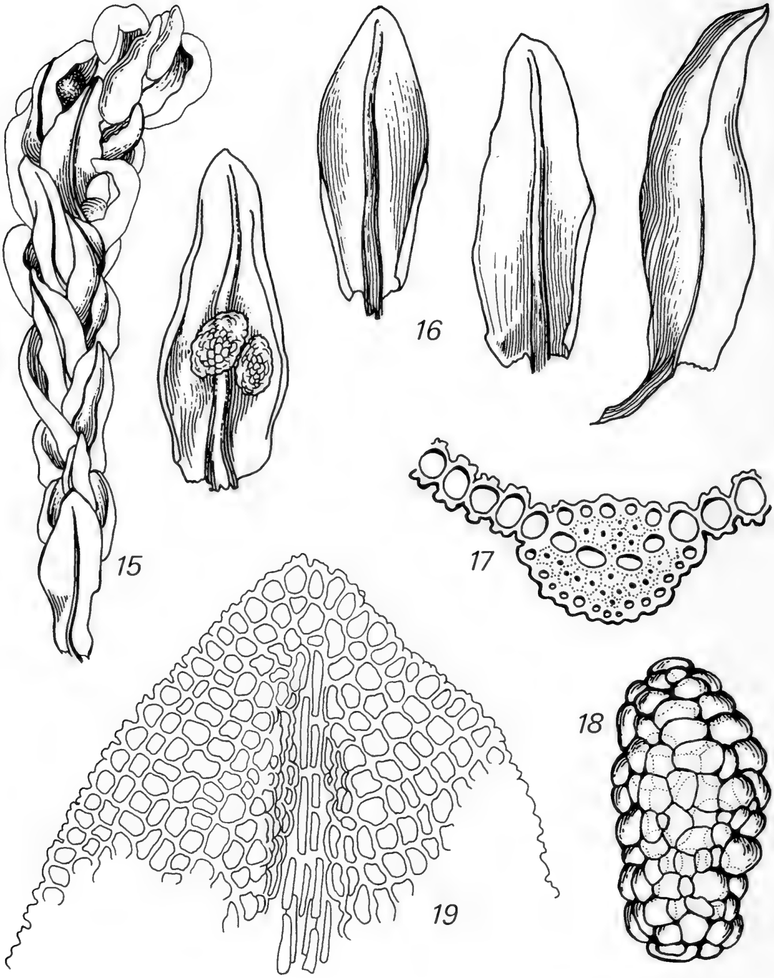
7b. *Barbula convoluta* var. *gallinula* Zander, var. nov.

Varietati typicae similis, sed propagulis portatis in pedicellis intra axillas foliorum superorum differt; folia ovalia, costis terminantibus in 2-4 cellulas sub apicibus foliorum.

Similar to the typical variety but differing by the propagula being borne on stalks in the axils of the upper leaves; leaves oval, with costae ending 2-4 cells below the leaf apices.

Type: Canada: Northwest Territories, District of Mackenzie, Nahanni National Park, South Nahanni R., Virginia Falls, 61° 38'N, 125° 42'W, *Scotter 22433*, 3 Sept. 1974 (NY--holotype; BUF--isotype). Paratypes: Canada: same locality, *Scotter 22408* (NY), *Steere 76-605* p.p. (NY); South Nahanni R., Kraus Hot Springs, 61° 15'N, 124° 03'W, *Steere 76-290* p.p. (ALA); U.S.A.: Alaska, Survey Pass Quad., confluence of Altna and Nahtuk Rivers, 67° 25'N, 153° 43'W, *Murray 5067c* (ALA); Philip Smith Quad., Yukon R.-Prudhoe Bay Haul Rd., W end of Atigun Canyon, 68° 27'N, 149° 18'W, *Murray 77-228* (ALA); Harrison Bay Quad., National Petroleum Reserve-Alaska, Fish Creek Test Well 1, 70° 19'n, 151° 58'W, *Murray 77-813B* (ALA).

Barbula convoluta var. *gallinula* (Fig. 15-19) is known only from sterile plants in alpine-montane areas of northwestern North America. The plants are not common where found and grow gregariously or as small sods on rock--mainly limestone--or soil, in lowland tundra slopes, on cliffs, or mist areas of waterfalls, from near sea level to 400 m elevation. The new variety differs from var. *convoluta* in the characters cited in the diagnosis above. Under the dissecting microscope, the egg-shaped propagula are easily visible in the axils of the leaves of wet or dry plants. The general appearence of the plants is reminiscent of poultry, whence the name. The axillary propagula are red-brown, spherical or elliptical, massive, 120-250 µm long, lacking apiculi or spines but otherwise similar to the propagula of facies "*B. gregaria*" of *B. indica*. There appears to be morphological and geographical discontinuity in the characters of propagula position in *B. convoluta* while no clear, similar discontinuity can be discerned in *B. indica*. Because *B. indica* with large axillary propagula has also been found in Canada, it is necessary to carefully determine the presence of simple papillae (not prorulae) on the abaxial costal surface. In addition, the leaf cells of *B. convoluta* var. *gallinula* are 9-12 µm wide, as opposed to 7-9(10) µm for *B. indica*. *Barbula convoluta* var. *gallinula* consistently has oval leaves; the var. *convoluta* occasionally may have oval leaves but usually such specimens have the costa ending 4-6 cells below the leaf apex. *Barbula amplexifolia* q.v. may approach *B. convoluta* var. *gallinula* closely in size of the propagula and in unusual, broadly deltoid leaves when both occur at the same station.



Figures 15-19. Barbula convoluta var. gallinula Zander. 15. Gametophore, X32. 16. Leaves, X46. 17. Costal transverse section near midleaf, X320. 18. Axillary propagulum, X320. 19. Leaf apex, X320.

The European Barbula convoluta var. propagulifera Glow. (Yugoslavia: Soca Tal, Kanal, Glowacki, 1909, GJO—holotype) is a new synonym of Gymnostomum aeruginosum Sm. The type corresponds to the facies "G. calcareum" and has small, clavate, axillary propagula (see discussion by Zander, 1977).

8. Barbula eustegia Card. & Ther., Bot. Gaz. 30: 17. 1900.
Type: U.S.A., Idaho, Latah Co., Cedar Creek, Henderson 4231 (NY—isotype). [Columbariate.]

Synonym: Barbula whitehouseae Crum, Southw. Naturalist 1(1): 35. 1956, syn. nov. Type: U.S.A., Texas, Fannin Co., Lake Crockett, ca. 19 km N of Honey Grove, Whitehouse 21001 (CANM—isotype); Tarrant Co., Eagle Mountain Lake, Whitehouse 17984 (CANM—isoparatype).

For additional synonymy, see Steere (1938).

This species was described and illustrated by Flowers (1973), Lawton (1971) and Steere (1938). It is known from Washington, Idaho, Montana, Utah and Texas in the U.S.A. and was reproted from British Columbia, Canada, by Crum (1965). Androgametophores are usually not noted in descriptions of B. eustegia. These are smaller than the gynogametophores and mixed with them, and are often minute, largely buried in the soil, with perigonia terminal (singly or paired). Propagula, similar to those of B. convoluta, are present on basal rhizoids in the soil in most specimens including the types of B. eustegia and B. whitehouseae. Both of these type collections, also, have apiculate leaf apices, and the lack of the apiculus is not a good character state for distinguishing B. eustegia from B. convoluta though indicated as such by some authors. Barbula eustegia apparently differs from B. convoluta only in the appearance of the perichaetial leaves (see key) and in its largely western distribution. It may better be recognized as a variety of B. convoluta (if at all) but is here presented as a "columbariate" (pigeonhole) species (cf. Zander, 1978a) pending further study. Crum (1965) and Steere (1938) considered B. eustegia to be closely related to the European B. flavipes B.S.G. (= B. enderesii Garov.). The perichaetial leaves of the latter species are far larger and more strongly differentiated in the specimens I have see than are those of B. eustegia. However, there is probably a close relationship—Moenkemeyer (1927) pointed out that the propagula of both B. convoluta and B. flavipes are similar in morphology and rhizoidal position.

BARBULA sect. HYDROGONIUM (C. Müll.) K. Saito, Jour. Hattori Bot. Lab. 39: 492. 1975.

Basionym: Trichostomum sect. Hydrogonium C. Mull., Linnaea 40: 297. 1876. Type species: Barbula ehrenbergii (Lor.) Fleisch. (lectotype by Saito, 1975).

Synonyms: Hydrogonium (C. Muell.) Jaeg., Ber. S. Gall. Naturw. Ges. 1877-78: 405. 1880. -- Barbula subg. Hydrogonium (C. Müll.) Fleisch., Musci Fl. Buitenzorg 1: 352. 1904.

This taxon is distinguished from the other sections of Barbula subg. Barbula by the leaves lax when wet; upper leaf margins plane to narrowly recurved, laminal cells usually rectangular, epapillose or seldom weakly papillose, their surfaces often adaxially more strongly convex than abaxially; the perichaetial leaves often convolute-sheathing; and, propagula often present, usually stellate and brown to green in color.

9. Barbula ehrenbergii (Lor.) Fleisch., Musci Arch. Indic. Exs. ser 4: n. 161. 1901. [Columbariate.]

Basionym: Trichostomum ehrenbergii Lor., Abhandl. Akad. Wiss. Berlin 1867: 25. 1868.

Synonym: Barbula ehrenbergii var. mexicana Ther., Smiths. Misc. Coll. 85(4): 19. 1931, syn. nov. Type: Mexico, Nuevo Leon, Monterray, Abbon 10969 (PC--holotype).

For additional synonymy, see Podpera (1954).

Description and illustration of B. ehrenbergii has been given by Flowers (1973) and Steere (1938), among others. This species intergrades with B. arcuata in Mexico and Central America; some collections (e.g. Belize: Big Falls, Lundell, 1965--NY) are quite impossible to assign to either species. In the New World, B. ehrenbergii is largely a Temperate Zone species, while B. arcuata is restricted to the West Indies, Mexico, Central America, and areas of South America. The leaves of the former are more commonly papillose (albeit weakly so) than are those of the latter. Nonetheless, the two should be considered columbariate species until an intensive study can be made of their relationship.

Barbula abbonii Ther. (Mexico: Nuevo Leon, Monterrey, Abbon 10970, PC—holotype) is referred to B. ehrenbergii by Crum (1951); however, the tubulose, relexed leaves with broadly decurrent basal margins and yellow-brown upper laminal cells, lead me to believe that it is a synonym of Didymodon tophaceus (Brid.) Lisa.

Barbula ehrenbergii is reported (Crum, 1951; Flowers, 1973; Steere, 1938) in North America from the U.S.A. in Missouri, Texas, Okalahoma and Utah, and from Mexico in Coahuila, Nuevo León and San

Luis Potosi. I have also seen a Mexican collection from Chihuahua, Sta. Elena Canyon of Rio Grande, Fern Canyon, 29° 09'N, 103° 39'W, Wendt & Lott 101 (TENN). In other areas of the New World it is known from Belize (Steere, 1934) and Cuba (Theriot, 1939-1941; Welch, 1950). I agree with Crum and Steere (1958) that the report of this species from Haiti (Theriot, 1944) was based on a specimen (PC!) that is actually Hymenostylium recurvirostrum (Hedw.) Dix. The habitat of B. ehrenbergii is wet rocks, usually calcareous, often in springs or running water, often tufa-forming.

Barbula ehrenbergii (Lor.) Fleisch. is indicated to be an illegitimate homonym in the Supplement (Volume 5) of Index Muscorum (van der Wijk, 1959-1969). However, the supposed earlier name was apparently only a mispelling of B. ehrenbergiana on the part of Kindberg (1888-1891) and is not listed in Steere and Crum's (1977) catalogue of Kindberg's new combinations and new taxa.

10. **Barbula arcuata** Griff., Calcutta Jour. Nat. Hist. 2: 491. 1842. Type: India, Griffith 27 (BM—holotype). [S. ampl. & columb.]

Synonyms: Hydrogonium arcuatum (Griff.) Wijk & Marg., Taxon 7: 289. 1958.

Barbula subulifolia Sull., Proc. Amer. Acad. Arts Sci. 5: 227. 1861, syn. nov. Type: Cuba, Wright 32 (BM—isotype). — Tortula subulifolia (Sull.) Mitt., Jour. Linn. Soc. Bot. 12: 161. 1869.

Barbula crispula Hampe in Jaeg., Ber. S. Gall. Ges. 1871-72: 438. 1873 (Ad. 1: 286), syn. nov. Type: Cuba: Wright 27 (BM—holotype).

Barbula macrogonia Besch., Jour. de Bot. 8: 61. 1894, syn. nov. Type: Guadeloupe, Baines Jaunes, Marie s.n. (BM—isotype).

Barbula suberythropoda C. Mull., Bull. Herb. Boiss. 5: 194. 1897, syn. nov. Type: Guatemala, Alta Vera Paz, Pansamala, Tuerckheim, 1887 (BM, NY—isotypes).

Barbula ferrinervis C. Mull., Bull. Herb. Boiss. 5: 557. 1897, syn. nov. Type: Jamaica, Bridge Hill, Harris 11026 (BM, NY—isotypes).

Barbula ferrinervis var. eggersiana C. Muell., Hedwigia 37: 232. 1898, syn. nov. Type: Santo Domingo, Rio Camú, Eggers 2685 (June 1887) (BM—isotype). — Barbula eggersiana (C. Mull.) C. Mull., Gen. Musc. Frond. 437. 1900.

Trichostomum setifolium C. Müll., Hedwigia 37: 234. 1898, syn. nov. Type: Puerto Rico, Sabana, Sintensis, 1886 (BM, NY--isotypes). -- Barbula setifolia (C. Müll.) Broth., Nat. Pfl. 1(3): 408. 1902.

Barbula stillicidiorum Card., Rev. Bryol. 37: 126. 1910, syn. nov. Type: Mexico, Veracruz, Barnes & Land, 1906 (NY--isotype).

Barbula rubricaulis Ther., Smiths. Misc. Coll. 85(4): 19. 1931, syn. nov. Type: Mexico, Nuevo León, Monterrey, Abbon 10968 (FH--isotype).

For additional synonymy, see Gangulee (1972) and Saito (1975).

Barbula arcuata is known in the Old World from India, Burma, Malaysia, Indonesia, Molucca, New Guinea, the Philippines, China, Japan and western Oceania. It has been well described and illustrated by Gangulee (1972) and Saito (1975). Its New World distribution is similarly tropical and subtropical. I have seen material from Mexico (Nuevo Leon, Veracruz), Guatemala, Cuba, Jamaica, Haiti, Dominican Republic, Puerto Rico, Guadeloupe, and Venezuela. Steere (1948) reported it, as the synonym B. subulifolia, from Ecuador. Judging from the checklist of Pursell (1973), I here report this species as new to Venezuela: Miranda, between Los Ocumites tunnel and Cortada de Maturìn highway (Caracas-Valencia), Ramìrez Cr 46-74 (TENN). The habitat includes wet cliffs, riverbanks, calcareous soil, wet rock, travertine, at 150-1350 m elevation.

As is common in hygrophytes, Barbula arcuata is polymorphic. The leaf shape is especially variable; some forms approach the broad-elliptical leaves of B. ehrenbergii and other forms, these mainly in the West Indies, have very narrow, subulate leaves, such as in the types of B. ferrinervis or B. setifolium, synonyms. The terminal perigonia may be visually accentuated in plants with very narrow leaves (e.g. the type of the synonym B. macrogonia). Multicellular, green, fusiform to stellate propagula are commonly present, borne on branching stalks in the leaf axils, and are similar to those of Hyophila involuta (Hook.) Jaeg. & Sauerb. Whitehouse (1976) has discussed the considerable variation in size and degree of ornamentation of propagula of B. arcuata.

Barbula arcuata is similar to B. indica in the red, spiculose, usually highly twisted peristome. The two species often grow intermixed. In hygric habitats, the leaves of B. indica are more flaccid than usual and may be confused with those of B. arcuata. Barbula arcuata differs from B. indica in the long-triangular leaves with 1-3 apical teeth, costa abaxially smooth or sharply crenulate by projecting cell cross walls, adaxial surface of costa often bulging, not in a groove, adaxial stereid band of costa often nearly as large as the dorsal, and laminal cells smooth, short-rectangular.

BARBULA subgenus HYOPHILADELPHUS (C. Müll.) Zander, stat. nov.

Basionym: Barbula sect. Hyophiladelphus C. Müll., Syn. Musc. 1: 604. 1848. Type: Barbula agraria Hedw. (lectotype).

Synonyms: Tortula sect. Hyophiladelphus (C. Müll.) Broth., Nat. Pfl. 1(3): 429. 1902.

Barbula sect. Agrariae Steere in Grout, Moss Fl. No. Amer. 1(3): 173. 1938, nom. illeg. Type species: Barbula agraria Hedw.

Steere (1938) speculated, with good reason, that Barbula agraria Hedw. was probably sufficiently different from both Barbula and Tortula to justify the designation of a new genus. I agree that it is rather distinctive but recognize it here in a monotypic subgenus. The salient character states of subg. Hyophiladelphus are the long, red, spiculose, twisted peristome teeth, the revoluble annulus, the moderately differentiated perichaetial leaves, the spathulate, epapillose leaves with adaxially strongly bulging cell walls, and the costa sharply mucronate, with two stereid bands and ventral surface of longitudinally elongate cells. Luisierella barbula (Schwaegr.) Steere has a similar strongly colliculate adaxial laminal surface and nearly smooth abaxial surface, but the peristome is not twisted, the leaves are ligulate, the laminal cells have rounded, not quadrate lumens, the costa has an adaxial epidermis of cells similar to those of the lamina, and propagula are often present.

11. **Barbula agraria** Hedw., Spec. Musc. 116. 1801. Type: "Jamaica et Domingo," Swartz s.n. (G—syntype, BM—syntype?).

Synonyms: Tortula agraria (Hedw.) P. Beauv., Prodr. 91. 1805.

Bryum stellatum Dicks. ex With., Syst. Arr. Brit. Pl. ed. 4, 3: 796. 1801. Type: Anon., s.n. (BM--holotype?). — Tortula stellata (Dicks. ex With.) Sm., Fl. Brit. 3: 1254. 1804. — Barbula stellata (Dicks. ex With.) Brid., Mant. Musc. 88. 1819.

Tortula linearifolia P. Beauv., Prodr. 92. 1805.

Tortula pallens Brid., Spec. Musc. 1: 246. 1806. — Barbula pallens (Brid.) Brid., Mant. Musc. 88. 1819.

Tortula decipiens Brid., Spec. Musc. 1: 247. 1806, nom. inval. incl. spec. prior. [T. linearifolia P. Beauv., 1805].

Barbula acuminata Brid. in Roehl., Deutsch. Fl. Krypt. ed. 2, 3: 79. 1813 non. B. acuminata Hedw., 1801. -- Barbula agraria var. acuminata (Brid.) Brid., Mant. Musc. 88. 1819. -- Tortula agraria var. acuminata (Brid.) Mont., Ann. Sci. Nat. Bot. ser. 2, 14: 347. 1840.

Barbula domestica Brid., Mant. Musc. 89. 1819. Type: Antilles, Richard s.n. (BM--isotype).

Barbula latifolia Brid., Bryol. Univ. 1: 536. 1826. -- Tortula latifolia (Brid.) Mont. in Ramon de la Sagra, Hist. Fis. Cuba Bot. Pl. Cell. 513. 1838-1842 non T. latifolia Bruch ex Hartm., 1832.

Barbula rauii Aust., Bull. Torrey Bot. Cl. 6: 43. 1875.

Barbula husnotii Schimp. ex Besch., Ann. Sci. Nat. Bot. ser. 6, 3: 199. 1876, syn. nov. Type: Martinique, Gueydon, and Guadeloupe, Basse-Terre and bridge of Noire R. (apparently a mixture), Husnot s.n. (Husnot, Pl. des Antilles 139) (BM, FH--isotypes). -- Tortula husnotii (Schimp. ex Besch.) Broth., Nat. Pfl. 1(3): 429. 1902.

Barbula subagraria C. Müll., Bull. Herb. Boiss. 5: 193. 1897. -- Tortula subagraria (C. Müll.) Broth., Nat. Pfl. 1(3): 429. 1902.

Barbula agraria fo. involuta Biz. & Thér., Mem. Soc. Cub. Nat. Hist. 13: 273. 1939, nom. inval. descr. gall., syn. nov. Type: Cuba, Oriente, Baracoa, Ekman 4490 (FH—isotype).

Barbula agraria was illustrated and described by Bartram (1949), Breene (1963), Crum and Steere (1957), and Steere (1938). Crum (1951) gave the distribution of this common tropical moss as U.S.A. (Florida, Louisiana, Texas), Mexico (Campeche, Hidalgo, Quintana Roo, San Luis Potosí, Veracruz, Yucatán), Guatemala, West Indies, and northern South America. The habitat includes soil, rocks, walls, coral, limestone, sandstone, brick, from near sea level to 350 m elevation. Although certain other species of Barbula (B. arcuata, B. indica)that are also widespread in tropical America have proven to be pantropical, B. agraria is apparently a New World endemic. There are no closely related species. Species of Hyophila also have an areolation of epapillose, adaxially bulging cells. But these species have laminal cells with evenly thickened walls, subquadrate to rounded lumens and a yellow-brown color cast, giving a far different appearance. The areolation of B. agraria is of thin-walled, rectangular cells and lumens, with a clear to light yellow coloration.

Although it has a spathulate leaf shape and long, twisted peristome of 32 spiculose teeth, B. agraria differs from Tortula species in the distinctive leaf areolation and the costa having two stereid bands. It differs from other species of Barbula in the areolation, the revoluble annulus, and the spathulate leaf shape. A further difference may be in sexual condition. Barbula species are consistently dioicous. Most authors (including Hedwig, 1787-1797) who have described B. agraria (under synonyms) apparently have been unable to determine sexual condition. However, Swartz (1806) indicated that this species has distinct androgametophytes, but Müller (1949) described it as monoicous, the androecia being terminal on a basal branch. In fact, perigonia are very difficult to locate and are absent, seemingly, in many collections. When found, they occur on what appear to be separate, minute androgametophores that grow contiguous to the gynogametophores. The possibility that B. agraria is rhizautoicous, remains, is taxonomically important, and should be tested in experimental cultivation.

PSEUDOCROSSIDIUM Williams, Bull. Torrey Bot. Cl. 42: 396. 1915.
Type species: Pseudocrossidium chilense Williams.

Synonyms: Barbula sect. Revolutae B.S.G., Bryol. Eur. 2: 89. 1842 (fasc. 13-15 Mon. 27), syn. nov. Type species: Barbula revoluta Brid. in Schrad. -- Barbula subsect. Revolutae (B.S.G.) Chen, Hedwigia 80: 209. 1941.

As discussed by Zander and Steere (1978b), this genus is distinguished from Barbula mainly by the trend to elaboration of parts of the leaf as photosynthetic organs, either in differentiation of a pad of adaxial costal filaments, as is found in Crossidium Jur. of the Pottieae, or of thin-walled, hollow-papillose cells of the interior of the often spiral-revolute upper leaf margins, as in certain species of Tortula sect. Cuneifoliae (B.S.G.) Spruce, or both elaborations may occur in the same species. Character states associated with the strongly revolute margins are thickening of the superficial laminal cell walls, often of a deep yellow-brown color, of the exposed adaxial laminal surface near the margins. This thickening is only medial on the abaxial surface of the leaf. Additional characters are leaves usually lacking an adaxial stereid band, and perichaetial leaves usually highly differentiated, convolute-sheathing and largely prosenchymatous in most species. Although many specimens of Pseudocrossidium species are similar to Tortula in having only one stereid band, Pseudocrossidium is easily distinguished from Tortula by the differentiation of an abaxial costal epidermis. This consists of one layer of either comparatively thin-walled, wide-lumened cells or thick-walled cells with small, semicircular lumens, or intergradations between these expressions. An abaxial costal epidermis is lacking or rarely poorly differentiated in Tortula. This convenient distinction has not been previously recognized and one might expect to find further synonyms in Tortula that rightly belong in Pseudocrossidium if other characters agree. Pseudocrossidium is, however, similar to Tortula in the presence of Begleiter (leaf strand) cells. These are located between the abaxial stereid band and the guide cells in P. apiculatum, P. aureum,

P. leucocalyx, P. replicatum and P. revolutum. I have never seen Begleiter cells in costal sections of species of Pleuroweisieae; however, these occur in some taxa of Barbuleae (e.g. Barbula unguiculata, B. orizabensis) and in many taxa of Pottieae, including species of Tortula and Crossidium. Pseudocrossidium is somewhat intermediate in character between Barbula sect. Barbula and Tortula, but is probably best placed in the Barbuleae near Barbula on the basis of the abaxial costal epidermis and the occasional presence of an adaxial stereid band in the costa of some species.

Pseudocrossidium species appear to form a north-south gradient in morphological elaboration, in that North American and European species lack some of the salient characters distinguishing the South American species (see appended key to South American species). The northernmost-ranging species, P. revolutum, is much reduced in size and lacks most of the distinguishing characters of the genus but is related through P. aureum and P. replicatum.

12. **Pseudocrossidium revolutum** (Brid. in Schrad.) Zander, comb. nov.

Basionym: Barbula revoluta Brid. in Schrad., Jour. Bot. (Gott.) 1800(2): 299. 1801.

Synonyms: Tortula revoluta (Brid.) Schrad., Bot. Zeit. Regensburg 1: 214. 1802.

Barbula platyneura C. Müll. & Kindb. in Macoun, Cat. Canad. Pl. 6: 52. 1892, syn. nov. Type: Canada, British Columbia, Deer Park, Arrow Lake, Macoun 244 (CANM--isotype).

Desmatodon ellesmerensis Brassard, Bryologist 74: 208. 1971, syn. nov. Type: Canada, Northwest Territories, Ellesmere Is., 82° 30'N, 62° 20'W, Brassard 4467 (BUF--isotype).

Pseudocrossidium revolutum is described and illustrated by European authors as Barbula revoluta, a synonym. This species is widespread in Europe, western Asia and northern Africa (Podpěra, 1954), and occurs in South Africa fide Index Muscorum (van der Wijk et al., 1959-1969). I have seen New World material (cited below) of P. revolutum from several areas in north Canada and from the Pacific Coast of Canada and the U.S.A. When present, the convolute-sheathing perichaetial leaves and the propagula borne on the adaxial surface of the costa easily distinguish P. revolutum from the very similar southern species P. replicatum. However, none of the North American specimens bore sporophytes and in only one (isotype of B. platyneura at DUKE) were propagula found on the leaves. However, the small plant size and weakly recurved leaf margins that are not or weakly differentiated as photosynthetic organs indicate appropriate referral to P. revolutum. The gametophores regenerating in experimental culture from U.S.A., California, Galloway 242 (H.L.K. Whitehouse, pers. comm.) formed differentiated perichaetial leaves quite unlike those of P. replicatum. An Ecuadorian specimen in a small packet glued to a sheet together with the type of *Barbula replicata* Tayl. at BM is possibly *P. revolutum*. It has the highly differentiated perichaetial leaves seen in European collections of *P. revolutum* and the capsules are much smaller than those of *P. replicatum*, being only 1.1-1.3 mm long. The leaves are similar to those of *P. revolutum*, but this fragmentary specimen may be only a poorly developed form of *P. excavatum* (Mitt.) Williams, which normally has well-developed marginal photosynthetic organs (see key below).

North American specimens of *P. revolutum* have apiculate to short-mucronate, subacute to blunt leaf apices that are similar to *P. revolutum* in Europe, but are perhaps more strongly mucronate. The synonym *Barbula platyneura* was indicated by Steere (1938) to be an "American counterpart of the European *B. hornschuchiana*." However, the latter is distinguished from *P. revolutum* by the very narrowly acute leaf apex with a strongly excurrent mucro, and apparently never produces propagula. A combination in *Pseudocrossidium* is given here for this European taxon.

Pseudocrossidium hornschuchianum (Schultz) Zander, comb. nov.

Basionym: *Barbula hornschuchiana* Schultz, Flora 5(Syll.): 36. 1822.

Synonyms: *Barbula revoluta* var. *hornschuchiana* (Schultz) Brid., Bryol. Univ. 1: 572. 1826. -- *Tortula hornschuchiana* (Schultz) De Not., Syll. 179. 1838. -- *Tortula revoluta* var. *hornschuchiana* (Schultz) De Not., Mem. Roy. Acc. Sci. Torino 40: 315. 1838.

Combination of these European names in the heretofore exotic genus *Pseudocrossidium* may be disconcerting to some bryologists; however, it is possible that the study of neotropical taxa is the key to understanding the relationships of many European species.

New World collections of *P. revolutum*, other than the types cited above, include: Canada, Yukon, Firth River Basin, lower Manche Creek, *Sharp 58219b* (NY); U.S.A., Oregon, Sherman Co., along White R. tributary, Deschutes R., *Pechanec 1259* (herb. G.R. Brassard), California, San Diego Co., Descanso Distr., Cleveland National Forest, Boulder Creek Rd., *Galloway 242* (CSPU). Possibly *P. revolutum* is: Ecuador, Pichincha, Quite, *Jameson* s.n., as "*Tortula replicata*?" (BM). The habitat includes soil, rocks, north-facing cliffs, calcareous outcrops and soil, from 75-1050 m elevation.

13. Pseudocrossidium replicatum (Tayl.) Zander, comb. nov.

Basionym: Barbula replicata Tayl., London Jour. Bot. 5: 49. 1846. Type: Ecuador, Pichincha, Quito, walls, Jameson, 1847 (BM, NY--isotypes).

Synonyms: Tortula replicata (Tayl.) Wils., London Jour. Bot. 5: 454. 1846.

Barbula spiralis Schimp. ex C. Müll., Syn. Musc. 1: 622. 1849, syn. nov. Type: Mexico, Veracruz, Yarrea, Mirador, Liebmann, 1842 (BM--isotype). -- Tortula spiralis (Schimp. ex C. Müll.) Mitt., Jour. Linn. Soc. Bot. 12: 151. 1869.

Barbula apiculata Hampe, Linnaea 31: 519. 1862 non B. apiculata Hedw., 1801. -- Tortula apiculata Mitt., Jour. Linn. Soc. Bot. 12: 153. 1869 (nom. nov. for B. apiculata Hampe) non T. apiculata (Hedw.) Turn., 1804.

Barbula perlinearis C. Müll., Bull. Herb. Boiss. 5: 195. 1897, syn. nov. Type: Guatemata, Quezaltenango, Bernoulli & Cario 118 (NY--isotype).

Barbula spiralis var. emarginata Card., Rev. Bryol. 36: 84. 1909, syn. nov. Type: Mexico, México, Amecameca, Pringle 10611 (BM, MEXU, F, FH--isotypes).

F. Bowers (pers. comm.) has studied Pseudocrossidium and agrees with me that P. replicatum is appropriately placed in this genus. This species is unusual but not alone in the genus in having only weakly differentiated perichaetial leaves and the costa being merely mucronate, not short-awned. However, the strongly spiralled leaf margins, with thin-walled, hollow-papillose, deeply chlorophyllose interior cells, the upper laminal cells papillose medially but becoming epapillose towards the margins (on the exposed lamina), and the distinctive transverse section of the costa that shows only one stereid band and often Begleiter cell development, are in combination diagnostic features. It is closely related to P. aureum, in which the margins are not modified as photosynthetic organs and the costa is short-awned. A specimen of P. replicatum from Ecuador (Tungurahua, Ambato, Spruce 231--NY) has a strongly excurrent costa similar to that of P. aureum. Both species may develop a characteristic line of large-lumened, superficially thick-walled cells, often of a deep yellow or orange color, abaxially at the juncture of the costa and lamina, though this is less common in P. replicatum than in P. aureum. There is also a close relationship of P. replicatum to P. revolutum, but P. replicatum has more strongly revolute leaf margins, never has the propagula that are commonly found at least in European collections of P. revolutum, and never develops convolute-sheathing, largely prosenchymatous perichaetial leaves.

14. Pseudocrossidium aureum (Bartr.) Zander, comb. nov.

Basionym: Tortula aurea Bartr., Bull. Torrey Bot. Cl. 51: 339. 1924. Type: U.S.A., Arizona, Pima Co., Santa Catalina Mts., Bear Canyon, Bartram 307 (Bartram, Mosses So. Arizona 98) (FH—holotype, CU—isotype).

Synonym: Barbula aurea (Bartr.) Zander in Zander & Steere, Bryologist 81: 466. 1978.

This species was described and illustrated by Bartram (1924) and Steere (1938). It has been known from U.S.A.: Arizona, New Mexico and Texas (Steere (1938) and Mexico: Chihuahua, Coahuila, Hidalgo, San Luis Potosi, Sonora and Zacatecas (Crum, 1951). An additional locality is Mexico: Puebla, 6 km NW of Zacatepec, Delgadillo 3603b (MEXU). Its habitat is very dry or desert areas, on ledges, soil, canyon walls or rock outcrops, at 800–2350 m elevation. Magill (1976) noted that in Big Bend National Park in southwestern Texas, U.S.A., it is both locally abundant and the most frequently encountered moss of desert or grassland communities; Bartram (1924) indicated that it is common on dry ledges in the region of the type locality. The sporophytes of this species are unknown. The leaf margins vary between collections from broadly once-revolute to narrowly recurved. It is placed in Psuedocrossidium on the basis of the lack of an adaxial stereid band and presence of an abaxial epidermis in the costa, in addition to having Begleiter cells and the general appearance of the genus. Although closely related to P. replicatum, it differs in lacking marginal photosynthetic organs and in having a short awn. Pseudocrossidium aureum often has a row of large-lumened, cubical to short-oblong superficial cells, slightly larger than the laminal cells, abaxially along the juncture of the upper costa and leaf lamina. These distinctive cells are often superficially thick-walled and deep yellow-brown or orange in coloration, with the appearance of a row of ocelli.

* * * *

The foregoing key to taxa of Barbula and Pseudocrossidium will suffice for all species of Pseudocrossidium in North and Central America. The species in South America may be distinguished by the very tentative key given below, which is based largely on specimens at NY. I have not seen material of P. elatum or P. pachygatrellum. However, F. Bowers (pers. comm.) has studied the former species and believes it to be a Pseudocrossidium.

KEY TO SPECIES OF PSEUDOCROSSIDIUM IN SOUTH AMERICA

1. Adaxial epidermal cells of costa in one layer above guide cells, not forming filaments.................................. 2.

1. Adaxial epidermal cells of costa in 2 to several layers above guide cells, usually differentiated as separate filaments..... 3.

   2. Leaf margins recurved, upper medial laminal cells with spiculose papillae centered over the bulging lumens; Chile.................. *P. leucocalyx* (Mont.) Ther.

   2. Leaf margins once revolute to spiral-revolute, upper medial laminal cells with low, bifid to multiplex papillae apparently scattered over the weakly convex lumens; throughout Andes.............. *P. replicatum* (Tayl.) Zander

3. Leaf margins not differentiated as photosynthetic organs...... 4.

3. Leaf margins spiral-revolute, interior cells strongly chlorophyllose, thin-walled, hollow-papillose................................. 5.

   4. Leaves apiculate, costa percurrent, perichaetial leaves weakly differentiated; Peru...................................... ....*P. elatum* (Williams) Delgadillo

   4. Leaves obtuse, costa ending below apex, perichaetial leaves strongly differentiated; Chile... *P. chilense* Williams

5. Leaves 0.5-0.7 mm long, apiculate; Ecuador....................... ....*P. excavatum* (Mitt.) Williams

5. Leaves 1.2-1.8 mm long, mucronate to short-awned.............. 6.

   6. Leaves mucronate; Bolivia... *P. pachygastrellum* (Herz.) Broth.

   6. Leaves short-awned; Peru, Chile.............................. .... *P. apiculatum* Williams

EXCLUDED TAXA

In a treatment of the genus *Tuerckheimia* (Zander, 1978c), I indicated that *T. linearis* (Web. & Mohr) Britt. should be recognized as *Barbula linearis* Web. & Mohr, because of a supposed close relationship to *B. indica*. This was incorrect, being based upon a series of specimens at NY that included both *T. linearis* and West Indian expressions of *B. indica* with unusually long leaves and often rather massive laminal papillae. Material, including an isotype of *T. lineare*, that had been examined by Britton (1913) and Crum and Steere (1957) for their discussions of *T. lineare* has been located at NY, for which I thank W.R. Buck. On examination of these specimens and of the holotype ("Fl. Ind. Or." leg. Swartz s.n.) from SPA, I find that T. linearis is probably best recognized as Oxystegus linearis (Web. & Mohr) Hilp. The illustrations by Crum and Steere (1957), which I had suggested were probably O. tenuirostris (Hook. & Tayl.) A.J.E. Sm., are actually quite representative of most material of O. linearis. Oxystegus linearis is distinguished from Barbula indica by the broad costa with two layers of guide cells (in most collections), the lamina inserted laterally on the costa, not adaxially and thus not forming an adaxial laminal groove, and the basal laminal cells sharply differentiated, inflated, comprising an oval, somewhat sheathing leaf base. It differs from O. tenuirostris by the 32 anastomosing, filiform, closely spiculose, red peristome teeth borne on a distinct basal membrane, the weakly sheathing leaf base and the two layers of guide cells usually found in the costa. The differences in peristome structure between O. linearis and O. tenuirostris may seem extreme; however, Grout (1938b) noted similar variation to occur between different collections of Trichostomum jamaicense (Mitt.) Jaeg. in the West Indies. Also, many collections of Trichostomum species have peristomes lacking basal membranes, and the usual distinctions between the genera Oxystegus and Trichostomum seem to me rather arbitrary or even baseless in respect to peristome characters. Clarification of relationships between genera of Trichostomoideae await more intensive study, however.

Other North American species of Barbula that are not listed here or in the lists of synonymy cited above, or which are not treated in my review of Didymodon for North America north of Mexico (Zander, 1978a), are synonyms of species of Didymodon and will be discussed in a forthcoming paper on Didymodon in Mexico. However, Barbula crassicuspis H. Robinson is a synonym of Morinia crassicuspis (H. Robinson) Zander (Zander, 1978b).

CORRECTIONS

In a treatment of Didymodon in North America north of Mexico (Zander, 1978a), I dealt with the Didymodon fallax group of species as Didymodon sect. Graciles (Milde) K. Saito. However, an earlier name, noted in the Supplement to the Index Muscorum (van der Wijk et al., 1959-1969), is available at the sectional level.

Didymodon section Fallaces (De Not.) Zander, comb. nov.

Basionym: Tortula sect. Fallaces De Not., Mem. Roy. Acc. Sci. Torino 40: 287. 1838. Type species: Barbula fallax Hedw.

Synonyms: Barbula sect. Fallaces (De Not.) Steere in Grout, Moss Fl. No. Amer. 1: 174. 1938.

Barbula sect. Graciles Milde, Bryol. Siles. 117. 1869. Type species: Barbula rigidicaulis C. Muell. —

Didymodon sect. Graciles (Milde) K. Saito, Jour. Hattori Bot. Lab. 39: 504. 1975.

Barbula subsect. Fallaciformes Kindb., Eur. No. Amer. Bryin. 2: 246. 1897.

Additional synonyms are given by Saito (1975).

In the same paper, Didymodon reedii H. Robins. was inadvertently left out of the key. "See 11. D. reedii" should be inserted next to D. brachyphyllus (Sull. in Whipple) Zander on page 17.

SUMMARY

Taxa recognized in North America:

Barbula Hedw. subg. Barbula

sect. Barbula
- B. unguiculata Hedw.
- B. orizabensis C. Müll.
- B. calcarea Ther.
- B. inaequalifolia Tayl.

sect. Convolutae B.S.G.
- B. indica (Hook.) Spreng. [s. ampl.]
- B. amplexifolia (Mitt.) Jaeg.
- B. convoluta Hedw.
  - var. convoluta
  - var. gallinula Zander, var. nov.
- B. eustegia Card. & Ther. [columb.]

sect. Hydrogonium (C. Mull.) K. Saito
- B. ehrenbergii (Lor.) Fleisch. [columb.]
- B. arcuata Griff. [s. ampl. & columb.]

Barbula subg. Hyophiladelphus (C. Müll.) Zander, stat. nov.

- B. agraria Hedw.

Pseudocrossidium Williams

- P. revolutum (Brid. in Schrad.) Zander, comb. nov.
- P. replicatum (Tayl.) Zander, comb. nov.
- P. aureum (Bartr.) Zander, comb. nov.

Other nomenclatural novelty:

Pseudocrossidium hornschuchianum (Schultz) Zander, comb. nov.

New taxonomic synonyms in Barbula and Pseudocrossidium
(basionyms of species alphabetized by epithet):

Barbula sect. Revolutae B.S.G. = Pseudocrossidium

Barbula abbonii Ther. = Didymodon tophaceus
Barbula agraria fo. involuta Bix. & Ther. = B. agraria
Barbula convoluta var. propagulifera Glow. = Gymnostomum aeruginosum
Barbula crispula Hampe in Jaeg. = B. arcuata
Barbula cruegeri Sond. ex C. Müll. = B. indica
Barbula ehrenbergii var. mexicana Ther. = B. ehrenbergii
Desmatodon ellesmerensis Brassard = P. revolutum
Barbula erosa Hampe in C. Mull. = B. indica
Barbula ferrinervis C. Mull. = B. arcuata
Barbula ferrinervis var. eggersiana C. Mull. = B. arcuata
Tortula gregaria Mitt. = B. indica
Barbula haringae Crum = B. amplexifolia
Barbula horrinervis K. Saito = B. indica
Barbula husnotii Schimp. ex Besch. = B. agraria
Barbula hypselostegia Card. = B. indica
Barbula linguaefolia Bartr. = B. calcarea
Barbula macrogonia Besch. = B. arcuata
Barbula microglottis C. Mull. = B. indica
Barbula muenchii Card. = B. indica
Barbula perlinearis C. Mull. = P. replicatum
Barbula platyneura C. Mull. & Kindb. = P. revolutum
Barbula pringlei Card. = B. indica
Barbula purpuripes C. Mull. = B. indica
Barbula rubricaulis Ther. = B. arcuata
Barbula rufipes Schimp. ex Besch. = B. indica
Trichostomum setifolium C. Mull. = B. arcuata
Barbula spiralis Schimp. ex C. Mull. = P. replicatum
Barbula spiralis var. emarginata Card. = P. replicatum
Barbula stenotheca Ther. = B. orizabensis
Barbula stillicidiorum Card. = B. arcuata
Barbula suberythropoda C. Mull. = B. arcuata
Barbula subulifolia Sull. = B. arcuata
Barbula unguiculata fo. propagulosa Crum = B. indica
Barbula whitehouseae Crum = B. eustegia
Barbula wrightii Sauerb. in Jaeg. = B. indica

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NOTES ON NEW AND NOTEWORTHY PLANTS. CXXIX

Harold N. Moldenke

AEGIPHILA MEMBRANACEA var. *BOLIVIANA* Mold., var. nov.

Haec varietas a forma typica speciei pubescentibus distincte longioreque brunneo-hispidulis vel villosulis recedit.

This variety differs from the typical form of the species chiefly in having the conspicuous pubescence on the branches, branchlets, and larger venation on the lower leaf-surface longer and stiffly brown-villosulous or hirsutulous, spreading at right angles to the substrate.

The type of the variety was collected by William R. Anderson *(no. 11929)* in roadside thickets (capoeira) 5--10 km. northwest of Guayaramerin on the road to Cachuela Esperanza, El Beni, Bolivia, on January 31, 1978, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collector describes the plant as a slender unbranched shrub 2.5 m. tall, the fruits yellow.

JUNELLIA JUNIPERINA var. *CAMPESTRIS* (Griseb.) Mold., comb. nov.

Verbena juniperina var. *campestris* Griseb., Pl. Lorentz. 193. 1874.

LANTANA CANESCENS f. *GRANDIFOLIA* Mold., f. nov.

Haec forma a forma typica speciei laminis foliorum distincte ovalibus usque ad 11 cm. longis 5 cm. latis recedit.

This form differs from the typical form of the species in its much larger leaves, the blades of which are distinctly oval, to about 11 cm. long and 5 cm. wide.

The form is based on *Herrera 211* collected in the Quebrada de Cules, Río Cules, dept. Famaillá, Tucumán, Argentina, on March 4, 1945, and is deposited in the Britton Herbarium at the New York Botanical Garden.

PAEPALANTHUS JAUENSIS var. *CAULESCENS* Mold., var. nov.

Haec varietas a forma typica speciei habitu distincte caulescente recedit.

This variety differs from the typical form of the species in that it is distinctly caulescent, the stems often to at least 8 cm. in length and densely foliose throughout, the leaves erect to ascending.

The type of the variety was collected by Julian A. Steyermark, Victor Carreño Espinosa, Roy McDiarmid, and Charles Brewer-Carías *(no. 115893)*, growing in tufts, the leaves grass-green, at 2460--2500 m. altitude on the Cumbre de Aprada-tepuí, lat. 5°22' N., long. 62°20' E., Bolívar, Venezuela, on February 25, 1978, and is deposited in my personal herbarium. The collectors note that the plant seems related to "*Paepalanthus jauensis* and *duidae* but stems elongated and caulescent; see also *Syngonanthus phelpsae* var. *elongatus* but bracts have different color, etc."

SYNGONANTHUS COWANI var. *TABULATUS* Mold., var. nov.

Haec varietas a forma typica speciei caulibus elongatis rosetta foliorum medio ornatis recedit.

This variety differs from the typical form of the species in its very diminutive stature, mostly only 2.5--5.5 cm. tall when in full anthesis, the stems decidedly elongated and bearing a rosette of leaves exactly similar to the basal rosette at or somewhat above the midpoint.

The type of the variety was collected by Otto Huber *(no. 1684)* on a small savanna in the woods around the southwest base of Cerro Yapacana, 66°50' E., 3°40' N., at about 100 m. altitude, between February 14 and 28, 1978, and is deposited in my personal herbarium. The collector notes: "Hierba diminuta de unos 5--7 cm de alto, muy común en esta sabana. Cabezuelas color blanco-grisáceo....Dept. Atabapo, cabecera del Caño Cotúa hasta el pié occidental del Cerro Yapacana.... Sabana arenosa...sôbre terrenos planos parcialmente inundados dirante la época de lluvias."

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ADDITIONAL NOTES ON THE GENUS *VITEX*. XII

Harold N. Moldenke

VITEX Tourn.

Additional & emended bibliography: D. Dietr., Syn. Pl. 3: 610--612. 1843; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 132 & 169--172 (1894) and ed. 1, 4 (3a): 383. 1897; Engl., Syllab., ed. 2, 178 & 214 (1898), ed. 3, 188 & 233 (1903), ed. 4, 189 & 207 (1904), ed. 5, 193 & 247 (1907), and ed. 6, 198 & 253. 1909; Gilg in Engl., Syllab., ed. 7, 314 & 386 (1912) and ed. 9 & 10, 340 & 419. 1924; Diels in Engl., Syllab., ed. 11, 339 & 418. 1936; Deodikar & Thakar, Bull. Apicult. Lab. Mahabal. 1: 1--6. 1955; F. H. Wang, Pollen Gr. China. 1960; Chaubal & Deodikar, Indian Bee Journ. 27: 1--28. 1965; Palacios, An. Esc. Nac. Cienc. Biol. Mex. 16: 41--169. 1968; B. B. Mukherjee, Veget. Hist. South. West Beng. [thesis]. 1969; Assemien, Étud. Comparat. Fl. Act. Quat. Vég. Afr. Ouest [thesis]. 1971; Mukhopadhyay, Pollen Morph. Verb. [thesis]. 1971; Serbanescu-Jitariu & Mitroiu, Act. Bot. Hort. Bucurest. 1972-73: 105, 108, 109, 116, & 119, pl. 1, fig. 5. 1973; Shimakura, Spec. Publ. Osaka Mus. Nat. Hist. 5: 1--60. 1973; Thanikaimoni, Inst. Franç. Pond. Trav. Sect. Scient. Tech. 12 (2): 130. 1973; Fredoux, Assoc. Palynol. Lang. Franç. Trav. Docum. Géogr. Trop. 16. 1974; Sowunmi, Grana 13: 145--186. 1974; Kooiman, Act. Bot. Neerl. 24: [459], 461, & 462. 1975; López-Palacios, Bol. Soc. Venez. Cienc. Nat. 31: [353]. 1975; López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 10 & 94--102, fig. [18]--[21]. 1975; Menninger, Color Sky 10, 47, & 260. 1975; Meylan & Butterfield, N. Zeal. Journ. Bot. 13: 4. 1975; Mold., Phytologia 29: 512 (1975), 30: 512 (1975), 31: 336, 376, 380, 383, 387--390, 392, 400, 403, 407, & 412 (;975), and 32: 338. 1975; Molina R., Ceiba 19: 96. 1975; Ramachandran Nair, Ramesh., & Sankara Subramanian, Curr. Sci. India 44: 214--216. 1975; Saoji, Botanique 6: 253--260. 1975; Seabrook, Shrubs Your Gard. 130 &

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Tupas & Sajise, Kalikasan 6: 233. 1977; Anon., Roy. Bot. Gard. Kew Lib. Curr. Awaren. 8: 21 (1978) and 9: 23. 1978; Ching-Wei, China Reconstr. 27 (2): 4. 1978; Croat, Fl. Barro Colorado 40 & 732. 1978; Gibson, Wild Fls. Natal 92 & 93, pl. 92, fig. 8, & pl. 93, fig. 1. 1978; Gomas, El-Moghazy, Halim, & El-Sayyad, Ornament. Hort. 4: 825. 1978; Gomas, El-Moghazy, Halim, & El-Sayyad, Pl. Med. 33: 277. 1978; Gray & DeZeeuw, Internat. Assoc. Wood Anat. Bull. 2/3: 47. 1978; Heathcote in Heywood, Flow. Pl. World 237, fig. 3. 1978; Hsiao, Pl. Taiwan 4: 432. 1978; Khosla & Sareen, Indian Journ. Forest. 1: 174. 1978; Kurup, Journ. Bomb. Nat. Hist. Soc. 75: 325, 329, & 332. 1978; Lawton, Journ. Ecol. 66: 183, 188--190, & 193. 1978; A. L. Mold., Phytologia 41: 80. 1978; Mold., Biol. Abstr. 65: 6769. 1978; Mold., Phytologia 38: 178, 307--308, & 511 (1978) and 39: 424 & 512. 1978; Mound & Halsey, Whitefly World 78, 86, 98, 100, 115, 123, 137, 207, 305, & 314. 1978; Odebiyi & Sofowora, Lloydia 41: 245. 1978; Perkins & Payne, Guide Poison. Pl. Fla. [Fla. Coop. Ext. Serv. Inst. Food Agric. Sci. Circ. 441:] [53] & [66]. 1978; Pirone, Diseases Pests Ornament. Pl., ed. 5, 524. 1978; Reitz, Klein, & Reis, Proj. Madeira S. Catar. 42 & 86. 1978; Richards, Bot. Soc. Am. Misc. Ser. Publ. 156: 33. 1978; Sharma, Shetty, Vivekan., & Rathak., Journ. Bomb. Nat. Hist. Soc. 75: 16.& 33. 1978;.R. F. Sm., Act. Bot. Venez. 13: 186, 208, & 240. 1978; Sprangers & Balasubram., Trop. Ecol. 19: post 92. 1078; Steyerm. & Huber, Fl. Avila 861, [865], & 868, fig. 301b. 1978; St. John, Phytologia 39: 317. 1978; Subramanian & Misra, Indian Journ. Chem/ Sect. B Org. Chem. 16: 615--616. 1978; S. & D. Talalaj, Biol. Abstr. 65: 4710. 1978; D. E. Clark, Sunset New West. Gard. Book, ed. 4, imp. 2, 498. 1979; Jones & Luchsinger, Pl. Systemat. 301--302. 1979; Katyuzhanskaya, Biol. Abstr. 67: 5013. 1979; A. L. Mold., Phytologia 41: 302. 1979; Mold., Phytologia 41: 511 (1979), 42: 512 (1979), 43: 252, 272, & 512 (1979), and 44: 134 & 143--163. 1979.

In Menninger's work on flowering vines (1970) the index indicates that *Vitex* is listed on p. 369, but actually it is the unrelated genus *Vitis (Vitaceae)* that is there discussed. Similarly, items 9635, 9686, & 9902 cited by Farnsworth (1970) as applying to *Vitex* actually apply to *Vitis*. The Endlicher (1838) reference in the bibliography above is often cited as "1836--1856", but the pages involved here were actually issued in 1838. Biological Abstracts (1977) erroneously spells the surname of R. B. Faden (1976) as "Raden". The Foreman (1972) publication bears the erroneous date "1971" on its titlepage. The index in the work by Pandeya, Puri, & Singh (1968) indicates a mention of *Vitex* on p. 29, but I fail to find it on that page. Similarly, the "p. 121" reference in the Kobayashi work (1970) appears to be erroneous.

Brown (1954) informs us that *"vitex, -icis"* is the classical Latin name for the chastetree native to Italy, *Vitex agnus-castus* L. Wang (1961) states that plants of this genus, along with *Corylus, Ostryopsis,* and *Deutzia*, cover great expanses of the mountain slopes and foothills in the deciduous broadleaf forests of the northern provinces of China.

Miejer (1968) asserts that the leaves of *Vitex* are without oil-glands, but he surely did not examine the leaves of a sufficient number of species. The chromosome number for the genus is reported as x = 6 or 8. Martin (1946) reports that the seeds of *Vitex* contain endosperm. Gibbs (1974) reports the presence of agnuside (an aucubin-like glucoside) and aucubin, while saponins and tannins are absent or probably so, shikimic acid is present, but L-bornesitol is absent. Raffauf (1970) reports the presence of vitricene ($C_{17}H_{15}NO_3$) and nishindine ($C_{15}H_{21}NO$).

Huang (1972) describes the pollen for the genus as "Grains 3-colpate; prolate to prolate-spheroidal; 27--40 x 18--33 mu; amb circular-lobate; exine 2 mu thick; tectum with scabrate processes; sexine with OL-pattern; nexine as thick as sexine". In a genus of 400 taxa as now recognized one must wonder how reliable these descriptions are when given for the genus as a whole. Voss (1895) considered the genus as one of only 60 species in "wärmeren Gegenden"; Ohwi (1965) regarded it as containing 100 species "chiefly in the Tropics, few in temperate regions of Europe and e. Asia". Jones & Luchsinger (1979), probably due to a stenographic error, give "3" as the number of species in the genus! The genus, according to Savage (1945), is genus number 811 in the Linnean Herbarium. Jack (1820) comments rather unnecessarily that the only other genus in the *Verbenaceae* with compound leaves [known to him] is the genus *Peronema*, and that this is "abundantly distinct". Actually, at least 5 other genera in the family have compound leaves: *Petraeovitex, Petitia, Pseudocarpidium, Teijsmanniodendron,* and *Viticipremna*, albeit in some cases 1-foliolate.

Sharma (1975) reports an unidentified species of *Vitex* cultivated as a hedge in the Punjab -- this is probably one of the varieties of *V. trifolia*. In 1849 Hooker and Bentham regarded the "African oak" and "African teak" of Africa as probably members of the genus *Vitex*, but in this they were in error; the latter, at least, actually is *Oldfieldia africana* Benth. & Hook. f. in the *Euphorbiaceae*.

The genus *Tomex* L., sometimes cited in the synonymy of *Vitex*, actually belongs, instead, in that of *Callicarpa* L. It is of interest to note, in passing, that Caruel (1884) is among those botanists who correctly accredit the name *Vitex* to Tournefort, rather than to Linnaeus, who merely adopted it.

Dalla Torre & Harms (1963), regarding it as a genus of 100 species, divide *Vitex* as follows:

Sect. 1. *Agnus castus* Endl.
  Subsect. 1. *Terminales* Briq.
  Subsect. 2. *Axillares* Briq.
  Subsect. 3. *Glomerulosae* Briq.
Sect. 2. *Pyrostoma* Schau.
Sect. 3. *Chrysomallum* Schau.
Sect. 4 *Glossocalyx* Clarke

Capuron (1972, p. 45) refers to a Section "*Laniculatae*", apparently a typographic error for *Paniculatae* Schau.

It is also of interest to note that Dietrich (1837) places *Vitex* in his Family 57, *Viticeae*, and not in Family 58, *Verbenaceae*.

Sweet (1839) has pointed out that *Wallrothia* is a valid genus in the *Ammiaceae*, so the homonym proposed in the *Verbenaceae*, if maintained as a separate genus, must be renamed.

Langsdale-Brown and his associates (1964) list several unidentified species from Uganda that inhabit the *Butyrospermum-Hyparrhenia* savannas, *Acacia-Albizzia-Panicum-Chloris* savannas, *Albizzia-Combretum* woodlands, *Vitex-Phyllanthus-Sapium-Terminalia* woodlands, *Combretum-Hyparrhenia* savannas, *Borassus-Hyparrhenia rufa* palm savannas, *Borassus-Hyparrhenia* dissolute palm savannas, *Albizzia-Combretum-Terminalia-Hyparrhenia rufa* savannas, and *Hyparrhenia* grass savannas derived from *Butyrospermum* savannas in Africa. Kurz (1870 has listed another unidentified species from the Andaman Islands. Kotschy (1865) lists an unidentified species of the *Chrysomallum* section from Ethiopia, Irvine (1970) lists two from Gold Coast, Puri (1960) lists one from India, Foreman (1972) one from New Guinea, Jaffré (1974) one from New Caledonia, and Vergiat (1970) describes two from Ubangi which "Pour faire bonne pêche les Sangos frottent leurs filets avec des feuilles de cette plante. Les petites fourmis hantant les rameau sont utilisées comme appat pour la pêche, on les répand sur l'eau. La poudre obtenue en pilant les fruits avec les fourmis qui vivent sur cette plante est vénéneuse. Antidote: décoction de racines de... *Bauhinia thonningii*". Another species, unidentified, "C'est l'écorce brulée de cette espéce qui est utilisée, par les indigènes islamisées de race Haoussa, pour la fabrication de leur encre, les cendres sont diluées dans de l'eau natronée".

Vernacular names reported for the genus as a whole or for unidentified members of it include: "hamagō zoku" (in Japan), "Keuschbaum", "Keusch-lamm", and "Mönchspfeffer", as well as "Müllen" (in Germany), "rénu-ka-bij", "shambhāloo-ka-bij", and "tukm-i-panjangusht" (in India), "aceituma" and "totumillo" (in Venezuela), "afetewa" and "akwakora gyahina" (in Gold Coast), "burlya", "deniya", "gbabili", "oko alya", and "tela" (in Africa), "wallrothia" (in England), "muxillo-xyllo" (in Angola), "kachinori-pini" (in Peru), and "pala bikunda" (in western Africa).

Aristeguieta (1973) describes the Venezuelan members of the genus as very ornamental and "bastante resistentes", suitable as street and park trees. Dymock (1884) says of an unidentified species of *Vitex* in western India that the "small fruit is considered by native physicians to be astringent, resolvant and deobstruent, and useful for removing obstructions of the brain and liver. It is also given in enlargement of the spleen and dropsy.....The drug is imported from Persia". DeWit (1967) says that the genus is reputedly aphrodisiac -- a curious claim since the best-known species, *V. agnus-castus,* is widely regarded as an anti-aphrodisiac!

Hartwell (1971) reports an unidentified species in Angola is used to treat tumors of the breast and another is used in Peru to treat cancerous ulcers. DeWildeman (1920) reports an unidentified species in western Africa whose wood is used to make wooden utensils and in other woodwork.

Vitex species are attacked by the fungi, *Meliola viticicola* Hansf. (in Zaire) according to Hansford (1961), based on *Hendrickx 2390, M. paraensis* P. Henn. (in Brazil), also according to Hansford, based on *Huber 4* at Stockholm, *M. cookeana* Speg. (in Zaire), also according to Hansford, based on *Vanderyst 38577, 43953, 44309, & 44340, Leptosphaeria casta* according to Anon. (1969), *Ciferriella domingensis, Meliola campylopoda, Mycosphaerella viticis, Olivea acitula, Phoma viticicola,* *Pleurotus guaraniticus, Pucciniastrum clemensiae,* and *Vizella grandis* according to Anon. (1957), a leaf-spot, *Cercospora weberi,* according to Pirone (1978), another leaf-spot, *C. viticis* (in Louisiana and Texas), and a root-rot, *Phymatotrichum omnivorum* (in Texas) according to Westcott (1971), and the white-flies, *Aleurotrachelus viticis* Corbett (in Malaya), *Dialeurodes dicksoni* (in Malaya), and *D. vitis* Corbett (in Malaya).

The Baileys (1976) refer to the plants of this genus as "vitexes" and note that the cultivated ones "do well in any good soil. Propagated by seeds in spring, layers, and greenwood cuttings under glass".

Anatomical studies made by Gray & DeZeeuw are reported by Richards (1978) as follows: "The secondary xylem anatomy of the genus *Vitex* has been studied comparatively to prepare a more precise definition of the structural variation within the genus, to find possible relationships of anatomical structure to geographical regions, and to determine the possible cause or causes of the reported slow air-drying of the wood of several species in this genus. The material examined was worldwide in origin and more extensive than for any of the previous regional studies. Anatomical evidence obtained from this investigation corroborates existing data that the wood structure of *Vitex* is essentially homogeneous. The only exception is a slight trend for segregating African species by the more common presence of multiperforate perforation plates as well as low density and generally pale colored wood. Multiperforate and scalariform perforation plates in vessel elements were observed in many species, in contrast to previous reports which indicated that these specialized perforations were very rare in *Vitex*. The presence of multiple calcium crystals per parenchyma cell in a majority of species studied is a possible diagnostic character for the genus, while the presence of silica sand and specialized cell wall sculpturing can be used for diagnostic features for certain species within the genus. Unusual amounts of starch deposits observed in the septate fibers of the heartwood in over half of the species studied is suggested as a diagnostic character for the genus and as a possible cause for the reported slow drying characteristics for these species."

The *Helfer 304,* distributed as a species of *Vitex,* actually is one of *Buddleia (Buddleiaceae),* while *Kostermans 24039* is *Clerodendrum serratum* (L.) Moon, *Fosberg & Mueller-Dombois 50142* is *Glossocarya scandens* (L. f.) Trimen, *Prance, Rodrigues, Ramos, & Farias 8339* & *8344* are *Metradorea* sp. *(Rutaceae), T. Anderson 133* is *Peronema canescens* Jack, *Oldham 679* is *Premna microphylla* Turcz., *T. Anderson 183* and *Griffith 6065/1* are *Teijsmanniodendron coriaceum* (C. B. Clarke) Kosterm., *E. D. Merrill 2852* is *Viticipremna philippinensis* (Turcz.) H. J. Lam, *Bernardi 3360* and *R. V. Moran 7742* are in the *Bignoniaceae, Frodin NGF.26450* is in the *Rubiaceae,* and *T. Anderson 131, Claussen s.n.* [Minas Gerais], *G. P. Cooper 111, Daniel & Tomás 3368, Gilbert 2168, Goodland 389, Herb. Richard s.n., Hinton 16235,* and *Nadeaud s.n.* are not verbenaceous.

To the lists of taxa excluded from the genus previously published by me the following are to be added or emended:

Vitex aherniana Merr., Bur. Govt. Lab. Manila Publ. 6: 18. 1904 = *Teijsmanniodendron ahernianum* (Merr.) Bakh.

Vitex ahernianum Merr. ex Mold., Phytologia 5: 258, in syn. 1955 = *Teijsmanniodendron ahernianum* (Merr.) Bakh.

Vitex ?bantamensis Koord. & Val., Bijdr. Booms. Java 7: 210. 1900 = *Vavaea bantamensis* (Koord. & Val.) Koord. & Merr., *Meliaceae*

Vitex caribaea Hook. & Arn. ex Schau. in A. DC., Prodr. 11: 696, in syn. 1847 = *Vitis californica* Benth., *Vitaceae*

Vitex bahiensis Schau. in A. DC., Prodr. 11: 687. 1847 = *Arrabidaea bahiensis* (Schau.) Sandw. & Mold., *Bignoniaceae*

Vitex bankae H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 62. 1921 = *Teijsmanniodendron ahernianum* (Merr.) Bakh.

Vitex bogariensis H. J. Lam ex Mold., Alph. List Inv. Names 58, in syn. 1942 = *Teijsmanniodendron ahernianum* (Merr.) Bakh.

Vitex bogoiensis H. J. Lam ex Mold., Phytologia 28: 465, in syn. 1974 = *Teijsmanniodendron ahernianum* (Merr.) Bakh.

Vitex bogoniensis H. J. Lam ex Mold., Fifth Summ. 2: 714, in syn. 1971 = *Teijsmanniodendron ahernianum* (Merr.) Bakh.

Vitex bogoriensis H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 60. 1921 = *Teijsmanniodendron ahernianum* (Merr.) Bakh.

Vitex clarkeana Gamble in King & Gamble, Journ. Asiat. Soc. Beng. 74: 845. 1908 = *Teijsmanniodendron hollrungii* (Warb.) Kosterm.

Vitex clarkeana King & Gamble ex Mold., Phytologia 5: 258, in syn. 1955 = *Teijsmanniodendron hollrungii* (Warb.) Kosterm.

Vitex coriacea C. B. Clarke in Hook. f., Fl. Brit. India 4: 586. 1885 = *Teijsmanniodendron coriaceum* (C. B. Clarke) Kosterm.

Vitex curranii H. J. Lam, Verbenac. Malay. Arch. 207. 1919 = *Teijsmanniodendron ahernianum* (Merr.) Bakh.

Vitex curtifrutescens Elm., Leafl. Philip. Bot. 8: 2873. 1915 = *Claoxylon* sp., *Euphorbiaceae*

Vitex hollrungii Warb., Engl. Bot. Jahrb. 18: 208. 1894 = *Teijsmanniodendron hollrungii* (Warb.) Kosterm.

Vitex holophylla Baker, Kew Bull. Misc. Inf. 1896: 25. 1896 = *Teijsmanniodendron holophyllum* (J. G. Baker) Kosterm.

Vitex japonica Farnsworth, Pharmacog. Titles 5 (4): xii, sphalm. 1970 = *Vitis japonica* Thunb., *Vitaceae*

Vitex flabelliflora Hall. f., Meded. Rijks Herb. Leid. 37: 50. 1918 = *Teijsmanniodendron bogoriense* Koord.

Vitex koordersii H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 64. 1921 = *Teijsmanniodendron pteropodum* (Miq.) Bakh.

Vitex lanceolata Turcz., Bull. Soc. Nat. Mosc. 36 (2): 224. 1863 = *Psychotria sarmentosa* Blume, *Rubiaceae*

Vitex novae pommeraniae Warb. ex K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Sudsee 524. 1900 = *Viticipremna novae-pommeraniae* (Warb.) H. J. Lam

Vitex novae-pommeraniae Warb., Engl. Bot. Jahrb. 13: 429. 1891 = *Viticipremna novae-pommeraniae* (Warb.) H. J. Lam

Vitex novo-guineensis Kaneh. & Hatus., Bot. Mag. Tokyo 56: 116, fig. B. 1942 = *Teijsmanniodendron novo-guineense* (Kaneh. & Hatus.) Kosterm.

Vitex novoguineensis Kaneh. & Hatus. apud Kosterm., Reinwardtia 1:103, in syn. 1951 = *Teijsmanniodendron novo-guineense* (Kaneh. & Hatus.) Kosterm.

Vitex peralata Miq., Fl. Ind. Bat. Suppl. Sum. 242 & 567. 1862 = *Teijsmanniodendron pteropodum* (Miq.) Bakh.
Vitex philippinensis J. J. Lam ex Mold., Résumé 388, in syn. 1959 = *Teijsmanniodendron pteropodum* (Miq.) Bakh.
Vitex philippinensis Merr., Forest. Bur. Philip. Bull. 1: 52. 1903 = *Teijsmanniodendron pteropodum* (Miq.) Bakh.
Vitex philippnensis Merr. ex Mold., Résumé 388, in syn. 1959 = *Teijsmanniodendron pteropodum* (Miq.) Bakh.
Vitex premnoides Elm., Leafl. Philip. Bot. 8: 2874. 1915 = *Mastixia premnoides* (Elm.) H. Hallier, *Mastixiaceae*
Vitex pteropoda Miq., Fl. Ind. Bat. Suppl. Sum. 242 & 567. 1862 = *Teijsmanniodendron pteropodum* (Miq.) Bakh.
Vitex sarawakana H. H. W. Pearson, Kew Bull. Misc. Inf. 1907: 60. 1907 = *Teijsmanniodendron sarawakanum* (H. H. W. Pearson) Kosterm.
Vitex simplicifolia C. B. Clarke in Hook. f., Fl. Brit. India 4: 586. 1885 = *Teijsmanniodendron hollrungii* (Warb.) Kosterm.
Vitex smilacifolia H. H. W. Pearson, Kew Bull. Misc. Inf. 1907: 159. 1907 = *Teijsmanniodendron smilacifolium* (H. H. W. Pearson) Kosterm.
Vitex subspicata Hall. f., Meded. Rijks Herb. Leid. 37: 52. 1918 = *Teijsmanniodendron subspicatum* (H. Hallier) Kosterm.
Vitex tetragona Hall. f., Meded. Rijks Herb. Leid. 37: 53. 1918 = *Teijsmanniodendron sarawakanum* (H. H. W. Pearson) Kosterm.
Vitex tridentata Menzies ex Mold., Phytologia 28: 465, in syn. 1974 = *Viola tridentata* Menzies, *Violaceae*
Vitex venosa H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 61. 1921 = *Teijsmanniodendron coriaceum* (C. B. Clarke) Kosterm.
Vitex vinifera Farnsworth, Pharmacog. Titles 5 (3): vii, sphalm. 1970 = *Vitis vinifera* L., *Vitaceae*
Vitex zeylanica Burm. f., Fl. Ind. 138. 1768 = *Stereospermum* sp., *Bignoniaceae*
Wallrothia divaricata Presl, Delic. Prag. 134. 1822 = *Carum alpinum* Benth. & Hook., *Ammiaceae*
Wallrothia splendens Spreng. ex Schult. in L., Syst. Veg. 6: 557. 1820 -- in the *Ammiaceae*
Wallrothia tenuifolia DC. = *W. splendens* Spreng., *Ammiaceae*
Wallrothia tuberosa Spreng., Pl. Min. Cog. Pugill. 2: 52. 1815 = *Carum alpinum* Benth. & Hook., *Ammiaceae*

VITEX ACUMINATA R. Br.

Additional synonymy: *Vitex melicarpa* Janssonius, Mikrogr. Holz. 812, sphalm. 1926.

Additional bibliography: Wall., Numer. List 86. 1831; D. Dietr., Syn. Pl. 3: 612. 1843; Voigt, Hort. Suburb. Calc. 473. 1845; Schau. in A. DC., Prodr. 11: 695. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 501. 1858; R. Schomb., Fl. S. Austr. 52. 1875; Janssonius, Mikrogr. Holz. 812. 1926; Willaman & Schubert, Agr. Res. Serv. U. S. Dept. Agr. Tech. Bull. 1234: 237. 1961; Hocking, Excerpt. Bot. A.13: 569. 1968; Mold., Phytologia 16: 491. 1968; Mold., Biol. Abstr. 50: 942. 1969; Beard, West Austr. Pl., ed. 2, 113. 1970; Mold., Fifth Summ. 1: 349

(1971) and 2: 722 & 922. 1971; Serbanescu-Jitariu & Mitroiu, Act. Bot. Hort. Bucurest. 1972-73: 116. 1973; Mold., Phytologia 34: 280. 1976.

Dietrich (1843) describes this species as "foliolis ovato-oblongis acuminatis glabris integerrimis; paniculae rachi stricta; ramis dichotomis; calyce subdentulo; staminibus inclusis". Recent collectors describe it as a tall shrub, "deciduous shrub-tree", or "upright green tree", to 25 feet tall, the bark gray, flakey, the trunk 6 inches in diameter, usually with several branches from the base, and the fruit [immature?] green. They have encountered it in creekbeds with *Eucalyptus camalduensis,* in monsoon forests, and "rare growing against rocks", flowering and fruiting in February and March. The corollas are said to have been "mauve" in color on *Swinbourne 686*. A wood sample accompanies *Perry 1052*.

According to Bentham, *V. acuminata* usually has its petioles shorter than the leaflets, the petiolules being very short or to 1/4 inch long, and the flowers in a thyrsoid panicle, terminal or in the uppermost leaf-axils only. *Vitex glabrata,* on the other hand, has the petioles over 2 inches long, the petiolules always 1/2 to 3/4 inch long, and the flowers borne in loose, dichotomous, axillary cymes.

Serbanescu-Jitariu & Mitroiu (1973), based on *Herb. Mus. Bot. Haun. 122* [Herb. Univ. Cluj 138426], describes the pollen of *V. acuminata* as follows: "subprolat; 3-colpat; vazut apical 20,8--36,4 mu in diam., din profil inalt 26--52 mu, lat 20,8--33,8 mu. Polenul scuturat din antere si vazut cu ochiul liber este galben-portocaliu, in apa la microscop, portocaliu, iar in chloralhidrat, verzui-incolor. In general prezinta caractere asemanatoare cu cele intilnite la *V. agnus castus* cu deosebirea ca sporoderma este mai subţire, iar veruculli mai mari. Colpii 3/4 din raza microsporilor, sint mai lungi si de asemenea mai ingusti şi foarte ascutiti la capete".

Material of *V. acuminata* has been misidentified and distributed in some herbaria as *V. glabrata* R. Br. On the other hand, the *A. Cunningham 256,* cited previously by me as *V. acuminata,* actually represents *V. glabrata*.

Additional citations: AUSTRALIA: Northern Territory: *Byrnes NB.556* (Ai--14365); *Schomburgk s.n.* [North Coast] (W--74072); *Swinbourne 686* (Ai--10030). Queensland: *Helms 122* (W--1271357); *R. A. Perry 1052* (Ai).

VITEX AGELAEIFOLIA Mildbr. ex Pieper, Engl. Bot. Jahrb. 62, Beibl. 141: 55. 1928 [not *V. agelaeifolia* Mildbr., 1922, hyponym].

Additional bibliography: Good & Exell, Journ. Bot. 69, Suppl. 2: 144 & 145. 1930; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 402. 1938; Schnell & Grout de Beaufort, Mém. Inst. Fond. Afr. Noire 75: [Contrib. Étud. Pl. Myrmecod.] 9 & 45--47, pl. 10, fig. H--J. 1966; Mold., Phytologia 16: 491. 1968; Mold., Fifth Summ. 1: 225 & 231 (1971) and 2: 710 & 922. 1971.

Illustrations: Schnell & Grout de Beaufort, Mem. Inst. Fond. Afr. Noire 75: [Contrib. Etud. Pl. Myrmecod.] 47, pl. 10, fig. H--J. 1966.

Schnell & Grout de Beaufort (1966) describe the myrmecophily of this species and illustrate the nodal and internodal openings to the internal nests in the branches, based on *Jacques-Felix 2307* from Cameroons, *Lebrun 1847* from Zaire, *Le Testu 5892* & *5945* from Gabon, and *Le Testu 7785* from Cameroons.

Good & Exell (1930) describe the species as "a climbing shrub, sporadic in abandoned native plantations", flowering and fruiting in January.

The *Vitex agelaeifolia* Mildbr. (1922) of Subgenus *Euvitex,* Section *Axillares,* Subsection *Paniculatae,* is a synonym of *V. phaseolifolia* Mildbr.

VITEX AGELAEIFOLIA var. *RUFULA* Mold.

Additional bibliography: Mold., Phytologia 16: 491. 1968; Mold., Fifth Summ. 1: 231 (1971) and 2: 710 & 922. 1971.

Additional citations: ZAIRE: *Germani 5232* (E--2168604).

VITEX AGNUS-CASTUS L.

Additional & emended synonymy: *Vitex, sive Agnus Castus* Gerarde, Herbal, ed. 1, 3: 1387. 1597. *Agnus Castus* Cast. ex Schröd., Pharm. Med. 4: 10. 1649. *Elaeagnon Theophrasti* Lob. ex Schröd., Pharm. Med. 4: 10. 1649. *Salix Amerina* Dios., Matth. ex Schröd., Pharm. Med. 4: 10. 1649. *Vitex* Trag. ex Schröd., Pharm. Med. 4: 10. 1649. *Vitex foliis angustioribus cannabis modo dispositis* K. Bauhin ex Schröd., Pharm. Med. 4: 10. 1649. *Vitex, agnus castus* Lonicer. Kreuterb., imp. 1, 77. 1679. *Vitex agnus castus* L., Sp. Pl., ed. 1, imp. 1, 638. 1753. *Vitex agnus castus* Retz., Nom. Bot. 155. 1772. *Vitex agnuscastus* L. apud Gussone, Fl. Sic. Prodr. 2: 147. 1828. *Vitex agnes-castus* L. apud A. Wood, Class-book, [ed. 42], imp. 1, 539, sphalm. 1861. *Vitex agnus castus* var. *agnus castus* Kurz, Forest Fl. Brit. Burma 2: 270. 1877. *Vites agnus castus* L. apud B. Fedtsch. in O. A. & B. A. Fedtsch., Consp. Fl. Turkest. 5: 122, sphalm. 1913. *Vitex agnus custus* Al-Rawi & Chakvavarty, Iraq Min. Agr. Tech. Bull. 15: 4, sphalm. 1964. *Vitex agnus-castur* Coon, Fragrances Frag. Pl. 117, sphalm. 1967. *Vitex agnus-castus* var. *agnus-castus* [L.] apud Burlage, Ind. Pl. Tex. 184. 1968. *Vitex agnucastus* Farnsworth, Pharmacog. Titles 5 (10): xxiv, sphalm. 1970. *Vitex carone* Bircher ex Mold., Phytologia 28: 465, in syn. 1974. *Vitex ilensis* Runkewitz ex Mold., Phytologia 28: 465, in syn. 1974. *Vitex negundo* Hausskn. ex Mold., Phytologia 31: 412, in syn. 1975 [not *V. negundo* Curtis, 1832, nor L., 1753, nor L. f., 1966, nor Lour., 1934, nor "(not L.) Matsum.", 1955, nor Noronha, 1790, nor Roxb., 1977, nor Royle, 1919, nor Willd., 1918]. *Vitex agnus-castus* var. *agnus-castus* Thomas ex Mold., Phytologia 34: 279, in syn. 1976. *Vitex agnus-catus* Lewis & Elvin-Lewis, Med. Bot. 332, sphalm. 1977. *Vitex angus-castus* var. *angus-castus* [L.], in herb.

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139. 1751; Chomel, Abreg. Hist. Pl. Usuel., ed. 2, vol. 1-3. 1761; L., Sp. Pl., ed. 2, 890. 1763; Hasselq., Voy. Trav. Levant 280 & 282. 1766; [Retz.], Nom. Bot. 155. 1772; Ginanni, Istor. Civ. Nat. Pinet. Ravenn. 251. 1774; Lam., Fl. Franc. 2: 363. 1778; Plenck., Icon. Pl. Med. 6: 13, pl. 510. 1778; All., Fl. Ped. 1: 124. 1783; Gaertn., Fruct. Sem. Pl. 1: 269, pl. 56. 1788; Lam., Encycl. Meth. Bot. 2: 611--613. 1788; Ucria, Hort. Reg. Panhorm. 266. 1789; Poir. in Lam., Tabl. Encycl. Meth. Bot. 6: pl. 541. 1794; Russell, Nat. Hist. Aleppo, ed. 2, 2: 256. 1794; Gmel. in L., Syst. Nat., ed. 13, 2: 963. 1796; Salisb., Prodr. 106. 1796; Raeusch., Nom. Bot., ed. 3, 182. 1797; Balbis, Cat. Pl. Hort. Bot. Taur. 49. 1804; Desf., Tabl. Ecol. Bot., ed. 1, 53. 1804; Sibth. & Sm., Fl. Graec. Prodr. 1: 441. 1809; Willd., Enum. Pl. Hort. Berol. 2: 660. 1809; Stokes, Bot. Mat. Med. 3: 413. 1812; Balbis, Cat. Stirp. Hort. Acad. Taur. 81. 1813; Desf., Tabl. Ecol. Bot., ed. 2, 64. 1815; Dierbach, Handb. Med. Pharm. Bot. 267, 461, & [463]. 1819; Pers., Sp. Pl. 3: 360. 1819; A. Rich., Bot. Méd. 1: 243. 1823; Dierbach, Arzneim. Hippok. 1824; A. Rich. [transl. G. Kunze], Med. Bot. 1: 382--383. 1824; Spreng. in L., Syst. Veg., ed. 16, 2: 759. 1825; A. Rich. [transl. G. Kunze], Med. Bot. 2: 1302. 1826; Sweet, Hort. Brit., ed. 1, 1: 323. 1826; Gussone, Fl. Sic. Prod. 2: 147--148. 1828; G. Don in Loud., Hort. Brit., ed. 1, 246. 1830; Sibth. & Sm., Fl. Graec. 7: pl. 609. 1830; Sweet, Hort. Brit., ed. 2, 416. 1830; Bischoff, Grundr. Med. Bot. 305. 1831; Tenore, Syllog. Fl. Nap. 86. 1831; Tenore, Syll. Vasc. Pl. 298. 1831; G. Don in Loud., Hort. Brit., ed. 2, 246. 1832; Loud., Hort. Brit., ed. 2, 551. 1832; Mohl, Ann. Sci. Nat., ser. 2, 3: 319. 1835; A. Dietr., Handb. Pharmaceut. Bot. 113 & 413. 1837; A. Dietr., Taschenb. Ausländ. Arzneigew. 221 & 324. 1839; G. Don in Loud., Hort. Brit., ed. 3, 246. 1839; Sweet, Hort. Brit., ed. 3, 551. 1839; Meisn., Pl. Vasc. Gen. 2: 201. 1840; Spach, Hist. Nat. Veg. Phan. 9: 230--231. 1840; Bouchez, Nouv. Corses 95. 1843; D. Dietr., Syn. Pl. 3: 612. 1843; Bertol., Fl. Ital. 6: 455. 1844; Gussone, Fl. Sic. Syn. 2: 110. 1844; Schau. in A. DC., Prodr. 11: 684. 1847; Wackernagel, Vocab. Optim. 49. 1847; Bussemak. & Daremb., Oeuvres d'Oribase 1--6. 1851-1876; Plinius Sec. [transl. Bostock & Riley], Nat. Hist. vol. 1--6. 1865; Schnitzl., Iconogr. Fam. Nat. 2: 137 Verbenac.[2]. 1856; Buek, Gen. Spec. Syn. Candoll. 3: 501. 1858; Reichenb., Icon. Fl. Germ. 18: 52--53, pl. 1293. 1858; Moris, Fl. Sard. 3: 343. 1859; Tornabene, Atti Accad. Gioena Sci. Nat. Catania, ser. 2, 16: [Fl. Foss. Etna] 119, pl. $3A^1$. 1859; Dupuis, Nouv. Fl. Usuel. Med. 2: 298, pl. 37, fig. 2. 1860; A. Wood, Class-book, [ed. 42], imp. 1, 539. 1861; Rosenth., Syn. Pl. Diaph. 1862; A. Gray, Man. Bot. North. U. S., ed. 3, lxvii (1862) and ed. 4, imp. 1, lxvii. 1863; Bocq., Adansonia, ser. 1, 2: pl. 6. 1863; A. Wood, Class-book, [ed. 42], imp. 2, 539. 1863; A. Gray, Man. Bot. North. U. S., ed. 4, imp. 2, lxvii. 1864; A. Wood, Class-book, [ed. 42], imp. 3, 539 (1865), [ed. 42], imp. 4, 539 (1867), and [ed. 42], imp. 5, 539. 1868; A. Gray, Field For. Gard. Bot., ed. 1, imp. 1, 243 (1868) and ed. 1, imp. 2, 243. 1869; A. Wood, Class-book, [ed. 42], imp. 6, 539 (1869) and [ed. 42], imp. 7, 539. 1870; A. Gray, Man. Bot. North. U. S., ed. 4, imp. 3, lxvii. 1870; Willkomm & Lange, Prod. Fl. Hisp. 2: 389. 1870; A. Wood, Am. Bot. Flor., ed. 1, imp. 1, 237 (1870) and ed. 1, imp. 2,

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[to be continued]

BEGONIA OF ECUADOR

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This revision is preliminary to a detailed manuscript for "Flora of Ecuador" edited by Gunnar Harling and Benkt Sparre. It enables us to place a number of new species on early record and to lay a framework for further study as more herbaria are consulted. So far we have studied in any depth only the herbaria of AA, AAU, GB, GH, NY, S, and US.

Our key is frankly artificial because the distinctions of placental form are highly impractical due to a lack of both pistillate flowers and fruit in a very large proportion of the specimens examined. For a taxonomic key to the sections see Irmscher in Pflanzenfam. ed. 2. 21: 579-580. 1925.

1. Flowering plant leafless.
  2. Inflorescence small, few-flowered, irregular; apical stipules imbricate. 33. _B_. _parcifolia_
  2. Inflorescence large, many-flowered, regularly dichotomous.
    3. Cortex yellow-brown, sublustrous, finely striate or rugulose when dry; stem tough, woody, ca. 3 dm long; capsule-wings subequal. 34. _B_. _compacticaulis_
    3. Cortex bluish gray, lustrous, smooth but crustose; stem soft, hollow, to 4 m long; capsule-wings very unequal. 35. _B_. _erythrocarpa_
1. Flowering plant leafy.
  4. Blades peltate.
    5. The blades subentire to doubly dentate but not lobed.
      6. Blades strongly asymmetric, oblique, doubly dentate; leaves fasciculate at the end of the short stem. 36. _B_. _asympeltata_
      6. Blades symmetric or nearly so.
        7. The blades broadly ovate or elliptic to suborbicular, 8-24 cm wide, nearly as wide as long; leaves fasciculate; stem short. 37. _B_. _serotina_
        7. The blades ovate, much longer than wide; plant caulescent, mostly scandent.
          8. Umbo close to the broadly truncate blade-base; blade to 24 cm long, 7-11 cm wide; stamens few; largest capsule-wing falciform, ascending. 7. _B_. _aeranthos_
          8. Umbo about equidistant from the rounded base and sides of the blade or the blade subcordate at base.
            9. Stamens free or on a low torus.
              10. Inflorescence dichotomously branched.
                11. Blade-base more or less indented; margins crenate-dentate; stamens numerous, clavate. 9. _B_. _ynesiae_
                11. Blade-base broadly rounded; margins subentire.

12. Cortex gray, friable.
13. Filaments slender, longer than the elliptic anthers. 10. _B. pululahuana_
13. Filaments short or lacking; stamens clavate. 11. _B. tropaeolifolia_
12. Cortex reddish, persistent; stamens clavate; filaments short to almost lacking. 12. _B. sodiroi_
10. Inflorescence unbranched, not more than 3-flowered.
14. Peduncles solitary, axillary.
15. Outer staminate tepals 14-15 mm long; stamens numerous; cortex gray, crustose. 13. _B. hitchcockii_
15. Outer staminate tepals not over 6 mm long; stamens few.
16. Blades subentire, bicolorous. 14. _B. truncicola_
16. Blades coarsely dentate, concolorous. 15. _B. segregata_
14. Peduncles several and secund from leafless branches; stamens few. 17. _B. dodsonii_
9. Stamens on a long column, numerous; outer staminate tepals 8-20 mm long.
17. Blades coarsely dentate; cortex reddish brown; outer staminate tepals dentate. 18. _B. maurandiae_
17. Blades subentire; cortex gray, crustose; outer staminate tepals entire. 19. _B. geminiflora_
5. The blades strongly lobed, digitate-nerved; stem stout, erect. 35. _B. erythrocarpa_
4. Blades basifixed.
18. The blades strongly lobed, digitate-nerved; stem erect; internodes distinct.
19. Stem gray, crustose, stout; blade-lobes 4-5, attenuate; inflorescence 2-3-dichotomous; capsule-wings only slightly unequal. 35. _B. erythrocarpa_
19. Stem not crustose.
20. Petiole-apex bearing a dense ring of slender trichomes; blade-lobes irregularly sinuate or lobed; ovary-wings narrow. 38. _B. ludwigii_
20. Petiole-apex without a ring of trichomes.
21. Inflorescence to 7 times dichotomous; flowers more than 100; tepals 4 mm long; capsule-wings equal. 3. _B. parviflora_
21. Inflorescence only a few times dichotomous; flowers relatively few; tepals 10-25 mm long; capsule-wings very unequal. 44. _B. acerifolia_
18. Blades not strongly lobed.
22. The blades straight or nearly so, the longest nerve continuing the direction of the petiole.
23. Blades digitate-nerved, generally less than twice as long as wide and widest below the middle, sometimes combined with oblique blades on the same plant.
24. Leaves fascicled; petioles to 45 cm long; stem short; internodes mostly shorter than the stipules.
25. Tepals subacute, usually dark red; stamens oblong.

30. B. froebelii

25. Tepals rounded, pale.
26. Staminate tepals 6-8 and pistillate tepals 6 or if less then some deeply lobed; capsule-wings very unequal, the largest subtriangular, acute or subacute.
27. Blades triangular-acute; tepals 8-13 mm long; inflorescence elongate, its branches secund. 28. B. aequatorialis
27. Blades rounded throughout or apiculate; tepals 20-30 mm long; inflorescence short, few-flowered, irregularly branched. 29. B. octopetala
26. Staminate tepals 4 and pistillate tepals 5, never lobed; blades shallowly lobed.
28. Upper blade-lobes semiorbicular, their sinuses narrow; blades sparsely vestite beneath; inflorescence once dichotomous. 39. B. triramosa
28. Upper blade-lobes subtriangular, their sinuses broad; inflorescence racemose or subracemose. 33. B. parcifolia
24. Leaves separated by distinct internodes; plants caulescent.
29. Stem scandent.
30. Inflorescence dichotomously branched.
31. Blades broadly rounded or minutely cordate at base, 4-15 cm long, sometimes undulate but otherwise entire; capsule-wings very unequal. 6. B. glabra
31. Blades deeply cordate at base, 4-7 cm long, crenate-dentate; capsule-wings subequal, small; stamens numerous, clavate. 9. B. ynesiae
30. Inflorescence simple, not more than 3-flowered.
32. Stamens few, free or on a low torus.
33. Peduncles solitary, axillary. 15. B. segregata
33. Peduncles several and secund from leafless branches. 16. B. secunda
32. Stamens many on a long column; outer staminate tepals dentate. 18. B. maurandiae
29. Stem erect or ascending.
34. The stem short, very much exceeded by the peduncles; blades strongly vestite beneath; tepals red, 20-35 mm long. 30. B. froebelii
34. Stem elongate; peduncles very short; blades glabrous or nearly so; tepals pale, 3-9 mm long.
35. Stipules and bracts fimbriate; blades narrow, attenuate; capsule-wings very unequal. 45. B. fischeri
35. Stipules and bracts crenate; blades ample, apiculate; capsule-wings equal. 42. B. tiliifolia
23. Blades pinnate-nerved, generally at least twice as long as wide and widest near the middle, rarely combined with oblique blades on the same plant; plants caulescent, usually erect.
36. Inflorescence long and narrow, many-flowered; blades

slightly asymmetric with the abaxial side somewhat the wider.

37. Plant pubescent; tepals elliptic or ovate; pistillate tepals 4-5; pistillate bracteoles serrate, about equaling the ovary; largest capsule-wing ovate, ca. 1 cm wide. 4. _B. buddleiifolia_

37. Plant nearly glabrous; tepals suborbicular; pistillate tepals 2; pistillate bracteoles obscurely undulate or entire, very ample, accrescent; largest capsule-wing falcate, 2-4 cm wide. 27. _B. rossmanniae_

36. Inflorescence broad and regularly dichotomous or few-flowered.

38. Blade-bases subsymmetric with both sides cuneate or broadly rounded; anthers suborbicular or obovate, much shorter than the filaments; capsules alate.

39. Blade-base cuneate, then narrowly rounded; blade oblanceolate, 10-28 cm long; capsule-wings subequal. 46. _B. maynensis_

39. Blade-base broadly rounded; blade elliptic, 4-6.5 cm long; capsule-wings very unequal; (also scandent). 8. _B. holtonis_

38. Blade-base strongly asymmetric.

40. The blade-base with both sides meeting the petiole at the same point, one side cuneate or both rounded.

41. Blades with one lateral cusp on the larger side, obliquely cordate at base; pistillate tepals 4. 47. _B. harlingii_

41. Blades with only a terminal cusp.

42. Inflorescence 2-5 times dichotomous; capsule-wings unequal.

43. Larger basal blade-lobe overlapping the petiole and the blade often appearing dimidiate, sharply serrate; inflorescence 5-dichotomous. 48. _B. guaduensis_

43. Larger basal blade-lobe strongly divergent from the petiole; blades obscurely serrulate; inflorescence 2-3-dichotomous (herbarium specimens not always obviously climbing). 31. _B. consobrina_

42. Inflorescence unbranched or once dichotomous; capsule-appendages equal.

44. Blades glabrous; capsule alate; tepals 2-3 mm long. 1. _B. semiovata_

44. Blades subdensely vestite with coarse tumid-based hairs; capsule horned; tepals 15-25 mm long. 20. _B. longirostris_

40. The blade-base dimidiate with one side decurrent on the petiole.

45. Stipules persistent; plant glabrous; ovary and capsule ellipsoid or globose, unequally alate. 5. _B. foliosa_

45. Stipules deciduous; plant vestite especially on the branchlets and blade-nerves; ovary and capsule

turbinate, equally 3-horned.

46. Stamens 4; staminate tepals 11-16 mm long.
47. Staminate tepals very unequal, ovate, acute; blades glabrous above. 21. B. tetrandra
47. Staminate tepals subequal, oblong, deeply retuse; blades hirtellous above. 22. B. valvata
46. Stamens more than 4; staminate tepals 3-8 mm long; blades variable. 23. B. urticae

22. Blades oblique to transverse, their longest nerve making an angle with the petiole.
48. Blade-base cuneate on one side; blade pinnate-nerved (climbing habit not always evident in herbarium specimens).
49. Peduncle less than 1 cm long; inflorescence densely few-flowered. 43. B. albomaculata
49. Peduncle much more than 1 cm long; inflorescence laxly 2-3-dichotomous. 32. B. consobrina
48. Blade-base cordate.
50. Stipules and bracts fimbriate, persistent; inflorescence simple or once dichotomous.
51. Plant low, soft, annual or of shorter duration, tepals 2-4 mm long. 2. B. humilis
51. Plant medium, firm, perennial; staminate tepals to 8 mm long; pistillate tepals 3-6 mm long (blades also straight). 45. B. fischeri
50. Stipules and bracts entire, sometimes quickly deciduous; inflorescence mostly many-flowered.
52. Stem short, stout, exceeded by the petioles; peduncles much exceeding the leaves (blades also straight). 30. B. froebelii
52. Stem long, slender, much exceeding the petioles; peduncles slightly if at all exceeding the leaves.
53. Stipules inconspicuous, quickly deciduous, stems glabrous.
54. Inflorescence simple, 3-flowered (staminate) or 1-flowered (pistillate); capsule turbinate, equally 3-horned. 24. B. mariae
54. Inflorescence once or more often twice dichotomous.
55. Staminate pedicels much enlarged toward apex; capsule turbinate, equally 3-horned. 25. B. fuchsiiflora
55. Staminate pedicels very slender throughout; capsule ellipsoid, unequally 3-alate. 49. B. piurensis
53. Stipules conspicuous, persistent; inflorescence 1-3 times dichotomous.
56. Inflorescence with many flowers in dense terminal clusters; stem, petioles, blades and inflorescence-branches villous; capsule exalate. 26. B. exalata
56. Inflorescence lax throughout; stem, petioles, blades and inflorescence-branches sparsely pubescent to glabrous; capsule alate.
57. Stipules, bracts and bracteoles narrow, bracteoles

deciduous. 50. B. microcarpa

57. Stipules, bracts and bracteoles ample; bracteoles persistent. 31. B. pastoensis

Section DORATOMETRA (Kl.) A. DC.
(Section Poecilia A. DC.)

1. B. SEMIOVATA Liebm., Kjoeb. Vidensk. Meddel. 1852: 22. 1853. B. spruceana A. DC., Ann. Sci. Nat. IV. 11: 142. 1859. B. flexuosa A. DC., loc. cit. B. guyanensis A. DC., loc. cit. B. guyanensis var. glaberrima C. DC., Bot. Gaz. 20: 540. 1895.

Type: Oersted 209 (Holotype, C; photo, F), Nicaragua.

Ecuador: Cotopaxi, Esmeraldas, Guayas, Los Rios, Napo, Pastaza, Pichincha, Tungurahua. Mexico to Guiana and Peru.

2. B. HUMILIS Dryand. in Ait., Hort. Kew. 3: 353. 1789. B. lucida Haworth, Saxifrag. Enum. 197. 1821. B. meyeniana Walp. in Nov. Act. Leop.-Carol. 19, Suppl. 1: 409. 1843. B. subhumilis A. DC., Ann. Sci. Nat. IV. 11: 124. 1859. B. pavoniana A. DC., op. cit. p. 142.

Type: Kew Hortus s n (Holotype, BM; photo, GH), West Indies.

Stems and petioles glabrous or (B. subhumilis) with a few fine hairs toward their apices.

Ecuador: Los Rios, Morena-Santiago, Napo, Zamora-Chinchipe. West Indies to Peru and Brazil.

Section SCHEIDWEILERIA (Kl.) A. DC.

3. B. PARVIFLORA Poepp. & Endl., Nov. Gen. & Sp. 1: 7, pl. 12. 1835. B. micrantha Steud., Nomencl. ed. 2. 1: 194. 1840. Scheidweileria parviflora (Poepp. & Endl.) Kl. Begon. 59. 1855. Begonia myriantha Britton, Bull. Torrey Bot. Club 18: 35. 1891.

Type: Poeppig s n (Holotype, W), Peru.

Ecuador: Bolivar, Cotopaxi, Loja, Morona-Santiago, Napo, Pastaza, Pichincha, Santiago-Zamora, Tunguruahua. Colombia to Bolivia.

Section PILDERIA (Kl.) A. DC.

4. B. BUDDLEIIFOLIA A. DC., Ann. Sci. Nat. IV. 11: 141. 1859. Pilderia urticaefolia Kl., Monatsb. Berlin Akad. 127. 1854. Begonia urticaefolia Hort. ex Kl., Monatsb. Berlin Akad. 127. 1854, nomen. B. lantanaefolia A. DC., Ann. Sci. Nat. IV. 11: 141. 1859. B. pilderia A. DC. in DC. Prod. 15, pt. 1: 380. 1864. B. urticifolia (Kl.) Warb., Pflanzenfam. 3, Abt. 6a: 144. 1894, non Smith 1790.

Type: Spruce 3998 (Holotype, G; photo, GH), Peru.

Ecuador: Morona-Santiago, Pastaza, Santiago-Zamora, Tungurahua Venezuela, Colombia, Peru.

Section LEPSIA (Kl.) A. DC.

5. B. FOLIOSA H.B.K., Nov. Gen. & Sp. Pl. 7: 183, pl. 642. 1825. ? B. elegans H. B. K., op. cit., 182. B. putzeysiana A. DC., Ann. Sci. Nat. IV. 11: 139. 1859. B. jamesoniana A. DC., loc. cit. B. foliosa H. B. K. var. rotundata L. B. Smith & Schubert, Caldasia 4, no. 18: 192, pl. 17. 1946; var. putzeysiana

(A. DC.) L. B. Smith & Schubert, loc. cit.; var. australis L. B. Smith & Schubert, op. cit. p. 194, pl. 17.

Type: Humboldt & Bonpland s n (Holotype, P; photo, US), Colombia.

Ecuador: Azuay, Carchi, Morona-Santiago, Pastaza, Pichincha, Tungurahua. Venezuela, Colombia.

Section PRITZELIA (Kl.) A. DC.
(Section Wageneria A. DC.)

6. B. GLABRA Aubl. Pl. Guian. 2: 916, pl. 349. 1775. B. scandens Sw. Prod. 86. 1788. B. elliptica H. B. K., Nov. Gen. & Sp. 7: 180, pl. 641. 1825. B. lucida Otto & Dietr., Allg. Gartenz. 16: 162. 1848. B. mortiziana Kunth & Bouché, Ind. Sem. Hort. Berol. 16. 1848. B. physalifolia Liebm., Kjoeb. Vidensk. Meddell. 1852: 19. 1853.

Type: Aublet s n (Holotype, BM; photo GH), French Guiana.

Ecuador: Cotopaxi, Esmeraldas, Guayas, Los Rios, Manabi, Napo, Oro, Pastaza, Pichincha, Santiago-Zamora, Tungurahua. Southern Mexico and the West Indies to Guiana, Peru and Bolivia.

7. B. AERANTHOS L. B. Smith & Schubert, Mem. N. Y. Bot. Gard. 8: 36, fig. 2 a-e. 1952.

Type: Camp E-1317 (Holotype, NY; photo, US), Ecuador.

Ecuador: Zamora-Chinchipe (Santiago-Zamora).

Section MEIONANTHERA A. DC.

8. B. HOLTONIS A. DC., Ann. Sci. Nat. IV. 11: 141. 1859. ?B. umbrata A. DC. in DC. Prod. 15, pt. 1: 396. 1864. B. foliosa H. B. K., var. amplifolia L. B. Smith & Schubert, Caldasia 4, no. 18: 198, pl. 17. 1946. B. schimpfii Irmsch., Bot. Jahrb. 74: 604. 1949.

Type: Holton 725 (Holotype, G; isotype, GH), Colombia.

Ecuador: Azuay, Bolívar, Guayas. Colombia.

Section GOBENIA A. DC.

9. B. YNESIAE L. B. Smith & D. C. Wasshausen, sp. nov. A B. sodiroi C. DC., cui affinis, foliorum laminis margine crenato-dentatis, basifixis profunde cordatisque vel peltatis et basi plus minusve indentatis differt.

Plant climbing, perennial, glabrous; stem flexuous, woody; cortex red becoming gray, rimose and friable on old stems; internodes 1-3 cm long. Stipules persistent, broad, to 5 mm long, entire, thin, brown. Petioles to 9 cm long, red. Blades broadly ovate, acute or acuminate, 4-7 cm long, crenate-dentate, basifixed and deeply cordate or peltate and more or less indented at base, pale beneath. Peduncles usually single and axillary, 1.5-4 cm long, very slender. Inflorescence several times dichotomous; bracts persistent, like the stipules. Staminate pedicels 2-5 mm long; tepals 4, red, the outer broadly ovate, obtuse, 12 mm long, entire, the inner elliptic, ca. 10 mm long. Stamens many on a low torus, clavate with short or no filaments, the enlarged connective enveloping the pollen sacs. Pistillate pedicels to 10 mm long in fruit; bracteoles suborbicular, covering the young ovary; tepals 6, ovate, subequal, 4 mm long. Ovary 4-celled, subglobose; wings subequal, small; placentae bilamellate, ovuliferous throughout; styles less than 1 mm long, the stigmatic tissue reniform. Pl. 1.

Type: Ecuador: Pichincha: Canton Quito: Alaspongo; trail Nono to Gualea; dense forest, alt. 3124 m, Ynes Mexia 7706 (Holotype, AA; isotype, US).

Paratypes: Corazon (?), André 3661 (NY). Quito-Mindo road, west side Andes, rainforest, Prescott 1467 (NY); 1494 (NY); 1505 (NY).

10. B. PULULAHUANA C. DC., Bull. Herb. Boiss. II. 8: 325. 1908.

Type: Sodiro 589 (Holotype, G; photo F), Ecuador.

Ecuador: Loja, Napo, Pichincha.

11. B. TROPAEOLIFOLIA A. DC., Ann. Sci. Nat. IV. 11: 120. 1859

Var. TROPAEOLIFOLIA.

Type: Triana 3637 (Holotype, G; photo US; isotype, BM).

Peduncle and inflorescence glabrous.

Ecuador: Not yet found.

Var. PUBERULA L. B. Smith & Schubert, Lloydia 13: 87. 1950.

Type: Steyermark 54173 (Holotype, GH; isotype, F).

Peduncle and inflorescence puberulous.

Ecuador: Oro.

12. B. SODIROI C. DC., Bull. Herb. Boiss. II. 8: 323. 1908.

Type: Sodiro 588 (Holotype, G; photo, F), Ecuador.

Ecuador: Cotopaxi, Napo, Pichincha.

13. B. HITCHCOCKII Irmsch., Bot. Jahrb. 74: 620. 1949.

Type: Hitchcock 21800 1/2 (Holotype, US), Ecuador.

Ecuador: Napo, Tungurahua.

14. B. TRUNCICOLA Sodiro ex C. DC., Bull. Herb. Boiss. II. 8: 323. 1908.

Type: Sodiro 587 (Holotype, G; photo, F), Ecuador.

Ecuador: Carchi, Cotopaxi - Pichincha.

15. B. SEGREGATA L. B. Smith & Schubert, Begonian 27: 224, pl. 1960.

Type: Alston 8455 (Holotype, BM), Colombia.

Ecuador: Carchi. Colombia.

16. B. SECUNDA L. B. Smith & D. C. Wasshausen, sp. nov. A B. maurandiae A. DC., cui affinis, foliorum laminis subintegris, pedunculis aliquot e ramis exfoliatis secunde portatis, tepalis masculinis suborbicularibus minoribus differt.

Plant climbing, perennial; stem flexuous, woody, yellow-brown, sulcate, laxly and minutely glandular; internodes ca. 2 cm long. Stipules persistent, broadly ovate to suborbicular, acuminate, 2 mm long, entire, thin, brown, nerveless, glabrous. Petioles to 6 cm long, glabrous. Blades basifixed, ovate, attenuate, truncate or slightly retuse at base, 8 cm long, 4 cm wide, subentire, subglabrous, pale beneath. Peduncles several and secund from leafless branches, 2 cm long, filamentous, glabrous. Inflorescence 3-flowered with the single staminate flower central; bracts persistent, like the stipules. Staminate pedicel 2 mm long; tepals 4, the outer subreniform, 3.5 mm wide, entire, red, very sparsely pubescent, the inner saccate, 1.5 mm long, white. Stamens few, nearly free; filaments longer than the anthers; anthers ellipsoid with the enlarged connective enveloping the pollen sacs. Pistillate pedicels 15 mm long, longer in fruit; bracteoles persistent, ample, covering the ovary and capsule; tepals 5 (?), suborbicular, fleshy, the outer 1.5 mm long, the inner smaller, reniform. Ovary subglobose; wings very unequal, the largest falcate, ascending, to 10 mm wide and 5 mm high in fruit; placentae bilamellate, ovuliferous throughout; styles less than 1 mm long, the stigmatic tissue reniform. Pl. 2.

Type: Ecuador: Pichincha: Tandapi, epiphytic on tree trunk in forest, I. Holmgren 847 (Holotype, S; photo, US).

17. B. DODSONII L. B. Smith & D. C. Wasshausen, sp. nov. A *B. truncicola* Sodiro ex C. DC., cui valde affinis, foliorum laminis grosse sinuato-dentatis concoloribus differt.

Plant climbing, perennial; stem slightly flexuous, woody, gray-crustose on thicker parts, climbing to 5 m level (! Dodson). Stipules persistent, ovate, acuminate, 5 mm long, brown, glabrous. Petioles to 7 cm long, glabrous. Blades peltate, ovate, acuminate, evenly rounded at base, to 11 cm long, 4.5 cm wide, coarsely sinuate-dentate, concolorous, very sparsely pubescent beneath when young. Peduncles several from leafless branches, 2 cm long, filamentous, glabrous. Inflorescence 3-flowered with the single staminate flower central; bracts persistent, like the stipules. Staminate pedicel 5 mm long; tepals 4, entire, orange (! Dodson), the outer suborbicular, 5 mm long, the inner broadly obovate, 4 mm long. Stamens few, free, broadly clavate with filaments shorter than the anthers; the connective enveloping the pollen sacs. Pistillate pedicels 10 mm long in fruit; bracteoles persistent, broadly elliptic, entire or sparsely dentate, covering the fruit; tepals 5 (?), elliptic, ca. 1 mm long. Ovary subglobose, white (! Dodson); wings very unequal, the largest 10 mm wide and 4 mm high in fruit; styles less than 1 mm long. Pl. 3.

Type: Ecuador: Pichincha: Canton Santo Domingo, Centinela, 12 km east of Patricia Pilar, alt. 600 m, C. H. Dodson, T. Dodson & A. Embree 7115 (Holotype, SEL; isotype, US).

18. B. MAURANDIAE A. DC., Ann. Sci. Nat. IV. 11: 119. 1859.

B. hederacea A. DC., Ann. Sci. Nat. IV. 11: 120. 1859.

Type: Triana 386 (Holotype, K; isotype, GH), Colombia.

Ecuador: Azuay, Carchi, Imbabura, Napo, Pichincha, Santiago-Zamora, Tungurahua. Colombia.

19. B. ~~GEMINIFLORA~~ L. B. Smith & D. C. Wasshausen, sp. nov. A *B. hitchcockii* Irmsch., cui affinis, tepalis masculinis ellipticis, staminum columna elongata differt.

Plant climbing, perennial; stem flexuous, woody, gray-crustose, hirtellous; internodes ca 2 cm long. Stipules of stem large, soon disintegrating, those of branches persistent, ovate, acuminate, 2 mm long, 1-nerved, brown, glabrous. Petioles to 7 cm long, soon glabrous. Blades peltate, ovate, acute or acuminate, evenly rounded at base, 10 cm long, 6 cm wide, subentire, sparsely puberulent beneath around the umbo, pale beneath.

Peduncles 4 cm long, sparsely pubescent, soon glabrous. Inflorescences unisexual with evidently the single staminate flower suppressed in one and the 2 lateral pistillate in the other; bracts persistent, elliptic, 3 mm long, entire, thin, brown, pubescent. Staminate pedicel 3 mm long, pubescent; tepals 4, entire, red, the outer broadly elliptic, 20 mm long, sparsely pubescent, the inner shorter. Stamens many on a 12 mm long column; filaments about equaling the anthers, stout; anthers obovoid with the connective enveloping the pollen sacs. Pistillate pedicels 2 cm long; bracteoles persistent, suborbicular, covering the fruit; tepals 5 (?), elliptic, 2 mm long. Ovary subglobose; wings very unequal, the largest 15 mm wide and 6 mm high in fruit; styles less than 1 mm long. Pl. 4.

Type: Ecuador: Pichincha: Road from Santo Domingo to Quito, Cornejo Astorga (Tandapi), climbing in shrub vegetation, alt. ca. 1800 m, Harling, Storm & Ström 9262 (Holotype, US; isotype, S).

Section CASPARYA (A. DC.) Warb.
(Semibegoniella C. DC.)

20. B. LONGIROSTRIS Benth., Pl. Hartweg. 185. 1845. Casparya grewiaefolia A. DC., Ann. Sci. Nat. IV. 11: 117. 1859. C. grewiaefolia var. jamesoniana A. DC.; var. pavoniana A. DC. in DC. Prod. 15, pt. 1: 272. 1864. C. longirostris (Benth.) A. DC., loc. cit. Begonia grewiaefolia (A. DC.) Warb. in Pflanzenfam. 3, Abt. 6a: 146. 1894. Semibegoniella jamesoniana (A. DC.) C. DC., Bull. Herb. Boiss. II. 8: 327. 1908. C. sodiroi C. DC., loc. cit. Begonia colombiana L. B. Smith & Schubert, Caldasia 4, no. 16: 29, pl. 6. 1946.

Type: Hartweg s n (Holotype, K; photo, GH), Ecuador.

Ecuador: Imbabura, Napo, Pastaza, Pichincha. Colombia.

21. B. TETRANDRA Irmsch., Bot. Jahrb. 74: 626, pl. 7. 1949.

Type: Lobb s n (Paratype, W), Peru; Hitchcock 21889 (Paratype, US), Ecuador.

Ecuador: Napo, Pastaza, Tungurahua. Peru.

22. B. VALVATA L. B. Smith & Schubert, Mem. N. Y. Bot. Gard. 8: 40, fig. 2 f-i. 1952.

Type: Camp E-1560 (Holotype, NY), Ecuador.

Ecuador: Morona-Santiago.

23. B. URTICAE L. f., Suppl. 420. 1781. B. columnaris Benth., Pl. Hartweg. 131. 1844. Sassea glabra Kl., Monatsber. Berlin Akad. 128. 1854. Casparya columnaris beta glabra (Kl.) A. DC. in DC. Prod. 15, pt. 1: 274. 1864. Begonia monticola C. DC., Bull. Herb. Boiss. II. 8: 325. 1908. B. torresii Standl., Journ. Washington Acad. Sci. 17: 313. 1927. B. chiriquensis Standl. in Woodson & Schery, Ann. Missouri Bot. Gard. 27: 321. 1940. B. columnaris Benth. var. glabra (Kl.) L. B. Smith & Schubert in Macbride, Fl. Peru in Field Mus. Pub. Bot. 13, pt. 4: 187. 1941.

Type: Mutis s n (Holotype, M?), Colombia.

Ecuador: Azuay, Carchi, Imbabura, Loja, Morona-Santiago, Napo, Pichincha, Zamora-Chinchipe. Venezuela and Costa Rica to Peru.

24. B. MARIAE L. B. Smith, Phytologia 27: 213, pl. 2. 1973.
Type: John J. & Marie L. Wurdack & Tillett 2782 (Holotype, US; isotype, VEN), Venezuela.
Ecuador: Napo. Venezuela.

25. B. FUCHSIIFLORA (A. DC.) Warb. in Pflanzenfam. 3, Abt. 6a: 146. 1894, as "fuchsiifolia"; Baranov & Barkley, Phytologia 26: 220. 1973. Casparya fuchsiaeflora A. DC., Ann. Sci. Nat. IV. 11: 116. 1859.
Type: Jameson 415 (Holotype, G; photo, F), Ecuador.
Ecuador: Imbabura, Napo.

Section APTERON C. DC.

26. B. EXALATA C. DC., Bull. Herb. Boiss. II. 8: 326. 1908.
Type: Sodiro 597 (Holotype, G; photo, F), Ecuador.
Ecuador: Bolivar, Pichincha.

Section ROSSMANNIA (Kl.) A. DC.

27. B. ROSSMANNIAE A. DC. in DC. Prod. 15, pt. 1: 333. 1864. Rossmannia repens Kl., Begon. 99, pl. 9, fig. A. 1855.
Type: Ruiz & Pavon s n (Holotype, BM), Peru.
Ecuador: Morona-Santiago, Napo, Pastaza, Santiago-Zamora, Tungurahua. Colombia to Peru.

Section EUPETALUM (Lindl.) A. DC.
(Section Huszia A. DC.)

28. B. AEQUATORIALIS L. B. Smith & Schubert, Lloydia 13: 85. 1950.
Type: Steyermark 52878 (Holotype, GH; isotype, F), Ecuador.
Ecuador: Azuay, Chimborazo.

29. B. OCTOPETALA L'Hérit., Stirp. Nov. 101. 1788. B. grandiflora Knowles & Westcott, Flor. Cab. 1: 51. 1837. Huszia octopetala (L'Hérit.) Kl., Begon. Monatsber. Berlin Akad. 121. 1854. B. octopetala L'Herit. ssp. ovatiformis Irmsch. Bot. Jahrb. 76: 75. 1953.
Type: Dombey s n (Holotype, P), Peru.
Ecuador: Bolívar, Cañar, Cotopaxi, Loja, Pastaza. Peru.

30. B. FROEBELII A. DC., Gard. Chron. 2: 552. 1874.
Type: Froebel Hortus s n (Holotype, G?), Ecuador.
Ecuador: Cañar, Chimborazo.

31. B. PASTOENSIS A. DC., Ann. Sci. Nat. IV. 11: 121. 1959.
Type: Triana 3031 (Holotype, K; photo, US), Colombia.
Ecuador: Bolivar. Colombia.

Section RUIZOPAVONIA A. DC.

32. B. CONSOBRINA Irmsch. in Diels, Biblioth. Bot. 29: Heft 116: 111. 1937.
Type: Diels 995 (Holotype, B; photo, US), Ecuador.
Ecuador: Morona-Santiago, Napo, Pastaza, Santiago-Zamora, Tungurahua.

Section BEGONIA
(Section Begoniastrum A. DC.)

33. B. PARCIFOLIA C. DC., Smithsonian Misc. Coll. 69, no. 12: 10. 1919. B. nervidens Irmsch., Bot. Jahrb. 74: 614. 1949.
Type: Townsend 947 (Holotype, US), Ecuador.
Ecuador: Loja, Oro.

34. B. COMPACTICAULIS Irmsch., Bot. Jahrb. 74: 612. 1949. B. griseocaulis sensu L. B. Smith & Schubert, Mem. N. Y. Bot. Gard. 8 (1): 38. 1952, ex parte, non Irmsch. 1949. Pl. 5.
Type: Hitchcock 20315 (Holotype, US), Ecuador.
Ecuador: Chimborazo.

35. B. ERYTHROCARPA A. DC., Ann. Sci. Nat. IV. 11: 121. 1859. B. griseocaulis Irmsch. in Diels, Biblioth. Bot. 29, Heft 116: 112. 1937. B. pennellii L. B. Smith & Schubert, Field Mus. Publ. Bot. 13 (4): 196. 1941. B. lobato-peltata Irmsch. Bot. Jahrb. 76: 86. 1953.
Type: Weddell 4729 (Holotype, G), Bolivia.
Ecuador: Azuay, Chimborazo. Peru, Bolivia.

36. B. ASYMPELTATA L. B. Smith & D. C. Wasshausen, sp. nov. Inter species ecuadorenses quoad habitum acaulem haud tuberiferum et foliorum laminis peltatis B. serotinam accedit sed foliorum laminis valde asymmetricis, grosse duplicato-serratis, base emarginatis plicatisque differt.

Plant herbaceous, perennial. Stem erect, stout, 6 cm high, covered with the remains of old stipules. Leaves few, fasciculate at apex of stem. Stipules imbricate, persistent, broadly ovate, acute, ca. 1 cm long, entire, thick, glabrous, brown and rugose when dry, evidently fleshy when live, lateral nerves obscure. Petioles 4-6 cm long, laxly puberulent. Blades peltate, oblique and strongly asymmetric, 9-11 cm long, 5-7.5 cm wide, emarginate and plicate at base, pale beneath, sparsely puberulent on both sides. Peduncle terminal, erect, 15 cm long, much exceeding the leaves, glabrous in age. Inflorescence laxly 3-dichotomous, 12 cm wide, glabrous in age; bracts unknown. Staminate flowers unknown. Pistillate pedicels 15 mm long; bracteoles unknown; tepals 5, subequal, oblanceolate, subacute, ca. 7 mm long, entire. Ovary broadly ellipsoid, 9 mm long in fruit; wings subequal, broadly ovate, obtuse; placentae bilamellate; styles 3, subfree, bifid; stigmatic tissue linear, continuous, twice spiraled on each branch. Pl. 6.

Type: Ecuador: Los Rios: Hacienda Clementina, river side in virgin forest, epiphyte, alt. 150 m, Gunnar Harling 201 (Holotype, S; photo, US).

37. B. SEROTINA A. DC., Ann. Sci. Nat. IV. 11: 121. 1859. B. parmata Irmsch., Bot. Jahrb. 76: 190. 1953.
Type: Jameson 594 (Holotype, K), Ecuador.
Ecuador: Chimborazo, Cotopaxi, Guayas, Manabi.

38. B. LUDWIGII Irmsch. in Diels, Biblioth. Bot. 116: 113. 1937.
Type: Diels 1204 (Holotype, B), Ecuador.
Ecuador: Chimborazo, Oro.

39. B. TRIRAMOSA Irmsch., Bot. Jahrb. 74: 613. 1949.
Type: Rose 22493b ("224936") (Holotype, US).
Ecuador: Chimborazo.

40. B. XEROPHYTA L. B. Smith & D. C. Wasshausen, sp. nov. A B. parcifolia C. DC., cui verisimiliter affinis, foliorum laminis cum sinu basali aperto, floribus masculinis 6-plo majoribus differt.

Plant herbaceous, perennial. Stem erect, stout, known only from 4 cm. Leaves few, fasciculate at apex of stem. Stipules imbricate, persistent, broadly ovate to reniform, brown and rugose when dry, evidently fleshy when live, puberulent, ciliate. Petioles to 10 cm long, fleshy (?), red, puberulent. Blades basifixed, oblique and strongly asymmetric, broadly ovate to subreniform, deeply cordate at base, 15-23 cm wide and 13-16 cm high, shallowly lobate and duplicate-serrate, laxly puberulent above, white-tomentulose beneath. Peduncles terminal, erect, to 30 cm long, much exceeding the leaves, fleshy (?), red, puberulent. Inflorescence subracemosely 3-flowered; bracts deciduous, suborbicular, 2 cm long, fimbriate, thin, red. Staminate pedicels 4-5 cm long; tepals 4, the outer elliptic, obtuse, 18-30 mm long, 15 mm wide, entire, red outside, white inside; the inner broadly obovate, truncate or slightly retuse, 25 mm long, white to very pale pink (! Asplund). Stamens over 100 on a low torus; filaments 7 mm long; anthers elliptic, 2 mm long. Pistillate flowers (young) subsessile; bracteoles like the bracts; tepals 5, the 2 outer elliptic, much larger than the inner, red. Ovary ellipsoid; wings subequal, evenly rounded; styles 3, bifid; stigmatic tissue linear, spiral. Pl. 7.

Type: Ecuador: Loja: Between Loja and San Lucas, very steep and dry slope, alt. ca. 2100 m, Erik Asplund 18036 (Holotype, S; photo, US).

41. B. SPARREANA L. B. Smith & D. C. Wasshausen, sp. nov. A B. parcifolia C. DC., cui parum affinis, foliorum laminis haud lobatis, cum sinu basali aperto, inflorescentiis folia subaequantibus, tepalis femineis 4, exterioribus subaequalibus differt.

Plant herbaceous, perennial. Stem erect, known only from 4 cm. Leaves few, fasciculate at apex of stem. Stipules imbricate, deciduous, ovate, filiform-attenuate, 10 mm long, entire, thin, nerved, brown, pubescent. Petioles 3-7 cm long, slender, laxly pubescent. Blades basifixed, oblique, deeply cordate at base, to 15 cm long, 10 cm wide, evenly rounded except at apex, finely setose-serrate, sparsely pubescent above and very sparsely beneath. Peduncles 5-7 cm long, about equaling the leaves, laxly pubescent. Inflorescences simply racemose or unequally dichotomous with one branch simple and one racemose, laxly pubescent; bracts persistent, like the stipules but elliptic and rounded. Staminate pedicels 5-7 mm long; tepals 4, entire, the outer suborbicular, 9 mm long, slightly colored, the inner lance-ovate, 8 mm long, white. Stamens ca. 25, free; filaments 2 mm long; anthers elliptic, 1 mm long, the connective apex slightly produced, broadly rounded. Pistillate pedicels 8 mm long; bracteoles like the bracts; tepals 5, the 4 outer broadly elliptic, rounded and apiculate, 7 mm long, the inner one elliptic, acute, smaller. Ovary ellipsoid; wings slightly unequal, triangular with a horizontal upper margin; placentae bilamellate; styles 3, free, slender, bifid; stigmatic tissue linear, continuous, twice spiraled on the arms. Pl. 8.

Type: Ecuador: Morona-Santiago: Gualquiza, Misión Bomboiza, Misión Salesiana, primary and secondary tropical rainforest, alt. ca. 700-800 m, Benkt Sparre 19025 (Holotype, S; photo, US).

42. B. TILIIFOLIA C. DC., Bull. Herb. Boiss. II. 324. 1908, as "tiliaefolia".

Type: Sodiro 584 bis (Holotype, G); 554e (G, paratype; F, photo), Ecuador.

Ecuador: Carchi, Cotopaxi, Pichincha. Panama, Colombia.

43. B. ALBOMACULATA C. DC. ex Huber, Bol. Mus. Para 4: 593. 1906, description legal but useless.

Type: Hortus Museu Goeldi s n (Holotype, MG), Peru. Det. C. DC.: Sodiro 590a (G; F, photo). Type not seen, identification by photo of Sodiro 590a.

Ecuador: Oro, Pichincha. Peru.

44. B. ACERIFOLIA H.B.K., Nov. Gen. & Sp. 7: 186, pl. 644. 1825. B. dolabrifera C. DC., Bull. Herb. Boiss. II. 8: 324. 1908.

Type: Humboldt & Bonpland s n (Holotype, P; photo, US), Ecuador.

Ecuador: Azuay, Bolivar, Chimborazo (?), Loja.

45. B. FISCHERI Schrank, Pl. Rar. Hort. Acad. Monac. 2: pl. 59. 1820.

Var. FISCHERI. B. patula sensu Kl., Begon. 30. 1855, non Haworth 1819. B. tovarensis Kl., Begon. 31. 1855.

Type: Munich Hortus s n (Holotype, M), Brazil.

Blades all reniform and oblique.

Ecuador: Not yet found.

Var. KLUGII Irmsch., Bot. Jahrb. 76: 99. 1953.

Type: Klug 3389 (Holotype, US), Peru.

Blades or some of them ovate and straight.

Ecuador: Loja, Morona-Santiago, Pastaza, Zamora-Chinchipe. Peru.

46. B. MAYNENSIS A. DC., Ann. Sci. Nat. IV. 11: 126. 1859.

Type: Spruce 4859 (Holotype, G; photo, F), Peru.

Ecuador: Napo, Pastaza, Santiago-Zamora, Zamora-Chinchipe. Peru.

47. B. HARLINGII L. B. Smith & D. C. Wasshausen, sp. nov. Ab omnibus speciebus ecuadorensibus foliorum laminis lateraliter unicuspidatis, pedunculis brevibus, inflorescentia pauciflora, tepalis femineis 4 differt.

Plant ascending, perennial, 20-26 cm high; stem nearly straight, red, pubescent; internodes to 5 cm long. Stipules deciduous, oblong, acute, 12 mm long, 1-nerved, entire, thin, green. Petioles to 33 mm long, pubescent. Blades straight, strongly asymmetric with one side lanceolate and evenly curved, the other elliptic with a single lateral cusp, cordate, acuminate, to 13 cm long, 6 cm wide, coarsely serrate, thin, pubescent on the nerves beneath. Peduncles axillary, to 18 mm long. Inflorescence few-flowered, glabrous, bracts deciduous, elliptic, 10 mm long. Staminate pedicel 9 mm long; tepals 4, entire, white, the outer broadly ovate, 9 mm long, the inner oblong, obtuse, 6 mm long. Stamens about 20, free; filaments short; anthers oblong, ca. 2 mm long; connective produced, obtuse. Pistillate pedicels 6 mm long in fruit; bracteoles deciduous, like the bracts; tepals 4, punctulate, the (young) outer broadly ovate, 5 mm long, the inner oblong. Ovary ellipsoid, punctulate; wings subequally alate, the wings triangular with the upper margin horizontal; placentae bilamellate; styles 4, highly connate, bifid, the stigmatic tissue continuous, once spiral. Pl. 9.

Type: Ecuador: Los Rios: Hacienda Clementina, virgin forest, Samana, alt. 750 m, G. Harling 487 (Holotype, S; photo, US); 521 (Paratype, S; photo, US; flowers malformed and bisexual as if diseased).

48. B. GUADUENSIS H.B.K., Nov. Gen. & Sp. 7: 178. 1825. *B. ottonis* Walpers, Repert. Bot. Syst. 2: 212. 1843. *B. serratifolia* C. DC., Smithsonian Misc. Coll. 69, no. 12: 7. 1919.

Type: Humboldt s n (Holotype, P; photo, US), Colombia.

Ecuador: Santiago-Zamora, Zamora-Chinchipe. Colombia, Venezuela, Peru.

49. B. PIURENSIS L. B. Smith & Schubert, Field Mus. Pub. Bot. 13, pt. 4: 197. 1941.

Type: Stork 11393 (Holotype, UC; isotype, GH), Peru.

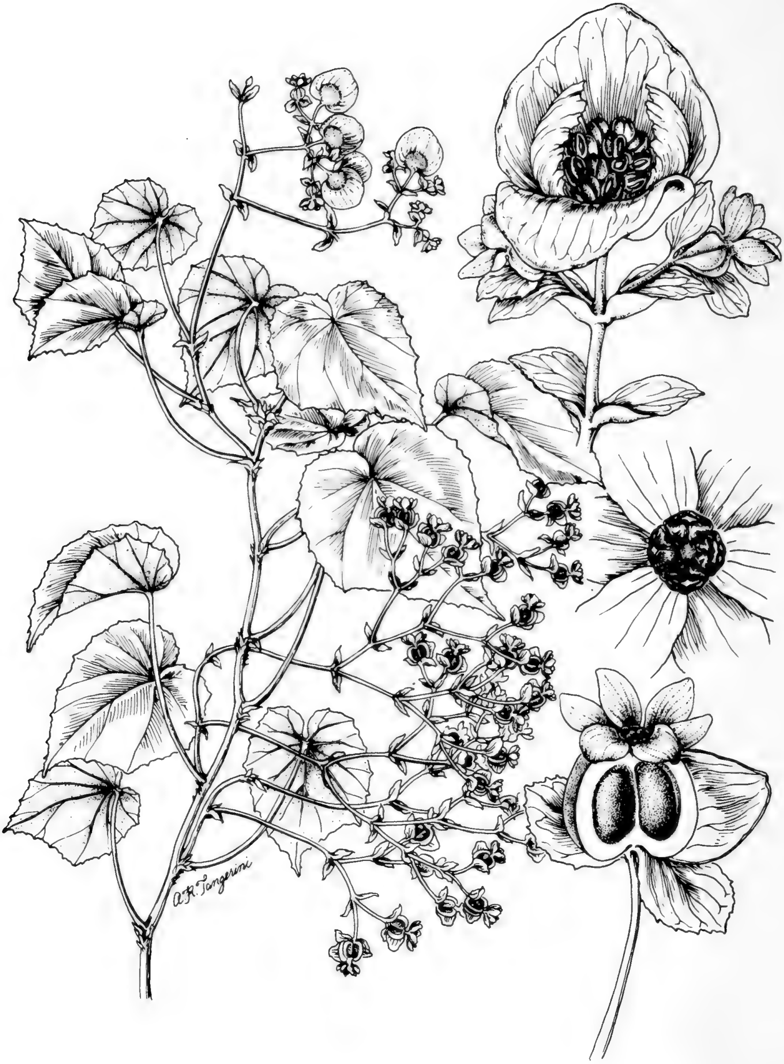
Ecuador: Chimborazo. Peru.

50. B. MICROCARPA A. DC. in DC. Prod. 15, pt. 1: 311. 1864.

Type: Spruce 5070 (Holotype, G; photo, F), Ecuador.

Ecuador: Province unknown. Colombia.

Plate 1.

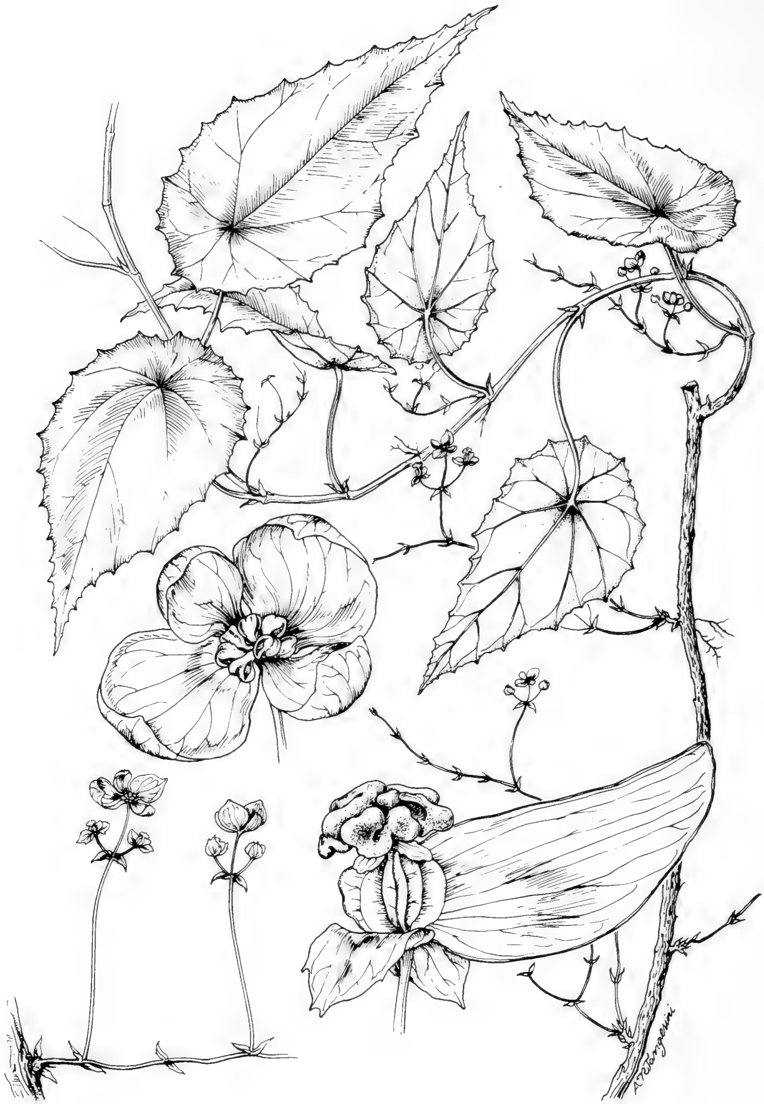


Begonia ynesiae L. B. Smith & Wasshausen

Plate 2.

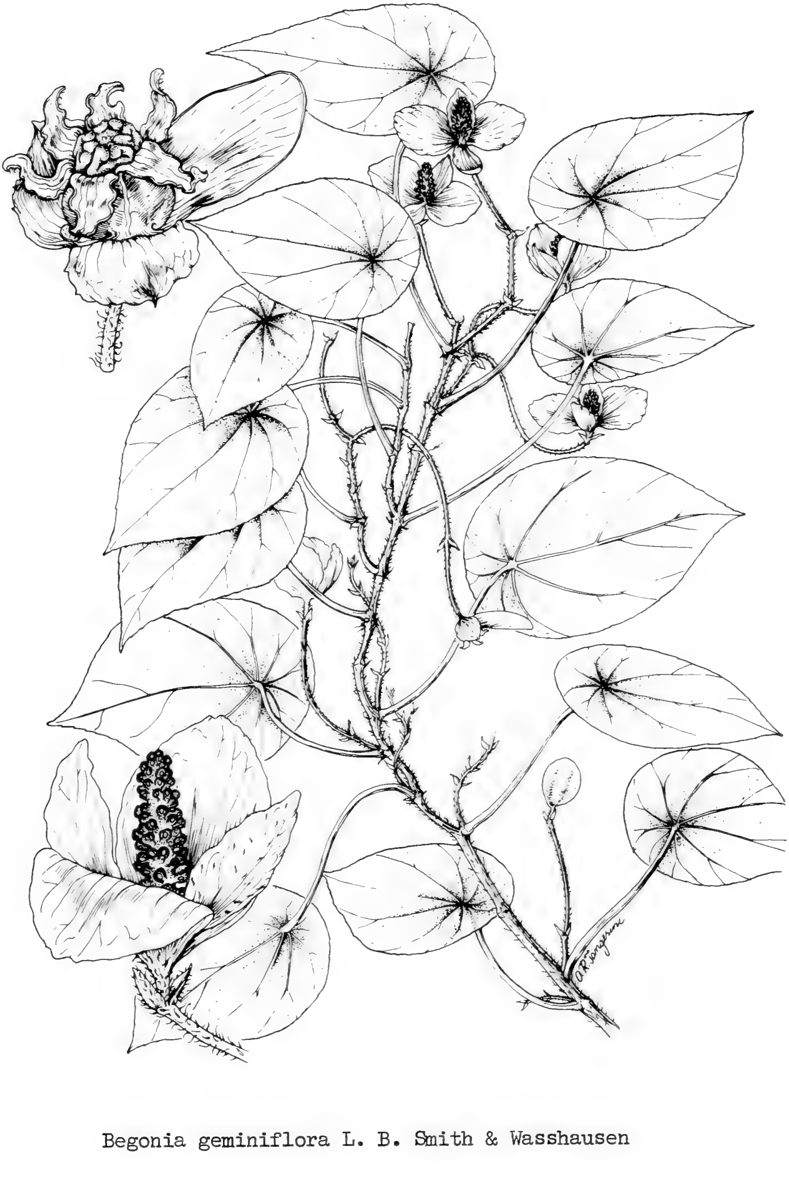
Begonia secunda L. B. Smith & Wasshausen

Plate 3.



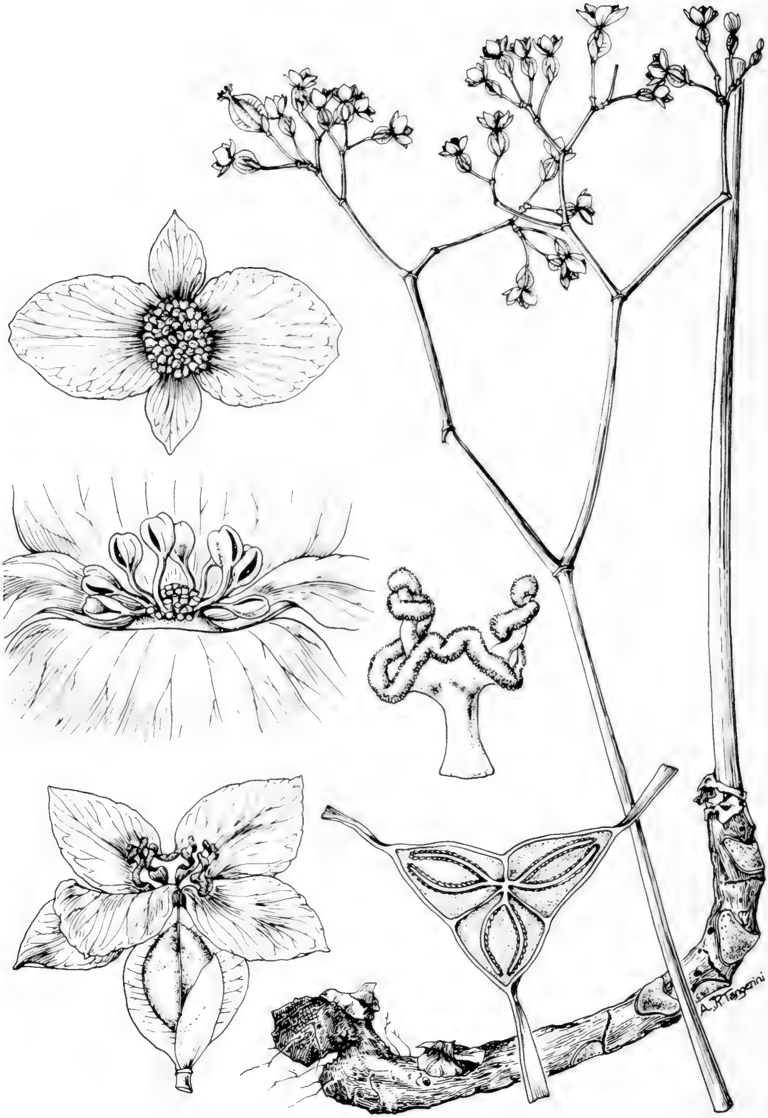
Begonia dodsonii L. B. Smith & Wasshausen

Plate 4.



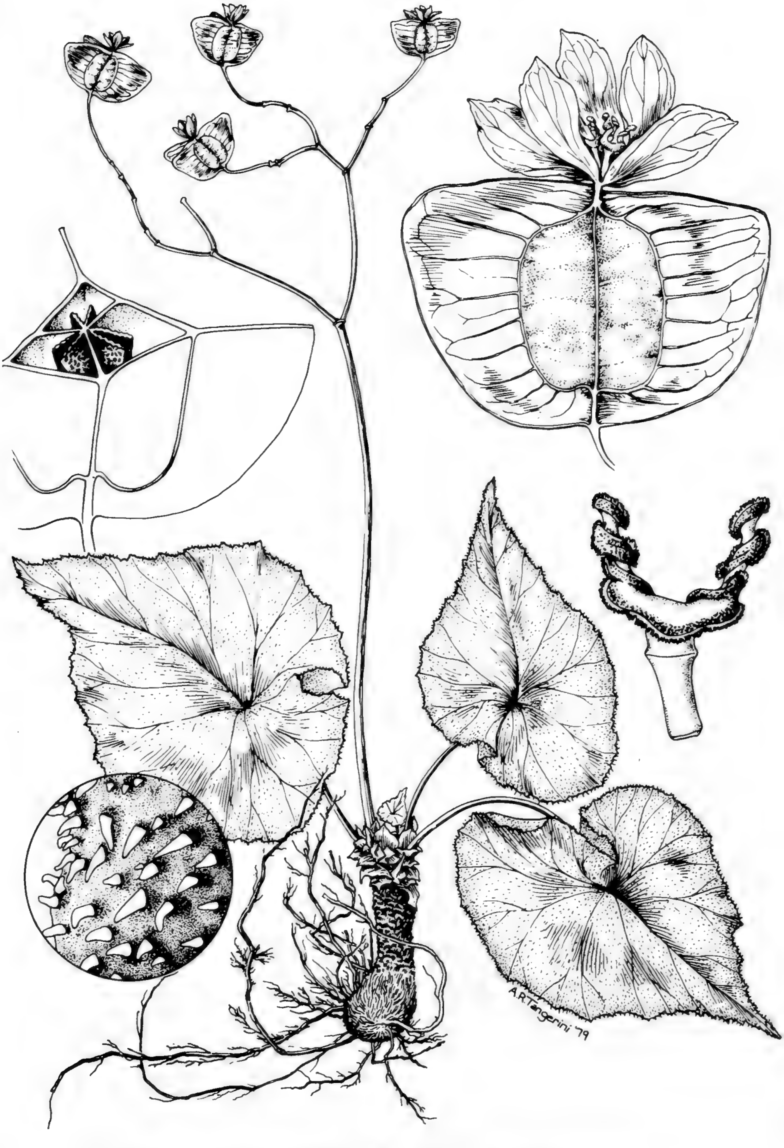
Begonia geminiflora L. B. Smith & Wasshausen

Plate 5.



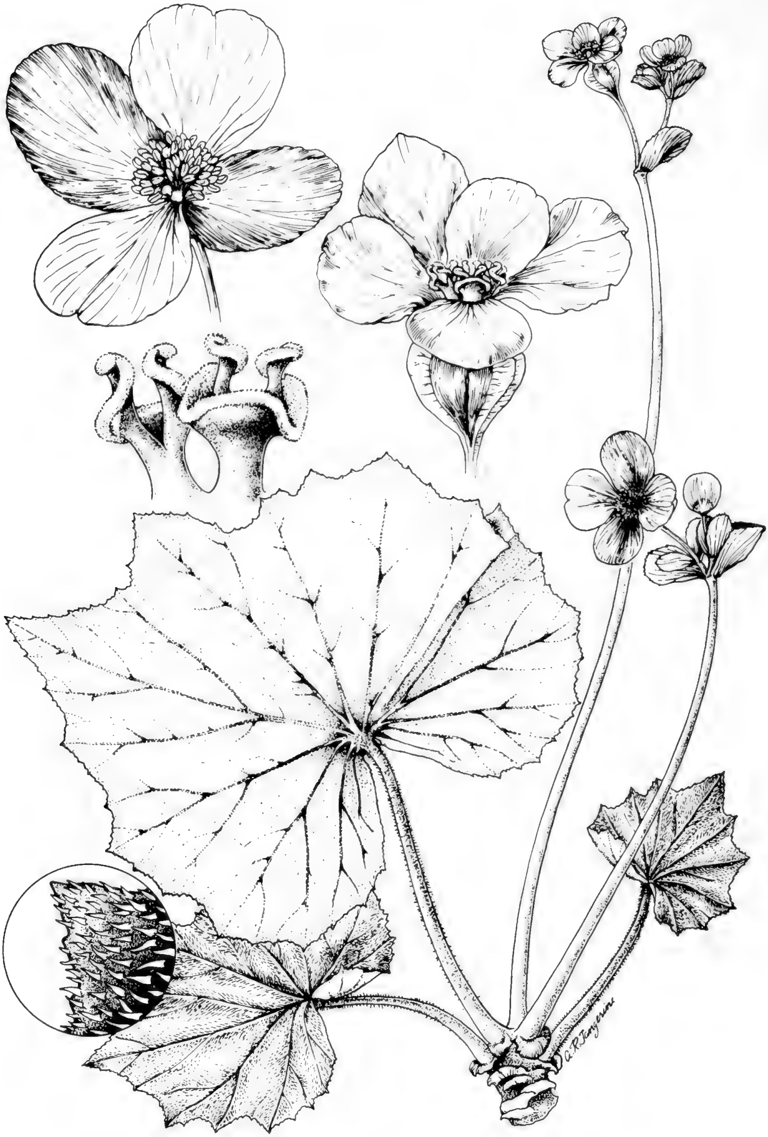
Begonia compacticaulis Irmscher

Plate 6.



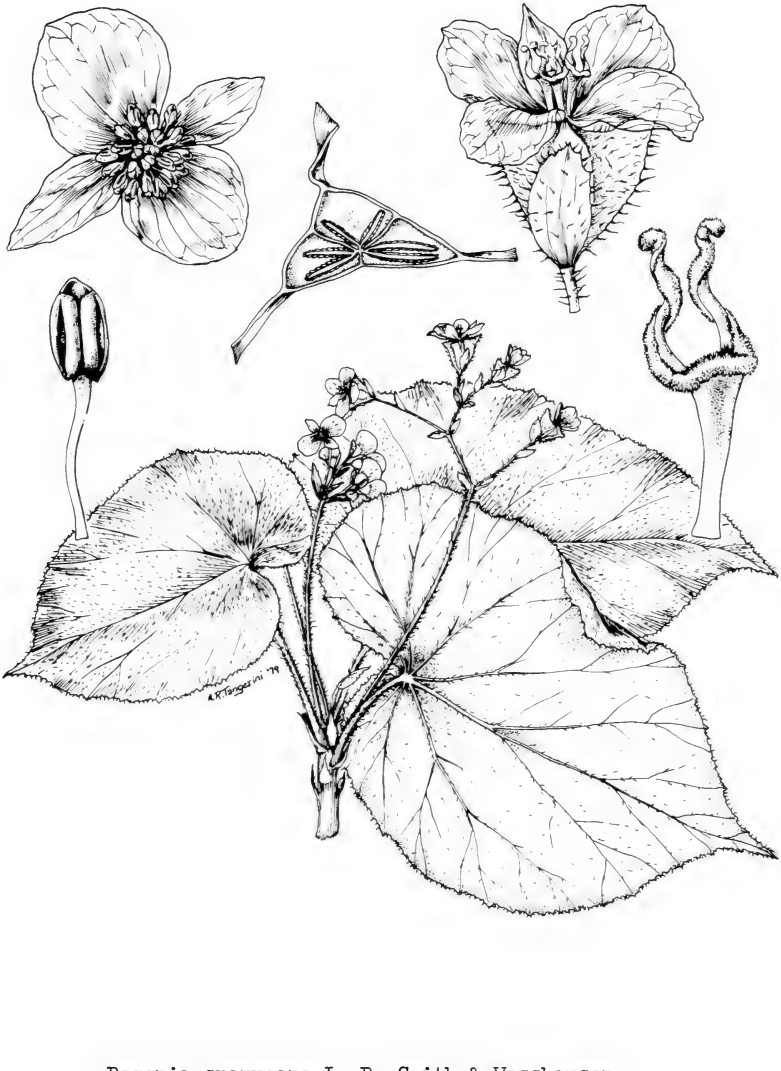
Begonia asympeltata L. B. Smith & Wasshausen

Plate 7.



Begonia xerophyta L. B. Smith & Wasshausen

Plate 8.



Begonia sparreana L. B. Smith & Wasshausen

Plate 9.

Begonia harlingii L. B. Smith & Wasshausen

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XVIII.

A NEW GENUS *HELIANTHOPSIS*.

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Though the genus *Helianthus* L. was the first one proposed of those now placed in the subtribe Helianthinae, the genus was never broadly interpreted, and the concept was soon mostly restricted to a natural group of herbaceous species native to North America. Most of the closely related elements in the Neotropics have been placed in such genera as *Simsia* Pers. or in the broadly circumscribed *Viguiera* H.B.K. Nevertheless, a distinctive group of shrubby species from the Andes of Ecuador and Peru, having a deciduous pappus like that of typical *Helianthus*, has continued to be included in the genus. Continuing studies of the Andean Heliantheae have shown the need to treat the disjunct group as a separate genus which is named here as *Helianthopsis*.

The present action rests on two basic conclusions, first, that the Andean group is not directly related to typical *Helianthus* of North America, and second, that it should not be included in a further broadened concept of the genus *Viguiera*. Actually, the problem of a polyphyletic *Helianthus* has been clearly stated for many years. Heiser (1957), in his study of South American *Helianthus*, concluded that *Viguiera* was the likely ancestral genus in the complex and that the two elements of *Helianthus* were separately derived. The deciduous pappus with obsolete squamellae in *Helianthus* versus a persistent pappus with prominent squamellae in *Viguiera* was the only difference then recognized for separating the genera, but Heiser argued against reducing *Viguiera* into synonymy in order to restore a phyletic concept. Nevertheless, Heiser did nothing more with the South American *Helianthus* than to rather informally propose a new subgenus, *Viguieropsis*, distinguished from the North American species by the shrubby habit.

An important character is now known which confirms the polyphyletic nature of *Helianthus*. The styles of the South American species have short tips without an appendage. The North American species have a long slender appendage present on the point of the style, a feature evident in even those species that have become cultivated or established in South America. In reality, typical *Helianthus* seems to find its closest relative in the genus *Simsia*, which also has a slender style appendage (Robinson & Brettell, 1972), but which has generally slender style branches which often coil when dried. It is significant that typical Viguiera also possesses a short but distinct appendage on its style (Robinson, 1977), and future trends will almost certainly require a narrowing rather than a broadening of that genus.

The present generic delimitation of Helianthopsis follows what has been called Helianthus in the Andes, and though the traditional separation from Viguiera is thus maintained, some clarification is necessary. In spite of the evident close relation of Helianthopsis with Andean elements presently placed in Viguiera, the division does seem to be a natural one. In Helianthopsis, the species that show superficial resemblance to Viguiera are all members of the specialized pale-anthered group. The less shrubby scarcely tomentose H. matthewsii would not immediately be recognized as a member of the genus, but it has the typical pappus form. Helianthopsis hutchisonii actually has a Viguiera-type pappus but has leaf pubescence, head structure and anther color which indicate its place in the pale-anthered series remote from anything in Viguiera. In Viguiera, only V. sodiroi (Hieron.) Blake and some specimens of V. incana (Pers.) Blake are likely to be mistaken for Helianthopsis because of the presence of tomentum, but they are perennial herbs, they have an obvious Viguiera-type pappus, and they are much like other species of Andean Viguiera in the way the lower lateral veins run subparallel to the leaf margin. The leaves and stems of both species tend to have at least some coarser pubescence unlike that of Helianthopsis.

Other generic names that have been used for Andean Helianthinae with exappendiculate styles are Leighia Cass. and Syncretocarpus Blake. Leighia originally included Helianthopsis microphylla, but the type was the herbaceous Mexican species, L. elegans Cass. (= Viguiera linearis (Cav.) Sch.Bip., Blake 1918). Syncretocarpus was established for a group of Peruvian species. The characteristic margin on the achene of Syncretocarpus was simply a differentiated zone rather than a Verbesina-type wing as suggested by Blake (1916), and the relationship of the genus is entirely within the Viguiera complex. Still, the suffrutescent habit and well-developed Viguiera-type pappus indicate a position apart from Helianthopsis.

In establishing the new genus, the informally proposed subgenus Viguieropsis has seemed an unlikely candidate for elevation. In any case, the name Helianthopsis seems best as a reflection of the historical placement of the species.

Helianthopsis H.Robinson, genus nov. Asteracearum (Heliantheae).

Plantae frutescentes mediocriter ramosae. Folia opposita vel alterna; laminae ovatae vel anguste oblongae plerumque distincte pubescentes supra dense vel perdense pilosae subtus tomentosae vel lanatae inferne trinervatae, nervis marginem non parallelis. Inflorescentiae terminales pauce capitatae. Squamae involucri plerumque triseriatae in part herbaceae;

paleae subconduplicatae obtusae vel breviter acutae. Flores radii numerosi asexuales; corollae flavae 2-3-lobatae supra papillosae. Flores disci numerosi hermaphroditi; corollae flavae vel superne nigrescentes 5-lobatae, faucis anguste campanulatis inferne plerumque scabridis; filamenta glabra; thecae antherarum plerumque nigrescentes; appendices antherarum abaxialiter glandu-liferae et interdum setiferae; rami stylorum obtusi exappendiculati, linis stigmataceis solitariis. Achaenia disci distincte compressa striata; aristae pappi base articulatae facile deciduae; squamellae paucae vel nullae.

Type species: Helianthus microphyllus H.B.K.

Twenty species are presently recognized in the genus. Also, as described, Helianthus argenteus H.B.K., from Azuay in Ecuador, has the characters of Helianthopsis. A photograph of the type shows solitary heads that are sometimes on rather long erect peduncles, a character that is rather unusual for the genus. No material matching the latter species has been seen in the present study, and it is omitted from the listing and key.

The genus is distributed from northern Ecuador southward to central Peru with a major concentration of species in Cajamarca and adjacent areas of northern Peru. In addition, Heiser (1957) cites a specimen of H. imbaburensis from Nariño in southwestern Colombia.

The phytogeographic approach has proven useful in the study of the species concepts, though not as clearly as in the case of Monactis (Robinson, 1976). The break betweem Ecuadorian and Peruvian elements of Helianthopsis is particularly marked, and no species is presently known from both countries. Furthermore, the black-anthered species of Ecuador and Peru seem to form two thoroughly distinct natural groups, and the pale-anthered species of Ecuador are obviously more closely related to each other than to those of Peru. The center of diversity is evidently in Peru with only the H. lehmannii group being restricted to Ecuador. No species with reflexed palea tips are known from Ecuador, though the character is seen in both black-anthered and pale-anthered species from Peru. Opposite leaves are found in many Peruvian species including some that are primarily alternate such as H. stuebelii and H. sagasteguii, the latter being one of the pale-anthered species. No opposite leaves have been seen in any specimens from Ecuador. In both H. lehmennii and H. grandiceps of Ecuador the anther appendages apparently vary in color from yellow to black. In Peruvian species, with the possible exception of H. discolor, the color of the anther appendages seems to be a reliable species character.

The following key attempts to de-emphasize use of opposite versus alternate leaves since the character is evidently variable and is poorly represented in many specimens.

Key to the species of Helianthopsis

1. Anther thecae at maturity not black. Most involucral bracts with prominent pale costae below and herbaceous distally. Disk corolla never black distally. Heads not solitary.

2. Ecuadorian species. Tips of paleae never recurved. Heads often densely clustered.

3. Leaves lanceolate, entire or slightly serrulate above ... *H. pseudoverbesinoides*

3. Leaves mostly ovate, serrulate or serrate mostly at widest part of blade.

4. Outer involucral bracts with distinctly reflexed tips ... *H. hypargyrea*

4. Outer involucral bracts without reflexed tips ... *H. imbaburensis*

2. Peruvian species. Tips of paleae often recurved. Heads usually laxly disposed.

5. Heads with disk mostly 5-7 mm wide. Corolla lobes scarcely emergent beyond paleae.

6. Leaves ovate-lanceolate, not much reduced in inflorescence, not more densely pubescent below ... *H. matthewsii*

6. Leaves narrowly lanceolate, reduced in inflorescence, obviously tomentose below ... *H. verbesinoides*

5. Heads with disk mostly 10-15 mm wide. Mature corollas with upper throat emergent beyond paleae.

7. Leaves lanceolate, entire, reduced in inflorescence. Stems puberulous ... *H. hutchisonii*

7. Leaves broadly ovate, serrate, moderately reduced in inflorescence. Stems hirsute ... *H. sagasteguii*

1. Anther thecae black at maturity. Outer involucral bracts without distinct pale costae basally. Disk corolla yellow or distally blackened.

8. Ecuadorian species. Leaves alternate; with blades large, often to 9-10 cm long and 5-7 cm wide, margins never reflexed; paleae glabrous on outer surface.

9. Peduncles and involucres densely lanate. Corolla lobes longer than wide, nearly glabrous on outer surface *H. lehmannii*

9. Peduncles hirsute with interspersed shorter hairs visible. corolla lobes equilaterallly triangular, densely pubescent on outer surface.

10. Numerous outer involucral bracts with reflexed narrow tips, mostly greenish *H. grandiceps*

10. Few or no differentiated outer involucral bracts, tips obtuse to short-acute, involucre blackish with outer surfaces sometimes partly subglabrous *H. nigrescens*

8. Peruvian species. Leaves alternate or opposite; blades often small, never more than 7 cm long or 4.5 cm wide. margins often reflexed; paleae usually pubescent on outer surface.

11. Anther appendages completely black. Leaf blades ovate or broadly oblong.

12. Stems and undersurfaces of leaves white-lanate. Paleae narrowly pointed and strongly recurved at tip *H. lanata*

12. Stems and undersurfaces of leaves mostly tomentose, usually yellowish or dingy white. Paleae sharply acute and erect to slightly recurved at tip *H. stuebelii*

11. Anther appendages partly to completely yellow.

13. Paleae all with sharply reflexed tips. Leaves ovate to broadly ovate *H. senex*

13. Paleae with tips erect or incurved, rarely reflexed.

14. Leaves densely puberulous or short-pilose below, pubescence not covering surface *H. viridior*

14. Leaves distinctly tomentose or lanate below.

15. Leaf blades ovate.

16. Leaf tips distinctly acuminate or narrowly acute. Heads raised on distinct peduncles. Rays with styles present *H. acuminata*

16. Leaf tips short-acute to obtuse. Heads short-pedunculate or subsessile. Rays without styles.

17. Leaves opposite, petiole 10-20 mm long ... H. jelskii

17. Leaves mostly alternate, petiole 3-5 mm long ... H. lodicata

15. Leaf blades narrowly oblong to linear or linear-lanceolate.

18. Stems mostly puberulous. Heads solitary on tips of slender branches; anther appendages often partially blackened; tips of a few paleae reflexed ... H. discolor

18. Stems densely lanate. Heads usually more than 1 on tips of branches; anther appendages yellow; tips of paleae all erect or incurved.

19. Upper leaf surface subglaucous with very dense very minute puberulence, surface not rugulose. Heads distinctly pedunculate on branches with some reduced leaves ... H. microphylla

19. Upper leaf surface coarsely puberulous, somewhat rugulose. Heads short-pedunculate or subsessile, clustered at tips of normally leaved branches ... H. subnivea

The twenty recognized species of Helianthopsis are as follows.

Helianthopsis acuminata (Blake) H.Robinson, comb. nov.
Helianthus acuminatus Blake, Jour. Wash. Acad. Sci. 16: 219. 1926. Peru (Huanuco, Junin). The type and one other specimen (Hutchison 4153) have been seen, the latter differing by the lack of opposite leaves. Both specimens have distinct though probably non-functional styles in the ray flowers, a feature that seems unique in the subtribe.

Helianthopsis discolor (Blake) H.Robinson, comb. nov.
Helianthus discolor Blake, Jour. Wash. Acad. Sci. 16: 220. 1926. Peru (Cajamarca, Huanuco, La Libertad). The specimen seen from Cajamarca (Soukup 4548) has sericous pubescence on the leaves and often multiple aristae on the achenes. Also, some of the heads have pale anthers, but the latter heads are apparently defective.

Helianthopsis grandiceps (Blake) H.Robinson, comb. nov.
Helianthus grandiceps Blake, Contr. U.S. Nat. Herb. 22: 621. 1924. Ecuador (Azuay, Chimborazo, Loja).

Helianthopsis hutchisonii H.Robinson, sp. nov.
Plantae frutescentes ad 2 m altae inferne pauce vel non

ramosae. Caules purpurascentes inferne dense cinereo-puberuli superne sparse puberuli. Folia alterna, petiolis 3-10 mm longis; laminae ovato-lanceolatae plerumque 4-7 cm longae et 0.7-2.3 cm latae base anguste rotundatae et sensim breviter acuminatae margine integrae apice anguste acutae supra velutinae subtus tenuiter albo-tomentosae fere ad basem trinervatae. Inflorescentiae terminales perlaxe ramosae, ramis elongatis superne tenuibus, bracteis anguste ellipticis vel linearibus 8-20 mm longis et 1-3 mm latis. Capitula hemisphaerica 12-14 mm alta et sine radiis ca. 15 mm lata. Squamae involucri ca. triseriatae ca. 20 anguste oblongae vel lineares 4-9 mm longae et 1.5-3.0 mm latae inferne pallide 2-4-costatae supra medium herbaceae apice acutae extus dense hirtellae intus in partibus herbaceis dense puberulae; paleae oblongo-ovatae ca. 9 mm longae pallide 4-6-costatae margine late scariosae apice acutae distincte reflexae extus minute puberulae. Flores radii ca. 12; corollae flavae 12-13 mm longae et 4 mm latae extus dense minute hispidulae, limbis glanduliferis, tubis 1-2 mm longis. Flores disci ca. 50; corollae flavae ca. 8 mm longae, tubis ca. 1 mm longis subglabris, faucis cylindraceis ca. 6 mm longis extus dense scabridulis et pauce tenuiter glandulo-piliferis, lobis triangularibus ca. 1.0 mm longis et 0.9 mm latis intus valde papillosis extus dense scabridulis; filamenta in parte superiore ca. 0.3 mm longa; thecae antherarum ca. 3 mm longae non nigrescentes; appendices antherarum ovatae ca. 0.45 mm longae et 0.4 mm latae. Achaenia radii sterilia ca. 3 mm longa glabra, squamellae pappi numerosae. Achaenia disci ca. 4.3 mm longa et 1.6 mm lata dense sericeo-setifera; aristae pappi 2 ca. 3.5 mm longae mediocriter deciduae; squamellae pappi 10-12 late lineares ca. 1.5 mm longae subpersistentes. Grana pollinis 35-37 µm in diametro longe spinosa.

TYPE: PERU: Cajamarca: Celendin: Opposite Balsas & upstream 1 km. Common border of Dept. Amazonas, on Rio Marañon. Alt. ca. 800 m. To 2 m. 29 May 1964. P.C.Hutchison & J.K.Wright 5436 (Holotype US, Isotypes F, UC, USM).

Helianthopsis hutchisonii is notable in the genus for the *Viguiera*-type pappus, a feature that does not seem to reflect any close relationship to species presently placed in *Viguiera*. Both the leaf-venation and the pubescence is strictly of the *Helianthopsis* type. In fact, *H. hutchisonii* is evidently a specialized member of the pale-anthered series of *Helianthopsis*, and it seems quite close to *H. sagasteguii* n. sp., having the same type of reflexed tips on the paleae. Differences of the new species include the shorter pubescence on the stems and leaves, the narrower entire leaves and the more open inflorescence with narrow reduced bracts. The new species also seems to occur at lower elevations than other members of the genus.

Helianthopsis hypargyrea (Blake) H.Robinson, comb. nov.

Helianthus hypargyreus Blake, Bot. Gaz. 74: 421. 1922.

Ecuador (Azuay, Chimborazo, Tungurahua).

Helianthopsis imbaburensis (Hieron.) H.Robinson, comb. nov. Helianthus imbaburensis Hieron., Bot. Jahrb. 21: 348. 1895. Ecuador (Imbabura), Colombia (Nariño).

Helianthopsis jelskii (Hieron.) H.Robinson, comb. nov. Helianthus jelskii Hieron., Bot. Jahrb. 36: 490. 1905. Peru (Cajamarca).

Helianthopsis lanata (Heiser) H.Robinson, comb. nov. Helianthus lanatus Heiser. Brittonia 8: 291. 1957. Peru (Ancash, Lima).

Helianthopsis lehmannii (Hieron.) H.Robinson, comb. nov. Helianthus lehmannii Hieron. in Sod., Bot. Jahrb. 29: 39. 1900. Ecuador (Cañar, Chimborazo, Pichincha).

Helianthopsis lodicata (Cuatr.) H.Robinson, comb. nov. Helianthus lodicatus Cuatr., Proc. Biol. Soc. Wash. 77: 144. 1964. Peru (Cajamarca).

Helianthopsis matthewsii (Hochr.) H.Robinson, comb. nov. Helianthus matthewsii Hochr., Bull. N. Y. Bot. Gard. 6: 296. 1910. Peru (Amazonas, Cajamarca).

Helianthopsis microphylla (H.B.K.) H.Robinson, comb. nov. Helianthus microphyllus H.B.K., Nov. Gen. et Sp. ed. fol. 4: 173, pl. 375. 1818. Leighia microphylla Cass., Dict. Sci. Nat. 25: 436. 1822. Viguiera microphylla Hieron., Bot. Jahrb. 36: 490. 1904. Peru (Cajamarca).

Helianthopsis nigrescens (Heiser) H.Robinson, comb. nov. Helianthus nigrescens Heiser, Brittonia 8: 287. 1957. Ecuador (Azuay).

Helianthopsis pseudoverbesinoides (Hieron.) H.Robinson, comb. nov. Helianthus pseudoverbesinoides Hieron. in Sod., Bot. Jahrb. 29: 40. 1900. Ecuador (Bolivar, Chimborazo, Tungurahua).

Helianthopsis sagasteguii H.Robinson sp. nov.

Plantae frutescentes as 2 m altae inferne pauce ramosae in caulibus inflorescentiis petiolis et superficiis superioribus foliorum dense hirtellae vel hirsutae. Caules inferne fuscescentes vel atro-purpurascentes. Folia alterna inferne interdum opposita, petiolis 1-3 cm longis; laminae late ovatae plerumque 5-12 cm longae et 3-9 cm latae base late rotundatae vel subtruncatae ad medium breviter acuminatae margine distincte serratae vel dentatae apice anguste acuminatae supra velutino-hirtellae subtus dense areolate tomentosae fere ad basem valde trinervatae. Inflorescentiae terminales divaricate ramosae pauce capitatae, ramis ultimis plerumque 2-3 cm longis, bracteis ovatis 1.5-4.5 cm longis et 1.0-3.5 cm latis. Capitula hemisphaerica ca. 12 mm alta et sine radiis ca. 15 mm lata. Squamae involucri ca. triseriatae ca. 20-25 anguste oblongae vel lineares 6-11 mm longae et 2-3 mm latae inferne pallide 2-4-costatae supra medium herbaceae apice argute acutae extus hirtellae intus in partibus herbaceis dense puberulae; paleae oblongo-ovatae 6-7 mm longae pallide 4-6-costatae margine late scariosae apice acutae distincte reflexae extus minute puberulae. Flores radii 12-14; corollae flavae 12-14 mm longae et 4.5 mm latae extus dense hispidulae, limbis glanduliferis, tubis ca. 2 mm longis. Flores disci 65-80; corollae flavae 3.5-6.0 mm longae, tubis 0.7-2.0 mm longis subglabris vel sparse hispidulis, faucis cylindraceis ca. 2-3 mm longis extus dense scabridulis et pauce tenuiter glandulo-piliferis, lobis triangularibus 0.7-1.2 mm longis et 0.6-1.0 mm latis intus superne papillosis extus dense scabridulis; filamenta in parte superiore ca. 0.3 mm longa; thecae antherarum ad 2.3 mm longae non nigrescentes; appendices antherarum ovate ad 0.5 mm longae et 0.4 mm latae. Achaenia radii sterilia ad 2.8 mm longa apice pauce squamulifera. Achaenia disci ad 3.7 mm longa et 1.4 mm lata dense sericeo-setifera vel glabra; aristae pappi 2 plerumque 2.0-2.5 mm longae facile vel mediocriter deciduae; squamellae pappi pauce vel nullas ad 0.8 mm longae. Grana pollinis ca. 30 um in diametro longe spinosa.

TYPE: PERU: Cajamarca: Celendin: Canyon Rio Marañon above Balsas 11 1/2 km below summit of road to Celendin. Shrub to 2 m. Stems, leaves densely puberulent. Rays bright golden. Disks yellow (dull). Aspect of plant silvery. Abundant. Alt. 2630 m. 27 May 1964. P.C.Hutchison & J.K.Wright 5397 (Holotype US, Isotypes F, UC, USM). PARATYPE: PERU: Cajamarca: Celendin: Hda. El Limón (Celendín-Balsas). Alt. 2150 m. ladera de arbustos. Aubarbusto piloso de flores amarillas. 5 May 1970. Sagastegui 7415 (US, HUT).

Helianthopsis sagasteguii is similar to *H. hypargyrea* in general aspect, and is in the same group having pale anther thecae. However, the two species do not seem to be immediate relatives. The paleae of *H. sagasteguii* have strongly reflexed tips and the inflorescence is rather lax, two characters of the Peruvian members of the pale-anthered group not found in the species from Ecuador. The new species is the only member of the series presently known to have some opposite leaves, but the specimen is more complete than most. The heads examined show great variation in achene pubescence and pappus structure, but the typical *Helianthus*-type pappus predominates, and the squamellae, when present, never seem to fill the entire lateral margin.

Helianthopsis senex (Blake) H.Robinson, comb. nov. *Helianthus senex* Blake, Jour. Wash. Acad. Sci. 16: 220. 1926. Peru

(Huanuco).

Helianthopsis stuebelii (Hieron.) H.Robinson, comb. nov. Helianthus stuebelii Hieron., Bot. Jahrb. 21: 249. 1895. Peru (Cajamarca).

Helianthopsis subnivea (Blake) H.Robinson, comb. nov. Helianthus subniveus Blake, Contr. U.S. Nat. Herb. 22: 621. 1924. Helianthus niveus Hieron., Bot. Jahrb. 21: 350. 1895. not H. niveus Brandegee 1889. Peru (Cajamarca).

Helianthopsis verbesinoides (H.B.K.) H.Robinson, comb. nov. Helianthus verbesinoides H.B.K., Nov. Gen. et Sp. ed. fol. 4: 173. 1818. Peru (Piura).

Helianthopsis viridior (Blake) H.Robinson, comb. nov. Helianthus viridior Blake, Jour. Wash. Acad. Sci. 16: 221. 1926. Peru (Junin).

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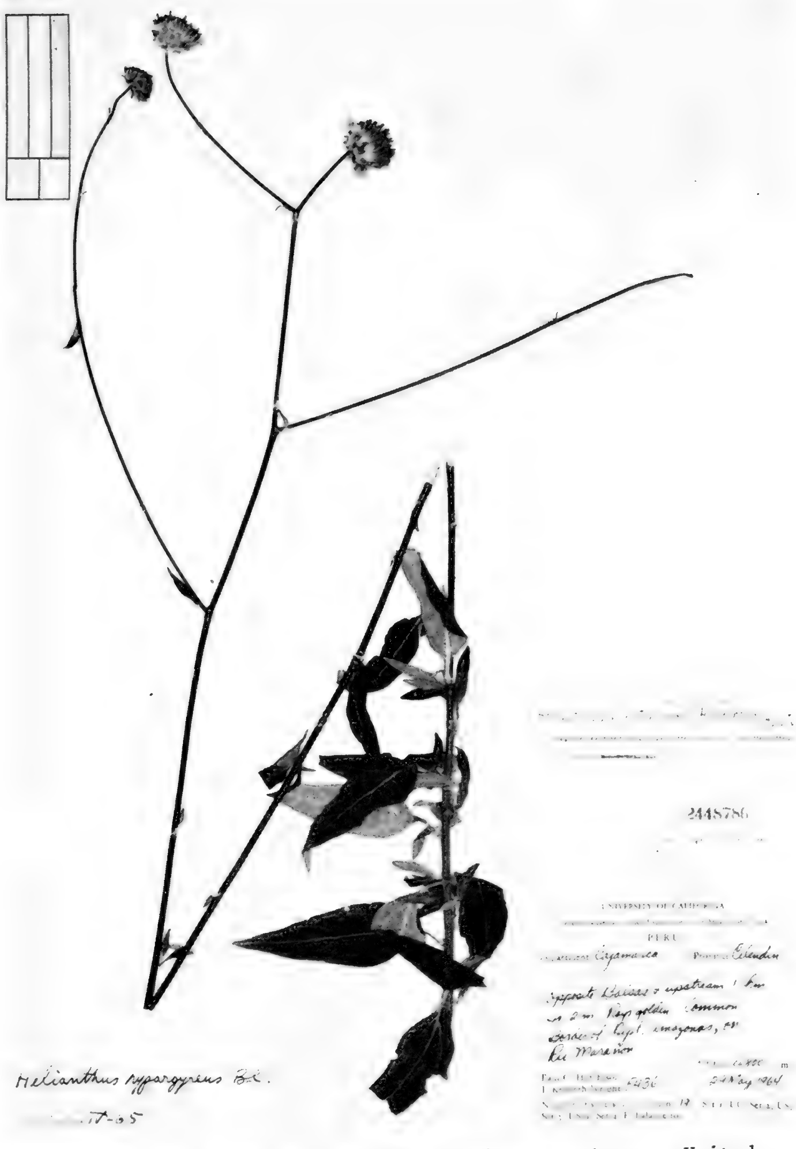
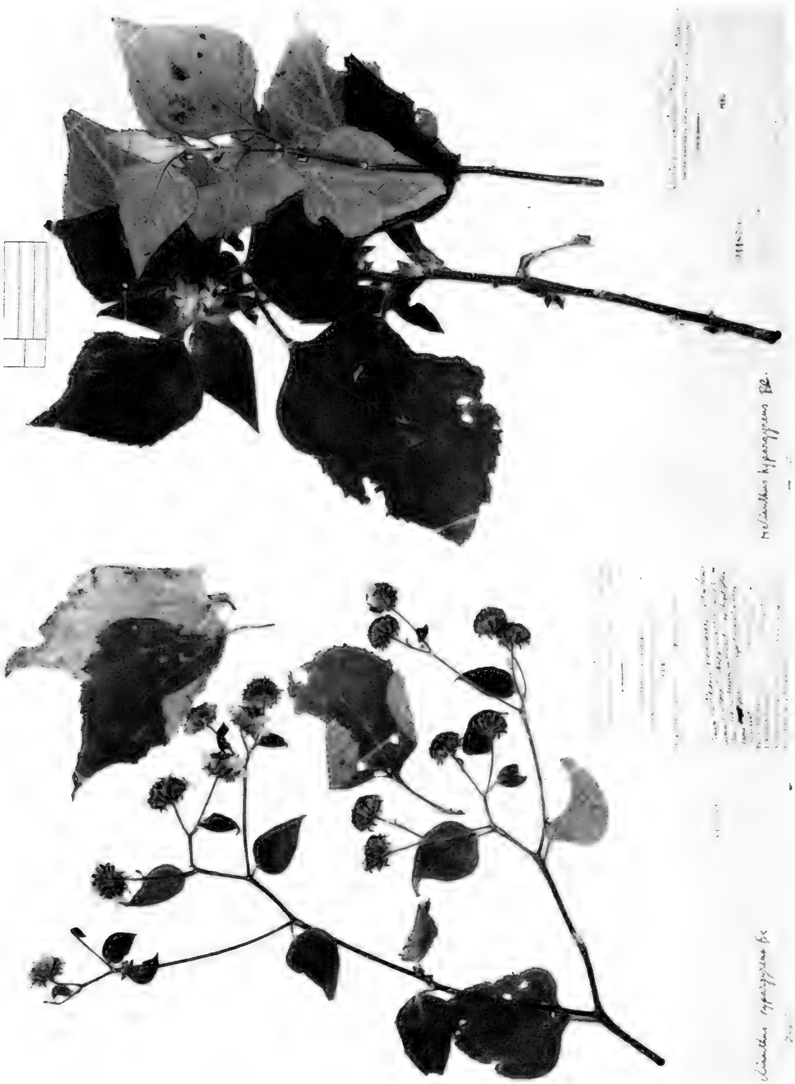


Helianthopsis hutchisonii H.Robinson, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.



Helianthopsis sagasteguii H.Robinson, Holotype, United States National Herbarium.

Helianthopsis enlargements of heads: Top. H. hutchisonii. Bottom. H. sagasteguii.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XIX.

FOUR NEW SPECIES OF CALEA FROM BRASIL.

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Recent efforts to identify specimens of Calea from Bahia have resulted in the recognition of the following four previously undescribed species from Brasil. All four species share the characters of the broad but natural concept of Calea that excludes Alloispermum Willd. (Robinson, 1978). The achenes are prismatic without striations, the pappus is radially symmetrical with numerous squamae, the disk corolla lobes are smooth with reddish ducts along the margins which join at the sinuses, and the anthers are yellowish. Disk corolla lobes of the genus are often elongate, but some Brasilian species have lobes scarcely longer than wide. Two of the new species lack paleae and are technically members of Geissopappus which has been placed in the synonymy of Calea by Robinson (1975). It should be noted that some of the traditional species of Calea in Brasil such as C. pilosa Baker of Bahia, lack paleae and should have been placed in Geissopappus. While the epaleaceous species seem to form a somewhat unnatural group, it is notable that they are all from the Guiana area or from eastern Brasil, and they all have short pappus squamae, none having the long aristae that are most common elsewhere in the genus.

Calea eitenii H.Robinson, sp. nov.

Plantae herbaceae perennes ascendentiter ramosae ca. 30 cm altae. Caules teretes subcarnosi in sicco rugulosi. Folia opposita, sessilia vel subsessilia; laminae inferne 2-5-lobatae in marginis lobarum integrae apice obtusae vel breviter acutae supra superne et fere ad marginem scabridulae subtus subcarnosae et distincte glandulo-punctatae. Inflorescentiae unicapitatae longe pedunculatae, pedunculis 10-15 cm longis superne antrorse scabridis. Capitula late campanulata 10-12 mm alta sine radiis ca. 12-15 mm lata. Squamae involucri biformes, exteriores herbaceae ca. 4 late oblongae vel suborbiculares 3-6 mm longae apice rotundatae margine superne reflexae base raro lobatae intus fere ad marginem scabridulae extus subcarnosae glandulo-punctatae, squamae interiores fusco-virides interdum marginaliter rubrescentes papyraceae subimbricatae late oblongae 7-12 mm longae et 4-5 mm latae apice late rotundatae margine anguste distincte scariosae extus glabrae, canalis resiniferis 7-11; paleae scariosae anguste lanceolatae vel lineares 6-7 mm longae apice anguste acutae. Flores radii ca. 12; corollae flavae, tubis ca. 3 mm longis glabris, limbis anguste oblongis ca. 13 mm longis et 3 mm latis extus distincte glandulo-punctatis apice distincte trilobatis, lobis plerumque retusis. Flores disci 20-25; corollae flavae 5.5-6.5 mm longae extus glabrae, tubis subdistinctis 1.0-1.5 mm longis, faucis anguste campanulatis 2.5-3.0 mm longis, lobis ca. 1.0 mm longis et 0.7 mm latis; thecae antherarum ca. 2.5 mm longae; appendices antherarum ovatae ca. 0.4 mm longae et 0.33 mm latae extus glanduliferae. Achaenia 2.5-3.0 mm longa plerumque in costis breviter setifera inferne leniter angustiora; squamae pappi ca. 14-16 anguste lanceolatae vel lineares aristatae plerumque 4-5 mm longae margine serrulatae vel erosae extus laeves. Grana pollinis ca. 35 µm in diam. spinulosa.

TYPE: BRASIL: Minas Gerais: Município de Jaboticatubas: Serra do Cipó. Along road at km 121. 19°18-19'S. 43°35'W. Alt. ca. 1200 m. Flat grassy meadow on thin soil derived from quartzite ("itacolomite"). Rays golden-yellow. Disk flowers with yellow petals and orange to broan anthers. 25 Nov. 1965. G. & L.T. Eiten 6891 (Holotype US).

Both *Calea eitenii* and the following *C. kirkbridei* initially seem close to *C. multiplinervia* Less. because of the solitary long-pedunculate heads and the narrow leaves or leaf-segments. The latter species differs, however, by the prominent longitudinal veins of the leaf which extend fully into the petioliform base, and by the long pilosity of the stems and leaf veins. The two new species actually seem closest to each other, but *C. eitenii* is notably distinct in the dissection that is evident in the leaves, the tips of the rays, and sometimes in the basal lobes of the outer involucral bracts. Also, *C. kirkbridei* lacks the herbaceous outer bracts of the involucre and lacks glands on the rays or anther appendages.

Calea kirkbridei H.Robinson, sp. nov.

Plantae herbaceae perennes erectae non vel pauce ramosae ca. 0.5 m altae. Caules brunnescentes vel rubrescentes subhexagonales glabri. Folia opposita sessilia; laminae anguste oblongae vel lineares 1.0-5.5 cm longae et 2.0-4.5 mm latae base anguste cuneatae margine integrae apice breviter acutae utrinque glabrae subtus subcarnosae fere ad basem obscure ascendentiter trinervatae. Inflorescentiae unicapitatae longe pedunculatae, pedunculis ca. 20 cm longis superne antrorse scabridis. Capitula late campanulata ca. 1 cm alta sine radiis ca. 1.0-1.2 cm lata. Squamae involucri ca. 15 brunnescentes subcoriaceae exteriores subherbaceae subaequales oblongae vel anguste oblongae 6-9 mm longae et 2-4 mm latae apice rotundatae vel obtusae margine anguste scariosae minute sparse puberulae extus base puberulae superne glabrae, canalis resiniferis 5-7; paleae scariosae lanceolatae ca. 8 mm longae apice breviter acutae. Flores radii ca. 8; corollae flavae glabrae, tubis 2.5-3.0 mm longis, limbis oblongis 11-12 mm longis et 4.0-4.5 mm latis. Flores disci ca. 20; corollae flavae 5.0-5.5 mm longae extus glabrae, tubis subdistinctis ca. 1.5 mm longis, faucis anguste campanulatis ca. 2.5 mm longis, lobis 1.0-1.5 mm longis et ca. 1.0 mm latis; thecae antherarum 1.8-2.0 mm longae; appendices antherarum ovatae ca. 0.4 mm longae et 0.3 mm latae extus non glanduliferae. Achaenia 4.0-4.5 mm longa plerumque in costis breviter setifera inferne angustiora; squamae pappi ca. 12 anguste lanceolatae aristatae 3-4 mm longae margine serrulatae vel erose denticulatae extus persparse papillosae. Grana pollinis 30-32 µm in diam. spinulosa.

TYPE: BRASIL: Minas Gerais: Serra do Espinhaço. Eastern slopes of Pico do Itambé, first large sandstone outcrops below the summit; elev. ca. 1700 m; sandstone and adjacent meadows, with both sandy soil and overlying humus. 11 Feb. 1972. W.R.Anderson, M.Stieber & J.H.Kirkbride Jr. 35792 (Holotype US).

For the distinctions of the species see the discussion under *C. eitenii*.

Calea harleyi H.Robinson, sp. nov.

Plantae suffrutescentes ascendentiter ramosae ca. 50 cm altae. Caules rubrescentes hexagonales inferne sensim teretes sparse minute scabriduli glabrescentes. Folia opposita, petiolis 2-5 mm longis indistinctis; laminae anguste ellipticae plerumque 3.0-4.5 cm longae et 0.4-1.0 cm latae base anguste cuneatae margine utrinque 2-3 (4) -serratae apice anguste acutae supra minute scabridulae in nervo primario prominentes subtus subcarnosae glandulo-punctatae plerumque in nervis sparse scabridulae fere ad basem ascendentiter trinervatae. Inflorescentiae in ramis terminales tricapitatae vel subumbellatae, ramis plerumque 5-17 mm longis scabridulis. Capitula campanulata 8-10 mm alta et 4.5 mm lata; squamae involucri ca. 18 flavescentes vel brunnescentes subcoriaceae exteriores non herbaceae subimbricatae minute ovatae vel late oblongae 1.5-7.0 mm longae et 1.5-3.5 mm latae apice rotundatae margine distincte anguste scariosae extus glabrae, canalis resiniferis plerumque 9-11; paleae nullae. Flores radii nulli. Flores disci ca. 10; corollae flavae ca. 4 mm longae extus glabrae, tubis distinctis ca. 1.5 mm longis, faucis campanulatis ca. 1 mm longis, lobis ca. 1.5 mm longis et 0.8 mm latis; thecae antherarum ca. 1.5 mm longae; appendices antherarum ovatae ca. 0.4 mm longae et 0.25 mm latae extus glanduliferae. Achaenia 3.0-3.5 mm longa sparse scabrida; squamellae pappi ca. 12 ca. 0.5 mm longae et 0.4 mm latae margine et apice erose denticulatae extus papillosae. Grana pollinis ca. 27 µm in diam. spinulosa.

TYPE: BRASIL: Bahia: Serra do Sincorá. ca. 6 km N. of Barra da Estiva on Ibicoara road. Grassland with low shrubs and scattered woodland. Alt. ca. 1100 m. Approx. 41°18'W, 13°35'S. Decumbent subshrub. Flowers yellow, ray florets absent. 29 Jan. 1974. R.M.Harley, S.A.Renvoize, C.M.Erskine, C.A.Brighton & R.Pinheiro 15586 (Holotype US). PARATYPES: BRASIL: Bahia: Serra do Sincorá. ca. 14 km N. of Barra da Estiva, near the Ibicoara road. Mixed vegetation with low scrub and dry grassland, and scattered woodland, occasionally disturbed or burnt-over. Alt.

1100 m. Approx. 41°18'W. 13°35'S. Low subshrub with ascending stems. Capitula yellow, flowers yellow. 2 Feb. 1974. Harley et al. 15842 (US); Serra do Rio de Contas. 10 km N. of town of Rio de Contas on road to Mato Grosso. Woodland along small stream, normally damp grassland, now dry, and dry cerrado/carrasco woodland on slopes of surrounding quartzitic hills. Alt. ca. 1000 m. Approx. 41°50'W. 13°28'S. Subshrub with swollen woody root to ca. 50 cm. Phyllaries yellow, florets yellow. 19 Jan. 1974. Harley et al. 15266 (US); Serra da Agua de Rega. Cerrado, ca. 24 km N. of Seabra, road to Agua de Rega, ca. 1000 m elev. Ascending herb, the stems to ca. 50 cm long. 25 Feb. 1971. H.S.Irwin, R.M.Harley & G.L.Smith 31073 (US).

Calea harleyi has a resemblance to C. hypericifolia Baker of Goyas, but the latter differs in numerous details and does not seem closely related. The leaves of the Goyas species are not as pointed and are not toothed, the midvein of the leaf is not prominent above, the hairs of the stems and leaves are longer and more slender, the glands on the leaf-undersurface are smaller and more superficial, the head has larger herbaceous bracts at the base, rays are present, and the pappus squamae are smaller. Actually, there is closer relationship to C. pinheiroi described below, but that has broader leaves with a less carnose undersurface and less prominent veins on the upper surface, the hairs of the stems and leaves are denser and longer, and the individual parts of the inflorescence show two orders of branching with the ultimate branches short.

Calea pinheiroi H.Robinson, sp. nov.

Plantae suffrutescentes multo ramosae ad 25 cm altae. Caules brunnescentes inferne teretes et obscure striati superne hexagonales hispiduli. Folia opposita, petiolis 3-5 mm longis; laminae ovatae plerumque 1.5-2.5 cm longae et 1-2 cm latae base obtuse cuneatae vix vel non acuminatae margine utrinque grosse obtuse 4-6-crenato-serratae apice obtusae supra sparse scabrae et dense scabridulae subtus pallidiores glandulo-punctatae in nervis et nervulis valde scabro-pilosae fere ad basem patentiter trinervatae. Inflorescentiae in ramis terminales corymbosae, ramis hispidulis, ramis ultimis ca. 3 mm longis. Capitula campanulata 7-8 mm alta et 4-5 mm lata; squamae involucri ca. 18 brunnescentes subcoriaceae exteriores non herbaceae subimbricatae minute ovatae vel latė oblongae 1.5-7.0 mm longae et 1.5-3.0 mm latae apice rotundatae margine distinct anguste scariosae extus glabrae, canales resiniferis plerumque 7-9; paleae nullae. Flores radii nulli. Flores disci ca. 8; corollae flavae ca. 3.5 mm longae extus glabrae, tubis distinctis ca. 1.3 mm longis, faucis late campanulatis ca. 1 mm longis, lobis 1.3-1.5 mm longis ca. 0.7 mm latis; thecae antherarum ca. 1.5 mm longae; appendices antherarum ovatae 0.3 mm longae et 0.23 mm latae extus glanduliferae. Achaenia 2.5-3.0 mm longa sparse scabridula; squamellae pappi 16-18 ca. 0.4 mm longae et 0.3 mm latae margine et apice erose denticulatae. Grana pollinis ca. 27 um in diam. spinulosa.

TYPE: BRASIL: Bahia: Serra do Curral Feio. 16 km NW. of Lagoinha (which is 5.5 km SW of Delfino) on side road to Minas do Mimoso. Small stream with marsh on white sand, and surrounding cerrado on sandstone rock exposures. Alt. 950-1000 m. Approx. 41°20'W. 10°22'S. Subshrub to 25 cm. Capitula yellow. 8 March 1974. R.M.Harley, S.A.Renvoize, C.M.Erskine, C.A.Brighton & R.Pinheiro 17020 (Holotype US).

For the distinctions of the species see the discussion under *C. harleyi*.

Calea barrosoana H.Robinson, nom. nov. *Meyeria longifolia* DC. Prodr. 5: 671. 1936. *Calea longifolia* (DC.) Baker *in* Mart., Fl. Bras. 6 (3): 260. 1884, not *C. longifolia* Gardn., Lond. Jour. Bot. 7: 418. 1848. Blake (1930) provided a new name, *C. angusta*, in a similar situation involving the various species called *C. angustifolia*, but apparently no name has been provided for *Meyeria longifolia* whose combination in *Calea* is preoccuppied.

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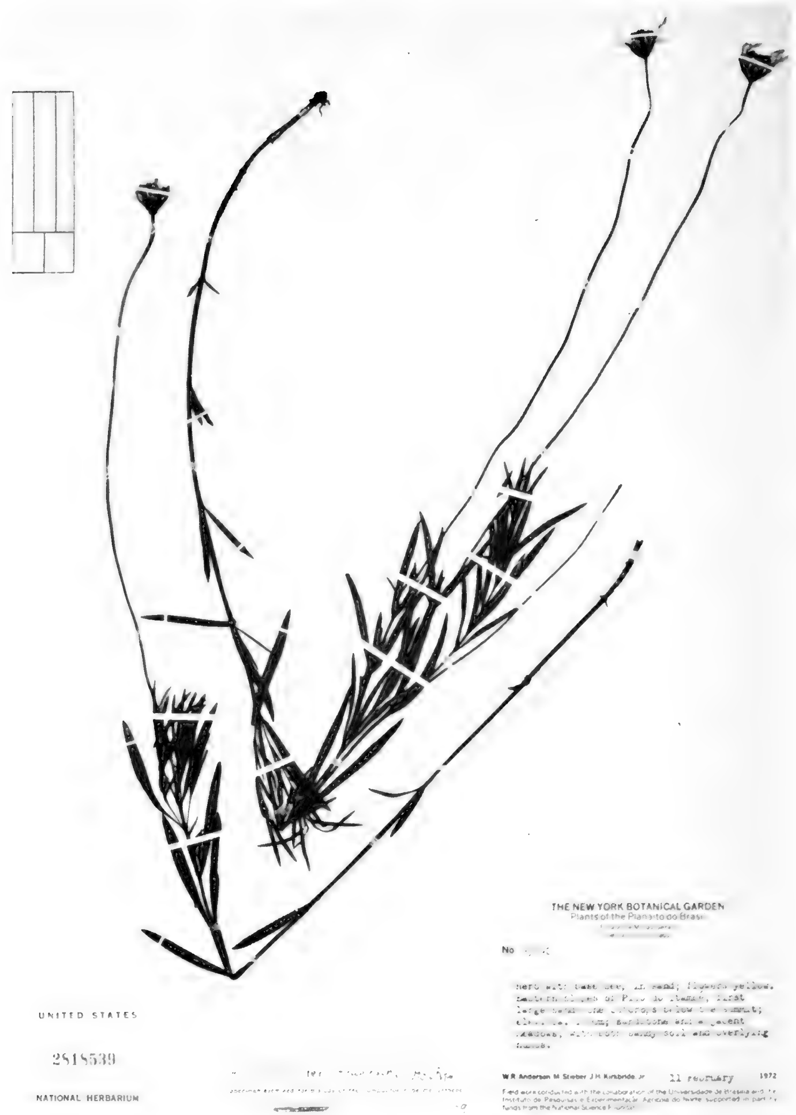
Calea eitenii H.Robinson, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.



Calea kirkbridei H.Robinson, Holotype, United States National Herbarium.

Calea harleyi H.Robinson, Holotype, United States National Herbarium.

<u>Calea</u> <u>pinheiroi</u> H.Robinson, Holotype, United States National Herbarium.

Calea, enlargements of heads: Top left. C. eitenii. Top right. C. kirkbridei. Bottom left. C. harleyi. Bottom right. C. pinheiroi.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XX.

NOTES AND NEW SPECIES IN CLIBADIUM.

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Clibadium is a genus of about forty species, including some which are common and widely distributed in the Neotropical Region. In spite of the absence of most of the US collections, which are on loan, it has been necessary to make preliminary studies toward the eventual treatments of the Heliantheae for the Floras of Ecuador and Peru. Recent Harling collections from Ecuador prove to include two previously undescribed species which are treated below. Comments are also provided on the following three species.

Clibadium caudatum Blake, is one of two species described from Panama which was inexplicably omitted from the recent treatment of that genus in Panama (Stuessy, 1975). Material of the species might key to C. asperum (Aubl.) DC. in that treatment, but could not be that species. The type of Blake's species was from an alluvial bottom near Bohío in the Canal Zone, and a recent collection (Nee 6963) from near Salamanca in the Province of Colon shows the characteristic broad leaf blades with caudate tips and appressed pubescence. The specimens apparently represent a distinctive element from low elevations in central Panama.

Clibadium eggersii Hieron., described from western Ecuador, seems to be the oldest name for at least the elements with appressed pubescence that have been treated under the names, C. pittieri Greenm., C. polygynum Blake and C. propinquum Blake (Wulffia sodiroi Hieron.). The species seems to range geographically from Costa Rica in Central America to areas of lower elevation on both sides of the Andes in Colombia and Ecuador. The species is particularly distinctive in the rather globose mature heads with a large number of ray florets (up to 40) in the axils of comparatively narrow bracts.

Clibadium sessile Blake was the second species described from Panama that was omitted from the recent treatment of the genus in that country (Stuessy, 1975). Descriptions and the locality in Chiriqui indicate that C. subauriculatum Stuessy is a synonym.

Clibadium manabiense H.Robinson, sp. nov. Plantae frutescentes 2.0-2.5 m altae mediocriter ramosae. Caules fulvescentes teretes leniter striati appresse scabriduli. Folia opposita, petiolis 7-25 mm longis; laminae ovatae vel anguste ovatae plerumque 8-16 cm longae et 2.0-8.5 cm latae base cuneatae sensim breviter anguste acuminatae margine multo crenato-serrulatae apice late breviter acuminatae supra sparse appresse strigosae subtus dense scabro-pilosae inferne ascendentiter trinervatae. Inflorescentiae in ramis terminales corymboso-cymosae, ramis dense appresse strigosis, ramis ultimis 0-2 mm longis. Capitula 4-6 mm alta et 4-5 mm lata; squamae involucri steriles basilares 2 et squamae femineae exteriores ovatae apice distincte acuminatae ca. 4 mm longae et 2 mm latae margine breviter ciliatae extus breviter strigosae; paleae masculinae anguste oblongae vel anguste ellipticae ca. 3.5 mm longae et 0.7-1.0 mm latae margine et apice breviter ciliatae. Flores radii 9-13; corollae tubiformes 1.8-2.0 mm longae base leniter angustiores superne sparse puberulae et persparse setiferae, lobis 4 ca. 0.3-0.5 mm longis. Flores disci ca. 15; corollae 3.0-3.5 mm longae, tubis angustis ca. 1 mm longis extus glabris, faucis abrupte late campanulatis ca. 1.5 mm longis plerumque glabris, lobis 5 aequilateraliter triangularibus ca. 0.6 mm longis et latis intus ubique valde papillosis extus breviter laxe setiferis et sparse puberulis; thecae antherarum ca. 1.2 mm longae; appendices antherarum extus minute puberulae vel subglanduliferae. Achaenia radii biconvexa ca. 2mm longa et 1.5 mm lata superne laxe setifera, articulis apicalibus angustis ca. 0.5 mm longis valde contortis. Achaenia disci sterilia 2 mm longa inferne glabra apice dense pilifera. Grana pollinis 23-25 µm in diam. spinosa.

TYPE: ECUADOR: Manabí: Road Sto Domingo - Chone, Flavio Alfaro, alt. ca 100 m.s.m. On the roadside. Shrub, ca. 2 - 2.5 m high. Flower-heads dirty white. Anthers dark brown-violet. 11 V 1968. G.Harling, G.Storm & B.Ström 9410 (Holotype GB: Isotype US).

Clibadium manabiense seems most distinct in the markedly acuminate tips of the bracts in the head. The heads having 9-13 female flowers and 15 male flowers, and the presence of paleae in the disk are also notable. The number of flowers in the head are reminiscent of the species group containing *C. grandifolium* Blake and *C. pacificum* Cuatr. occurring at lower elevations from Costa Rica to western Colombia, but the latter two have much larger leaf blades with broadly rounded to subtruncate bases, more appressed hairs on the leaf undersurface, and mostly non-paleaceous male flowers. The setae of the disk corolla lobes and the upper surfaces of the ray achenes seem less rigid and less strict in *C. manabiense* than in such species as *C. surinamense* L.

As delimited by reddish resin, there are five resin ducts in the throats of both the ray and disk corollas. The ducts of the disk corollas are particularly prominent and extend into the basal halves of the lobes.

Clibadium harlingii H.Robinson, sp. nov.

Plantae frutescentes ad 3 m altae mediocriter ramosae. Caules pallide fulvescentes teretes striati dense scabriduli. Folia opposita, petiolis 6-10 mm longis; laminae oblongae vel oblongo-ovatae plerumque 7-13 cm longae et 2.5-5.0 cm latae base breviter acutae vel obtusae non decurrentes margine multo serrulatae apice breviter acuminatae supra dense appresse scabridae subtus erecto-patentiter scabro-pilosae, nervis secundariis pinnatis utrinque ca. 6 valde ascendentibus. Inflorescentiae terminales in ramis tripartitis dense glomeratae, ramis dense antrorse longe strigosis, glomerulis ca. 10-12-capitatis. Capitula ca. 4 mm alta et 3-4 mm lata; squamae involucri steriles basilares 3 latae ovatae 4-5 mm longae et ca. 2.5-3.0 mm latae apice acutae extus breviter strigosae; squamae femineae ovatae vel oblongae apice acutae vel breviter acuminatae 3-4 mm longae margine breviter ciliatae extus superne breviter strigosae; paleae masculinae subscariosae ovatae vel rhomboideae ca. 3 mm longae et 1.5 mm latae acutae margine breviter ciliatae. Flores radii 5-8; corollae tubiformes 1.5-1.8 mm longae base leniter angustiores plerumque glabrae superne persparse puberulae, lobis plerumque 2 ca. 0.5 mm longis. Flores disci 5-9; corollae ca. 3 mm longae cylindraceae extus superne sparse puberulae et in lobis dense breviter strigosae, tubis ca. 0.7 mm longis, faucis ca. 1.5 mm longis, lobis 5 oblongo-ovatae plerumque 0.6 mm longis et 0.4 mm latis intus superne et fere ad marginem papillosis; thecae antherarum ca. 1.2 mm longae; appendices antherarum glabrae. Achaenia radii subtrigona 2.0-2.5 mm longa et ca. 1.5 mm lata glabra, callis apicalibus prominentibus ad 0.5 mm altis et 0.7 mm latis. Achaenia disci sterilia ad 2.2 mm longa ubique pilifera, pilis superioribus densioribus. Grana pollinis 25-27 um in diam. spinosa.

TYPE: ECUADOR: Carchi: Road Tulcán - Maldonado, ca. 13 km south east of Maldonado, mountain rain forest, alt. ca 2600 m.s.m. Shrub, ca 3 m high. 1 III 1974. G.Harling & L.Andersson 12363 (Holotype GB: Isotype US).

Clibadium harlingii is thoroughly distinct in the glomerate form of the inflorescence, the pinnate venation of the leaves, and the glabrous ray achenes, but the species has a number of other peculiarities as well. The ray achenes of Clibadium seem to always have an apical projection of some type, though it is often small and contorted or easily deciduous. In C. pediculatum Aristeg. of Venezuela it is long and narrow and is persistent at maturity. The new species seems unique in the thickened broad form of the apical projection or callus, and a smaller but distinct callus is present on the sterile disk achenes. The disk corolla lobes of the new species have small but distinct papillae on the inner surface toward the tips and margins, a notable contrast with some species such as C. manabiense where the lobes are evenly papillose on the whole inner surface.

The resin ducts of C. harlingii, as indicated by reddish resin, are restricted to the five veins in the throat of the disk corolla.

The above new species were obtained in a collection of Ecuadorian Heliantheae recently obtained from Dr. G. Harling at Göteborg. The genus Clibadium was particularly well-represented, as indicated by the following records. The numbers cited under 5000 are by Holguer Lugo S., those above 5000 are from the Harling series: Clibadium eggersii Hieron., Pastaza 2481, Napo 3094; C. laxum Blake, from the lowlands of Bolivar, El Oro and Pichincha to the west of the Andes, 9311, 9680, 11525, 14347; C. mexiae Blake, from Pastaza and Tungurahua on the eastern side of the Andes, 4605, 10153; C. microcephalum Blake, from Pastaza, 4554, 10114; C. sprucei Blake, from Chimborazo in central Ecuador, 763; C. surinamense L., material with shorter leaves tips from Bolivar and El Oro on the western side of the Andes, 9670, 14194, 14335, material with narrowly acuminate leaf tips from Morona-Santiago, Napo and Pastaza on the eastern side of the Andes, 152, 224, 228, 1027, 1338, 1343, 1360, 1371, 1385, 1396, 1414, 1426, 1703, 2315, 2821, 2926, 3890, 3986, 4369, 4941, 4971, 6948, 11876, 11959, 12679, 13823; C. sylvestre (Aubl.) Baill., from Napo, 2052, 2129, 7031.

Four specimens of Ecuadorian Clibadium have also been obtained from the Marie Selby Botanical Gardens which I had previously failed to identify correctly: Clibadium cordatum Cuatr., from Carchi near the Colombian border, Madison et al. 4940; C. laxum Blake, from Pichincha, Dodson et al. 7589, 7691; C. surinamense L., from Los Rios, Dodson et al. 7037. Some earlier Ecuadorian collections of C. laxum have been seen in herbaria under the name C. terebinthaceum (Sw.) DC.

Literature Cited

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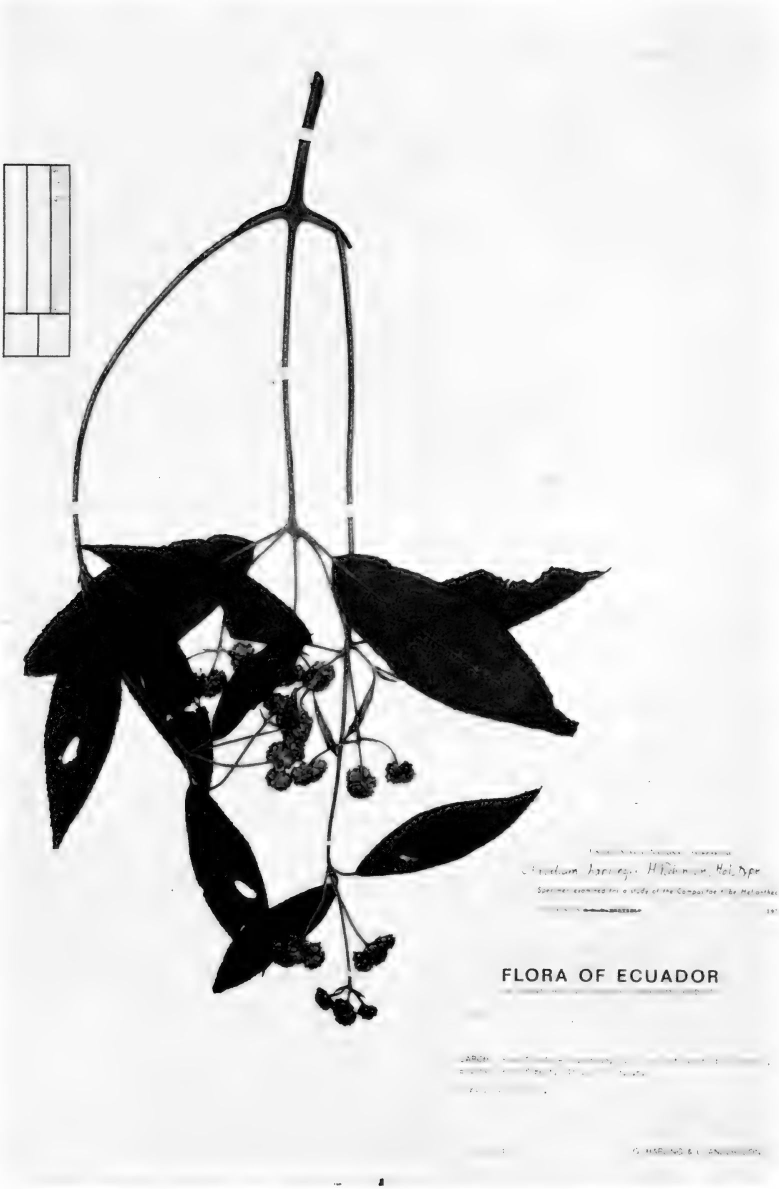
<u>Clibadium</u> <u>manabiense</u> H.Robinson, Holotype, University of Göteborg. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.



Clibadium harlingii H.Robinson, Holotype, University of Göteborg.

Clibadium, enlargements of heads: Top. C. manabiense. Bottom. C. harlingii.

NEW SPECIES OF VERNONIEAE (ASTERACEAE). II.

FIVE NEW SPECIES OF VERNONIA FROM BAHIA

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Brazil is probably the primary center of diversity for the tribe Vernonieae. The genus *Vernonia* is particularly well-represented with over 150 described species. The numerous species make identification of specimens difficult, even without the complication of the inevitable undescribed species. Repeated efforts have failed to obtain names for many species, and five of these, all from Bahia, are treated here. These species all share inflorescence types with elongate cymes and anther appendages lacking glands, but they fall into two subgroups on the basis of inflorescence-shape and pollen surface-structure.

Vernonia harleyi and *V. mattos-silvae* have the heads congested on distinctly scorpioid branches and the pollen is spinulose and weakly lophorate. In *V. morii*, *V. nobilis* and *V. persericea* the branches of the inflorescence are nearly straight or fractiflexed with heads 1-2 at each isolated node, and the pollen is strongly lophorate with the crests rather evenly fringed with numerous minute spines.

Vernonia harleyi H.Robinson, sp. nov.

Plantae suffruticosae vel fruticosae mediocriter ramosae ad 1.5 m altae. Caules dense breviter albo-tomentosi distincte 5-angulati. Folia alterna, petiolis distinctis 5-25 mm longis; laminae ovatae vel oblongo-ovatae plerumque 5-10 cm longae et 2.5-6.0 cm latae base rotundatae vel subtruncatae margine distincte crenatae vel duplo-crenatae apice obtusae supra in sicco atro-virides subtiliter rugulosae albo-pilosulae subtus dense breviter albo-tomentosae et dense glandulo-punctatae, nervis secundariis utrinque ca. 6 plerumque 45^{o} ascendentibus. Inflorescentiae multo ramosae, ramis valde scorpioideo-cymosae dense albo-tomentosis. Capitula congesta 2-3-seriata sessilia 4-5 mm alta et ca. 3 mm lata, bracteis subinvolucralibus minutis indistinctis ca. 1 mm longis subulatis; squamae involucri ca. 20 bi-tri-seriatae non patentes oblongae 1.5-3.0 mm longae plerumque 1 mm latae apice breviter acutae extus dense albo-tomentosae. Flores ca. 20 in capitulo. Corollae lavandulae ca. 4 mm longae extus parce glanduliferae, tubis ca. 2 mm longis superne infundibularibus, faucis 0.5-0.7 mm longis, lobis 1.3-1.5 mm longis ca. 0.4 mm latis superne dense pilosulis, pilis uniseriatis in cellulis apicalibus elongatis basilaribus brevibus; thecae antherarum ca. 1.3 mm longae inferne breviter acutae; appendices antherarum ovatae ca. 0.3 mm longae et 0.15 mm latae non glanduliferae. Achaenia ca. 1.2 mm longa dense breviter setifera; setae pappi ca. 30-32 plerumque 2.5 mm longae, setae in seriebus exterioribus numerosae anguste lineares 0.3-0.5 mm longae. Grana pollinis ca. 30-35 µm in diam. indistincte lophorata spinulosa.

TYPE: BRASIL: Bahia: 19.5 km SE of the town of Morro do Chapeu on the BA052 road to Mundo Novo, by the Rio Ferro Doido, with water worn horizontally-bedded sandstone at soil surface, with damp sand, sedge marsh, exposed rock & waterfall. Vegetation open scrub to closed low woodland in the drier areas. Alt. ca. 900 m. 2.3.77. Harley no. 19296 (Holotype US). PARATYPES: BRASIL: Bahia: Rio do Ferro Doido, 19.5 km SE of Morro do Chapeu on the BA 052 highway to Mundo Novo. Other data as in 19296. Shrub to ca. 1 m with slightly resinous-scented leaves. Leaves rugose, dark green above, white-tomentose beneath. Phyllaries grey-green. Corollas bluish-purple. 1 March 1977. Harley 19184 (GA, US); Município de Maracás. Rod. BA 026, a 6 km a SW de Maracás. Afloramento de rocha granítica. 900 m de altitude. Folha SD-24 (14-40a). Subarbusto, 1.5 m de altura. Flores lilás. 26 Abril 1978. Mori et al. 9933 (US).

In the distinctly scorpioid-cymose branches of the inflorescence the new species resembles Vernonia scorpioides Pers. but the distinctly crenulate leaf margins, the dense white tomentum, the obtuse leaves, and the short-acute involucral bracts are all different.

Vernonia mattos-silvae H.Robinson, sp. nov.

Plantae fruticosae mediocriter ramosae 1 m altae. Caules fulvescentes teretes striati vix angulati dense cinereo-puberuli vel pilosuli. Folia alterna, petiolis 1.0-2.5 cm longis; laminae ovatae vel anguste ovatae plerumque 5-8 cm longae et 1.5-3.0 cm latae base anguste cuneatae vel longe acuminatae margine multo serrulatae apice anguste acuminatae supra in sicco atro-virides parce puberulae subtus cinereo-subtomentosae subdense glandulo-punctatae, nervis secundariis utrinque ca. 5 plerumque 50-60° ascendentibus. Inflorescentiae multo ramosae, ramis valde scorpioideo-cymosae sordide subtomentosis. Capitula congesta 2-3-seriata sessilia 6-7 mm alta et 3-4 mm lata, bracteis subinvolucralibus linearibus attenuatis 4-5 mm longis; squamae involucri ca. 20 ca. triseriatae vix patentes lanceolatae 2-5 mm longae base 1.0-1.5 mm latae apice longe attenuatae margine et extus sericeae apice subglabrae. Flores ca. 15 in capitulo. Corollae lavandulae 5-6 mm longae extus inferne glabrae, tubis 2.5-3.0 mm longis superne infundibularibus, faucis ca. 1 mm longis extus parce glanduliferis, lobis ca. 2 mm longis et 0.4 mm latis extus superne parce setiferis et glanduliferis, pilis uniseriatis in cellulis apicalibus elongatis; thecae antherarum ca. 1.5 mm longae inferne breviter acutae; appendices antherarum oblongo-lanceolatae breviter acutae ca. 0.5 mm longae et 0.18 mm latae non glanduliferae. Achaenia ca. 1.3-1.- mm longa parce breviter setifera; setae pappi ca. 25-30 plerumque 4 mm longae, squamae exteriores in fimbriis brevibus 0.10-0.15 mm longae. Grana pollinis ca. 35 µm in diam. indistincte lophorata spinulosa.

TYPE: BRASIL: Bahia: Município de Macarani km 18 da Rod. Mai quinque / Itapetinga. Faz. Lagoa. Região de mata Mesófila. Pastaria. N.V.: Caminho-de-roça prêto. Arbusto, 1 m de altura. Inflorescência lilás. 2 agôsto 1978. L.A.Matto Silva, T.S. dos Santos & J.L.Hage 182 (Holotype US).

Vernonia mattos-silvae is evidently close to *V. scorpioides* Pers., showing the distinctly scorpioid branches of the inflorescence. The new species is most distinct by the long-attenuate tips of the subinvolucral and involucral bracts, the sparse pubescence of the achenes and corolla lobes, and the greatly reduced outer series of the pappus. The bases and tips of the leaf blades are also more narrowly acuminate. The pubescence and leaf margins place the new species closer to *V. scorpioides* than to *V. harleyi* n. sp.

Vernonia morii H.Robinson, sp. nov.

Plantae fruticosae mediocriter ramosae ad 2 m altae. Caules brunnescentes teretes vel subteretes striati inferne tenuiter arachnoideo-tomentosi superne sparse vel dense obtuse hirtelli. Folia alterna, petiolis brevibus vel nullis inferioribus interdum ad 1 cm longis; laminae ellipticae vel elliptico-ovatae plerumque 6-11 cm longae et 2.5-4.5 cm latae base cuneatae vel breviter acuminatae margine irregulariter subundulatae vel minute serrulatae apice breviter argute acuminatae supra saepe rugulosae sparse pilosae et scabridae subtus sparse vel dense puberulae in nervis et nervulis priminulae, nervis secundariis utrinque ca. 8 plerumque 60-70^{o} patentibus leniter arcuatis. Inflorescentiae pauce vel mediocriter ramosae, ramis vix arcuatis sparse vel dense obtuse hirtellis, bracteis foliiformibus ad 8 cm longis et 4 cm latis supra scabris vel dense pilosis subtus plerumque dense puberulis. Capitula remota uniseriata sessilia vel subsessilia axillaria vel extra-axillaria; involucra late campanulata plerumque 7-10 mm lata et 7-12 mm longa superne non post anthesin constricta; squamae involucri brunnescentes ca. 65-75 ca. 7-seriatae plerumque appressae 1.5-10.0 mm longae et base 1-3 mm latae margine dense tenuiter fimbriatae extus sparse sericeae vel puberulae et sparse glanduliferae saepe glabrescentes, bracteae exteriores ovato-lanceolatae argute acutae interiores sensim oblongo-lanceolatae obtusae vel retusae et mucronatae, bracteae interiores superne utrinque densius scabridulae. Flores 20-30 in capitulo. Corollae plerumque eburnae vel albae interdum lavandulae plerumque 11-12 mm longae extus glabrae, tubis 6-7 mm longis superne anguste infundibularibus, faucis ca. 1 mm longis, lobis ca. 3.5 mm longis et 0.6 mm latis margine superne sparse piliferis, pilis uniseriatis in cellulis apicalibus elongatis tenuibus; thecae antherarum ca. 3.5 mm longae inferne obtusae; appendices antherarum ovato-lanceolatae subacutae ca. 0.5 mm longae et 0.2

mm latae non glanduliferae. Achaenia 3.5-4.0 mm longa 10-costata in costis glabra inter costis glandulifera et sparse appresse setifera; setae pappi facile deciduae ca. 50-55 et 7-10 mm longae inferne tenues vix contiquae superne mediocriter incrassatae et angulatae, squamae exteriores numerosae distinctae lineares plerumque 2.0-3.5 mm longae. Grana pollinis ca. 45 µm in diam valde lophorata, cristis minute multo spiniferis, spinis majoribus nullis.

TYPE: BRASIL: Bahia: Município de Maracás. Rod. BA 026, a 6 km a SW de Maracás. Afloramento de rocha granítica. 900 m de altitude. Folha SD - 24 (14-40a). Arbusto 1.5 m de altura. Flores brancas. Vegetaçao secundaria. 26 Abril 1978. Mori et al. 9959 (Holotype US). PARATYPES: BRASIL: Bahia: Saida de Itiruçu / Maracás. Arb. de 2 m alt., fl. em capítulo verde, estames brancos. 20/05/969. J.A. de Jesus & T.S.Santos 440 (US); Encruzilhada, margem do Rio Parod, Mata Cipó. Planta de 1 m altura; flores cremes; invólucro verde. 23.5.1968. R.P.Belem 3610 (US); 19.5 km SE of the town of Morro do Chapeu on the BA 052 road to Mundo Novo, by the Rio Ferro Doido, with water worn horizontally-bedded sandstone at soil surface, with damp sand, sedge marsh, exposed rock & waterfall. Vegetation: open scrub to closed low woodland in the drier areas. Alt. ca. 900 m. Subshrub to 60 cm. Leaves scabrid, rugose, yellow-green above, pale beneath. Phyllaries pale green. Florets pale lilac. 2.3.77. Harley 19242 (US); Ca. 1 km N of Agua de Rega, road to Cafarnaúm, elev. ca. 1000 m, Acacia caatinga on slopes. Subshrub ca. 1 m tall. Heads cream. 28 February 1971. H.S.Irwin, R.M.Harley & G.L.Smith 31251 (US); same data, Shrub ca. 2 m tall. Irwin et al. 31260 (US).

Vernonia morii seems rather common in the eastern half of Bahia in spite of the previous lack of a name. The closest relative may be V. ammophila Gardn. of central Minas Gerais westward into Goyas. The latter species differs by the usually obtuse to rounded leaf-tips, the usually magenta-colored corollas, the more densely tomentose stems, the more glabrous somewhat exsculpate upper leaf surfaces, and the coarser more crowded and sharply edged pappus setae. The squamae of the outer pappus are usually broader and seem somewhat more persistent. Also, the inner involucral bracts lack the tendency for retuse and mucronate tips. One specimen of V. ammophila (Classen, Minas Gerais) has been seen showing more acute leaf-tips and slender marginal hairs on the corolla lobes reminiscent of the new species, and some integradation may occur between the species in that area.

Another close relative is V. rugulosa Sch.Bip. ex Baker of Minas Gerais. No material has been seen but an excellent photograph of the Berlin type distributed by the Field Museum shows the undulate membraneous tips of the larger involuvral bracts after which the species was named. There is no tendency toward such differentiated tips of the bracts in any material seen of the new species. The photograph and description indicate that

V. rugulosa has generally more petiolate leaves and glabrous achenes, but these features need to be checked when more material is available.

Vernonia nobilis H.Robinson, sp. nov.

Plantae fruticosae divaricate ramosae ad 3 m altae. Caules brunnescentes teretes pauce striati sparse albo-puberuli in nodis inferioribus non deflecti. Folia alterna, petiolis 3-5 mm longis; laminae ovatae 2-5 cm longae et 1.4-2.4 cm latae base rotundatae margine subintegrae vel irregulariter undulatae apice acutae vel perbreviter acuminatae supra virides rugulosae parce puberulae subtus sordide tomentosae vel lanatae et glandulo-punctatae, nervis secundariis utrinque 6-7 mediocriter ascendentibus. Inflorescentiae diffusae foliosae inferne saepe triramosae, ramis fractiflexis. Capitula in axillis solitaria sessilia 1.5-1.8 cm alta et ca. 0.8-2.0 cm lata base leniter tomentosa; squamae involucri ca. 75-80 multiseriatae lanceolatae 2-13 mm longae base 0.7-1.8 mm latae superne subulatae et patentes vel reflexae apice argute acutae extus rubrotinctae dense appresse pilosulae. Flores 35-40 in capitulo. Corollae violaceae 11-16 mm longae praeter apicem glabrae, tubis 6-8 mm longis angustis superne infundibularibus, faucis ca. 1 mm longis, lobis saepe inaequalibus plerumque 4-5 mm longis et 0.5 mm latis superne dense antrorse spiculiferis et parce micro-piliferis, spiculis unicellularibus; thecae antherarum 3.5-4.5 mm longae inferne acutae; appendices antherarum lanceolatae ca. 0.8 mm longae et 0.25 mm latae non glanduliferae margine plerumque anguste inflexae. Achaenia ca. 3 mm longa dense longe setifera; setae pappi ca. 30-35 et 10-12 mm longae, setae in seriebus exterioribus numerosae anguste lineares plerumque 2 mm longae. Grana pollinis ca. 45 µm in diam. valde lophorata, cristis minute multo spinuliferis, spinis majoribus nullis.

TYPE: BRASIL: Bahia: Vicinity of Machado Portello. June 19-23, 1915. J.N.Rose & P.G.Russell 19966 (Holotype US). PARATYPES: BRASIL: Bahia: Same data as holotype. Rose & Russell 19906 (US); Piauhy - Ceará: Picos to Campo Salles. Shrub about 3' high. Brushy borders. April 8-11, 1933. J.R.Swallen 4278 (US).

Vernonia nobilis has been found in two widely separated localities, one in the interior of Piauhy or adjacent Ceará, and the other in eastern Bahia near Salvador. Such a potential range would suggest other collections exist, but none have been seen and no described species of Vernonia seems particularly close. The specialized interests of the collectors in cacti and grasses might indicate that specialized habitats are involved.

It is possible that V. nobilis is closely related to the recently described Mattfeldanthus mutisioides H.Robins. & King of Bahia. The corollas of the former seem more reddish than most Vernoniae though not as reddish as indicated for Mattfeldanthus. The corolla lobes are somewhat unequal, but no pattern is evident as in Mattfeldanthus where the outer four lobes of the peripheral flowers are always shorter. The most obvious resemblance between the two is in the branching of the inflorescence. Multiple innovations are present in both, a character not seen in other members of Vernonia. In Mattfeldanthus the single extra branch is present under all fully developed heads observed. In V. nobilis the one or two basal nodes of the inflorescence seem to have characteristically three or even four branches. The vegetative stems of V. nobilis are straight while the branches of the inflorescence are deflected at the nodes. The achene pubescence is longer in the new species than in Mattfeldanthus, and the corolla lobes are much less rigid and less sharp-pointed.

Vernonia persericea H.Robinson, sp. nov.

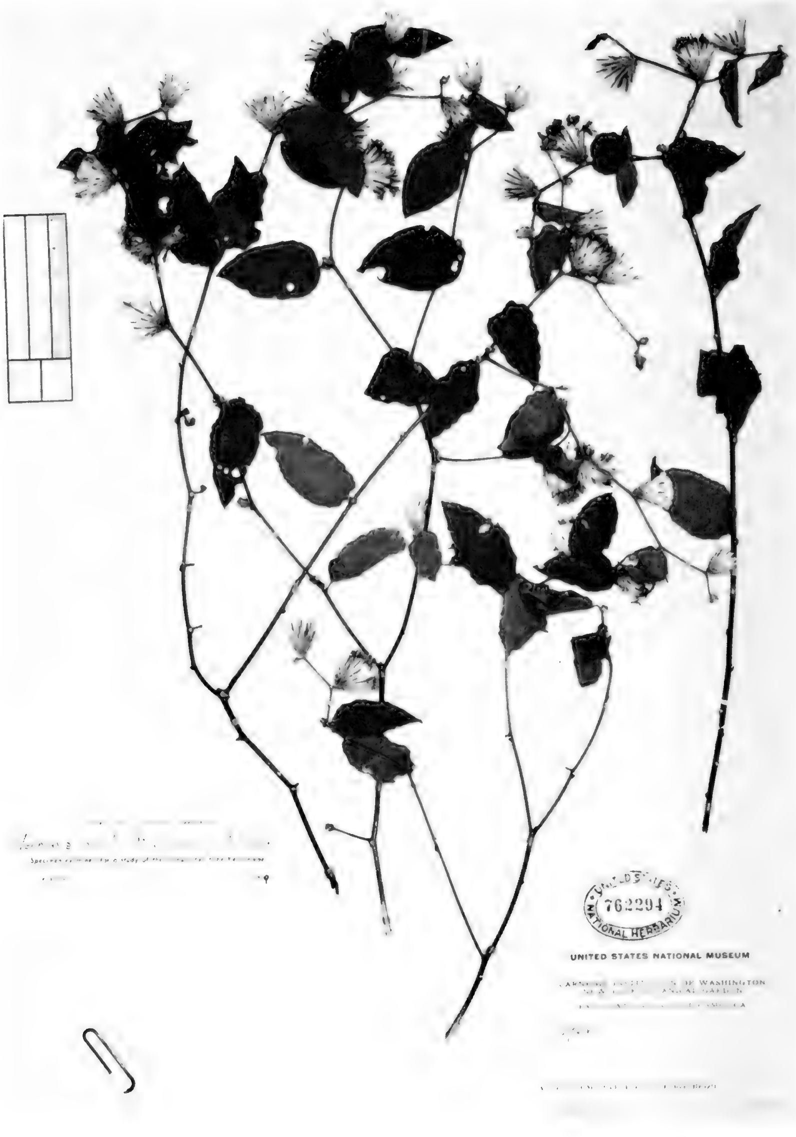
Plantae suffrutescentes inferne non vel pauce ramosae ad 2 m altae. Caules brunnescentes teretes anguste striati subdense sericei vel subhirtelli. Folia alterna subsessilia, petiolis ca. 1 mm longis; laminae oblongo-ovatae plerumque 2.5-5.0 cm longae et 1.2-3.0 cm latae base rotundatae margine integrae anguste reflexae apice abrupte breviter acuminatae supra atro-virides evanescentiter pilosae inferne in nervis persistentiter sericeae subtus perdense sordide sericeae, nervis secundariis utrinque ca. 6 distaliter ascendentibus. Inflorescentiae multo ramosae, ramis serialiter cymosis subtiliter deflectis dense sordide sericeis vel subhirtellis. Capitula in seriebus solitaria vel geminata sessilia 7-8 mm alta et ca. 5-7 mm lata, bracteis subinvolucralibus anguste ovatis 5-10 mm longis minute apiculatis in vestimento foliiformibus; squamae involucri exteriores 25-30 multiseriatae leniter patentes anguste lineares vel filiformes 2-5 mm longae apice anguste acutae non reflexae extus dense sericeae, squamae interiores ca. 10 lineari-lanceolatae 6-7 mm longae inferne ca. 1 mm latae apice acutae extus sericeae. Flores ca. 10 in capitulo. Corollae violaceae 5-6 mm longae praeter apicem glabrae, tubis 2-3 mm longis anguste infundibularibus, faucis subnullis, lobis ca. 3 mm longis et 0.5 mm latis superne dense breviter spiculiferis, spiculis uni- et bi-seriatis; thecae antherarum 1.8-2.0 mm longae inferne obtusae; appendices antherarum ca. 0.3 mm longae et 0.2 mm latae non glanduliferae. Achaenia immatura ca. 1.5 mm longa dense longe setifera; setae pappi ca. 40 et ca. 4 mm longae, setae in seriebus exterioribus distinctae anguste squamiformes ca. 0.5 mm longae. Grana pollinis 45-50 µm in diam. valde lophorata, cristis minute multo spinuliferis, spinis majoribus nullis.

TYPE: BRASIL: Bahia: Coastal Zone. Parque Nacional de Monte Pascoal. On NW slopes of Monte Pascoal. Rain forest, changing to disturbed areas with scattered trees and woodland, dominated by Pteridium at higher altitudes. Alt. 200-586 m. This plant growing at summit of mountain among shrubs and trees. Herb to 2 m. Leaves slightly coriaceous, mid-green above, pale below with pale buff hairs. Corolla pale magenta. 12 Jan. 1977. Harley et al. 17865 (Holotype US).

Vernonia persericea is one of a group including *V. geminata* Less., *V. coulsonii* Sch.Bip. ex Baker, *V. edmundii* Barroso, and many others. The distinctive features are the narrow outer rows of involucral bracts without reflexed tips and the subsessile oblong-ovate leaf blades with an abrupt acumination. The markedly sericeous vestiture is also notable. Additional features include the leaf undersurface with no glandular punctations, and the filaments of the anthers being inserted just below the sinues of the disk corolla lobes. The bracts of the inflorescence are reduced, but are larger than the scarcely evident bracts of *V. geminata* and its closest allies.

Vernonia harleyi H.Robinson, Holotype, United States National Herbarium. Photos by Vistor E. Krantz, Staff Photographer, National Museum of Natural History.

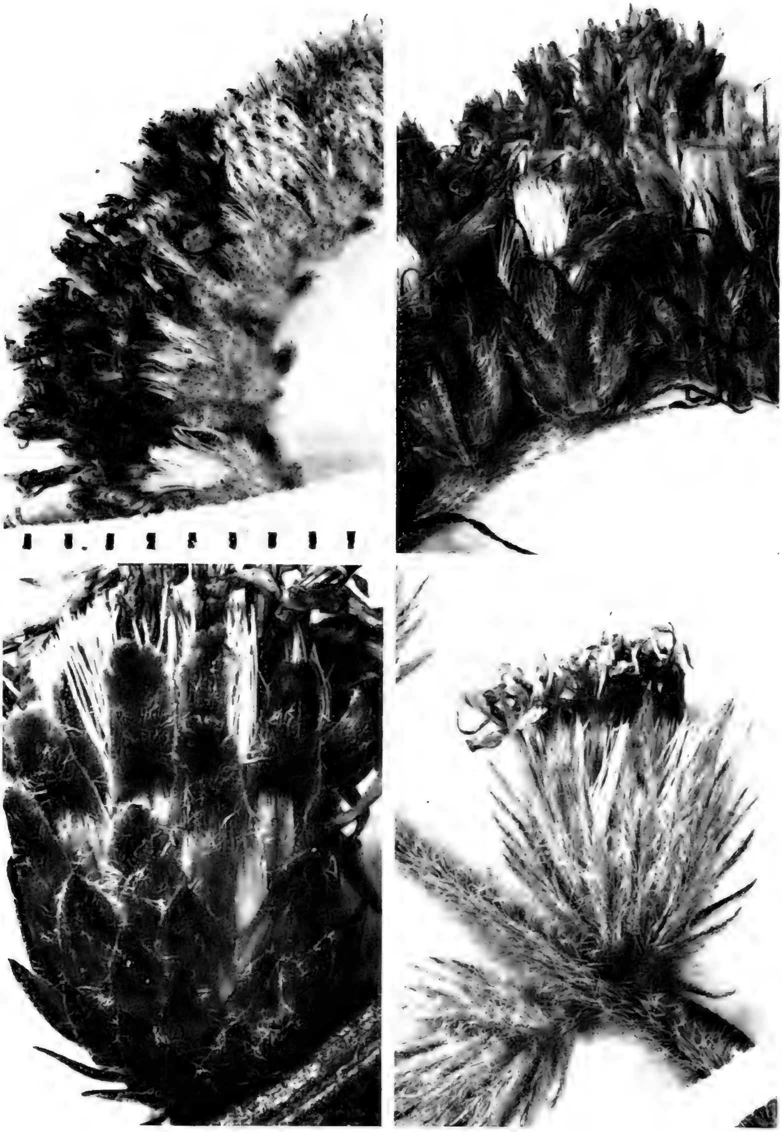
Vernonia mattos-silvae H.Robinson, Holotype, United States National Herbarium.



Vernonia nobilis H.Robinson, Holotype, United States National Herbariam.

Vernonia morii H.Robinson, Holotype, United States National Herbarium.

Vernonia persericea H. Robinson, Holotype, United States National Herbarium.



Vernonia, enlargements of heads: Top left. V. harleyi. Top right. V. mattos-silvae. Bottom left. V. morii. Bottom right. V. persericea.

NEW SPECIES OF VERNONIEAE (ASTERACEAE). III.

ADDITIONS TO PIPTOCARPHA

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Piptocarpha is a wide-spread genus in the Neotropical Region with most of the approximately 50 species (Jones, 1977) in South America. Numerous Andean species have been described in recent years, including the unique P. cuatrecasasiana (Aristeg.) Badillo (Aristeguieta, 1963, 1964; Badillo, 1974) having hairs inside the corolla. Recent studies involving Brazilian species include those of Cabrera (1957) and Barroso (1959), the latter with a key to the species in the Rio de Janiero area. Three further additions to the Brazilian flora given below include two new species and one transfer from the genus Stifftia.

Piptocarpha matogrossensis H.Robinson, sp. nov.

Plantae subarborescentes vel arborescentes multo ramosae ca. 4 m altae et 10 cm latae. Caules teretes subtiliter striati dense minute sordide lepidoti. Folia alterna, petiolis 7-17 mm longis saepe leniter arcuatis; laminae coriaceae oblongo-ellipticae plerumque 4.5-7.5 cm longae et 1.4-3.3 cm latae base anguste rotundatae vel breviter cuneatae plerumque inaequales margine integrae apice obtusae vel anguste rotundatae supra in sicco flavo-virides glabra in nervis primariis anguste lepidotae in nervulis prominulae subtus dense sordide lepidotae, nervis secundariis utrinque ca. 7 plerumque 20-30^{o} ascendentibus. Inflorescentiae axillares subglomeratae breviter corymbosae subumbellatae, ramis 1-4 mm longis dense sordide lepidotis. Capitula ca. 6-9 in axillo 10-12 mm alta; involucra anguste campanulata ca. 7 mm alta et 3 mm lata in partibus interioribus decidua; squamae involucri ca. 25 et ca. 5-6-seriatae confertae ellipticae 1-6 mm longae et ad 2 mm latae apice breviter acutae in squamis mediis margine scariosae, squamae exteriores et apices squamarum interioris extus appresse lepidotae margine pauce fimbriatae. Flores 5-8. Corollae albae? ca. 6 mm longae plerumque glabrae, tubis 1.5-2.0 mm longis, faucis ca. 1.5 mm longis leniter infundibularibus, lobis ca. 2.5 mm longis et 0.5 mm latis superne pauce glanduliferis et dense substellato-piliferis; thecae antherarum ca. 3.5 mm longae base caudatae argute acutae, caudis ca. 1 mm longis; appendices antherarum oblongo-lanceolatae ca. 0.6 mm longae et 0.2 mm latae non glanduliferae. Achaenia ca. 4 mm longa glabra sublaevia in superficiis interioribus leniter costata; carpopodia minuta; setae pappi tenues cinereae (appearing white on specimen) 90-100 plerumque 6 mm longae, setae exteriores paucae lineares 0.5-1.0 mm longae. Grana pollinis ca. 35 µm?

TYPE: BRAZIL: Mato Grosso: Vicinity of Barro do Garças, ca. 45 km N. on road to Xavantina. Cerrado. Small tree to ca. 4 m x 10 cm. Pappus gray-brown. Occasional. Elev. 300-300 m. Oct. 15, 1964. Irwin & Soderstrom 6926 (Holotype US).

Both geography and the general description place the new species close to P. senescens Baker, but the leaves of the latter are noted as 5-6 inches long by 2 1/2 - 3 wide, as being distinctly denticulate, and being subcoriaceous or comparatively flexuose for a member of the genus. Other suggested differences are the more brownish and more lepidote pubescence on the leaf undersurface. The carpopodium seems small compared to those of many other species, and the secondary veins are less prominent on the underside.

Piptocarpha santosii H.Robinson, sp. nov.

Plantae fruticosae (subscandentes?) mediocriter ramosae. Caules subteretes vix angulati dense ferruginose stellate tomentosi. Folia alterna, petiolis 2-3 cm longis crassis dense stellate tomentosis; laminae subcoriaceae suborbiculatae 8-12 cm longae et ca. 6-9 cm latae base plerumque aliquantum inaequales late rotundatae vel vix cordatae margine integrae vel remote minute denticulatae apice breviter apiculatae supra subtiliter rugulosae scabride pilosulae in nervis dense stellato-tomentosae subtus sordide subdense stellato-tomentosae, nervis secundariis utrinque ca. 8 plerumque recte patentibus. Inflorescentiae axillares subglomeratae breviter corymbosae, ramis ultimis 1-4 mm longis ferrugineo-tomentosis. Capitula ca. 8 in axillo 12-14 mm alta ca. 5 mm lata; involucra turbinata 8-9 mm alta superne constricta aliquantum persistentia; squamae involucri ca. 30 et ca. 6-seriatae dense confertae ellipticae vel late ellipticae 1.5-7.0 mm longae et 1.5-2.0 mm latae in squamis mediis suborbiculatae ad 4 mm latae margine late scariosae, squamae exteriores extus tomentosae, interiores extus plerumque subglabrae-subapice appresse substellate pubescentes margine fimbriatae. Flores ca. 9. Corolla albae firmae ca. 8-9 mm longae plerumque glabrae, tubis ca. 3.5 mm longis, faucis ca. 1.5 mm longis leniter infundibularibus, lobis 3.0-3.5 mm longis et ca. 0.5 mm latis superne glanduliferis et pauce substellato-piliferis; thecae antherarum ca. 3.5 mm longae base caudatae argute acutae, caudis ca. 0.5 mm longis; appendices antherarum lanceolatae 0.9 mm longae et base 0.25 mm latae non glanduliferae. Achaenia 3.5-4.0 mm longa distincte 10-costata glabra; carpopodia prominentia; setae pappi tenues albae 75-80 plerumque 6-7 mm longae, squamae exteriores numerosae lineares ad 1 mm longae. Grana pollinis ca. 35-37 µm in diam. indistincte lophorata spinulosa.

TYPE: BRAZIL: Bahia: Eunápolis Colonia estrada do rio do peixe do W. Arbusto raminoso fl. branca involoco verde.

Mata. 18.5.71. T.S.Santos 1670 (Holotype US).

The new species is unusual in the suborbicular leaves with nearly perpendicular spreading secondary veins. The stellate pubescence seems to be more highly developed than in any other species of the genus. The hairs are less branched on the stem, are densely branched on the petioles, and are more laxly but more stellately branched on the undersurface of the leaf.

Piptocarpha stifftioides H.Robinson, nom. nov.

Stifftia axillaris Barroso & G.da Vinha, Loefgrenia 44: 1. 1970. Not *Piptocarpha axillaris* (Less.) Baker. The species first aroused suspicion because of the axillary inflorescences such as are common in most Brazilian species of *Piptocarpha*. Nevertheless, careful examination has been necessary to confirm the relationship. The glabrous leaves and the stout rather reddish pappus setae are similar to *Stifftia* which is also native in eastern Brazil, however, a position in the Vernonieae rather than the Mutisieae is indicated by the small thin anther appendages, the slightly lophorate and spinulose pollen grains, the thinly and irregularly thickened endothecial cells, and the long style branches with pubescence along their entire external surface. The position in *Piptocarpha* is evident in the distinctive form of the achenes, the few somewhat stellate appressed hairs on the tips of the corolla lobes, and in the often slightly unequal bases of the leaf blades. The species has blunt-tipped anther bases, but the basal portion is evidently sterile tissue and thus represents a tail. Most species of *Piptocarpha* have a very sharp tail, but blunt tails have been seen on specimens from Bahia determined as *P. pyrifolia* Baker. The species is unusual in the genus by having only 1-3 heads in the axils of each leaf.

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

Piptocarpha santosii H. Robinson, Holotype, United States National Herbarium.

Piptocarpha, enlargements of heads: Top. *P. matogrossensis*. Bottom. *P. santosii*.

THE CORRECT GENERIC PLACEMENT OF *ALBIZIA CARBONARIA* BRITTON

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A survey of the pollen of tribe Ingeae (Mimosoideae) by Scanning Electron Microscopy and light microscopy was initiated to determine the usefullness of this character in the taxonomy of the tribe. The tribe is characterized by pollen that regularly occurs in 16-20-24-28-32-grained polyads. Almost all the high number polyads occur in New World taxa; the majority of the Old World genera have 16-grained polyads only. During the course of this study an interesting polyad was found in the genus *Albizia* The characteristic polyad of *Albizia* is composed of 16 pollen grains which agrees with the results of other recent pollen studies. Guinet (1969) in his treatment of the Mimosoideae reported the pollen of all the species of *Albizia* that he examined as polyads with 16 grains. Sorsa (1969), in a similar study, listed only one species from Africa (*Albizia amara ssp. seriocephala*) as having an occasional 32-grained polyad. A sample of this species' pollen contained 16 grains per polyad consistently with only one 32-grained polyad observed. It would seem that this chance occurrence may be the result of an aberrant division. Such irregularities commonly are found in other genera of the Ingeae.

As an extension of the pollen study, the stigmatic surfaces also were examined. It was noted that stigma size usually corresponds to the diameter of the polyad, and the stigmatic area can accommodate only one polyad. Such a system of pollination coupled with the fertilization of all the ovules by a single polyad would ensure maximum seed production with the least amount of energy expended. There should be many ovules/ovary in *Albizia* flowers as there is a significant correlation between morphologically permanent tetrads, polyads, and pollinia and high ovule number (Walker, 1971b). Under these circumstances it would be expected that a polyad of 16 grains should produce a maximum of 16 seeds per pod with correspondingly higher numbers for larger polyads. All available fruits on *Albizia* herbarium specimens at Field Museum were examined to see if a correlation could be established between seeds/pod and grains/polyad. The results of the examination agreed with predictions: the 16-grained polyad species of *Albizia* had fruits with 10-14 seeds. However, one specimen, an *Albizia* from Central and South America, did not seem to fit the otherwise established pattern (less than 16 seeds per fruit). This species had 25 seeds/pod which would not correlate with a fertilization by a single 16-grained polyad. Subsequent examination of the flowering material revealed that the polyads were consistently 32- rather than 16-grained. Either this is a unique species of *Albizia* or it has been incorrectly placed.

In examining the material it was found that specimens of this species have been previously identified as three separate species of *Albizia*, *A. carbonaria*, *A. filicina*, and *A. malacocarpa*. The oldest epithet is *malacocarpa* published in 1925 by Standley in the Flora of El Slavador but it lacks a species description. Subsequently, the name was validly published by Standley in North American Flora in 1928. However, in 1926, Britton established *A. carbonaria* for a tree that was growing at the Rio Piedras Forest Station in Puerto Rico. At a later date, 1936, Britton and Killip in the Mimosaceae and Caesalpinaceae of Colombia placed *A. malacocarpa* in synonomy with *A. carbonaria*. The third epithet, *filicina*, is handwritten on specimens in the herbarium at Field Museum as sp. nov. Standley. There has been no publication of this epithet.

Native to Colombia, *Albizia carbonaria*, has been introduced in El Slavador and Puerto Rico (type specimen). It is also found in Venezuela, Panama, and Costa Rica. Traditionally the genus *Albizia* had been classified as entirely Old World, being native to Asia and possibly Africa. But this distinction has been obscured as it has become very widespread in the New World due to the cultivation of many species as ornamentals (for example, *A. julibrissin*). Morphologically the genus is most closely allied to *Pithecellobium* (primarily New World) and is distinguished from it primarily on fruit characters.

Albizia - Fruit broadly linear, straight, plano-compressed, thin, not dehiscent, or 2-valved, continuous inside, the valves neither elastic not twisted (Hutchinson, 1964).

Legume oblong, flattened, straight, tapering at the base and apex, nonseptate, chartaceous to coriaceous, dry, indehiscent to tardily dehiscent, the valves thin, slightly thickened at the margins (Elias, 1974).

Pithecellobium - Fruit compressed, circinate, variously twisted, falcate, or rarely nearly straight, 2-valved or rarely not opening or splitting into joints, valves often twisted but not elastically revolute (Hutchinson, 1964).

Legume straight or curved, flattened to terete, 2-valved, dehiscent (or indehiscent), the valves continuous or interrupted within, dehiscence occurring along both sutures at the same time or proceeding from on the adaxial suture to the abaxial suture (usually incomplete), the valves being contorted after dehiscence (Elias, 1974).

A. carbonaria - Legume 8-11 cm. long, about 2 cm. wide, densely puberulent, stipitate, narrowed at the base, at length dehiscent (Standley, 1928 - as *A. malacocarpa*).

Pod flat, linear-oblong, 7-10 cm. long, 14-18 cm. wide, pubescent, short-pointed, narrowed at the base, the valves with thickened margins, its stalk about 1 cm. long (Britton, 1926).

Examination of fruiting specimens of *A. carbonaria* further reveals that the fruit is septate (note written on specimen - author unknown). In the Flora of Panama (Schery, 1950) a question is raised as to its placement: "On the basis of certain characters *A. carbonaria* might well be considered *Pithecellobium* (or *Samanea*, if this be recognized as distinct from *Pithecellobium*) instead of *Albizzia*. Yet the legume better fits *Albizzia*." The separation of *Albizia* from *Pithecellobium* based solely on fruit morphology is considered questionable by Elias (1974).

It has been traditional for workers in the Mimosoideae to use fruit characteristics as a major indicator of generic relationships or as determiners of generic boundaries. The widespread use of the fruit character has not resulted in a stabilized taxonomy that reflects, at least to some extent, natural relationships. We believe that fruit was chosen as a "key character" simply because they are generally large, easily observable, and forestall the need to make extensive dissections of small (usually) flowers. In our opinion floral morphology affords better opportunities for determining relationships as they appear to be intimately associated with particular pollination strategies. The fruit appears to be a secondary evolutionary character more closely attuned to habitat than to a set generic ground plan. What is needed to demonstrate this, is a broad survey that attempts to correlate fruit type with habitat and seed dissemination type. The latter would be difficult to perform because of our very limited knowledge of this subject within the Mimosoideae. Until such time as the proposed correlation can be demonstrated or disproven, we believe that prudence would tend to dictate that we "forget the fruit".

The individual pollen grains of tribe Ingeae are not differentiated to a great extent. However, with the exception of the larger genera (*Inga* and *Pithecellobium*), the pollen is consistent in the number of grains per polyad having either 16- or 32-grained polyads (Table 1). Of the genera having 32-grained polyads, *Affonsea*, *Enterolobium*, *Inga*, *Pithecellobium*, *Pseudosamanea*, and *Samanea*, only *Pithecellobium* possesses the morphological features that would allow the placement of *A. carbonaria* within the genus. Figures 1-4 are Scanning Electron micrographs of the 32-grained polyad of *A. carbonaria*, the characteristic 16-grained polyad of *Albizia*, and the 32-grained polyad of *Pithecellobium* for comparison.

In summary, the genus *Albizia* is not well defined nor separated easily from some members of the Ingeae. The characters of the fruit are limited in their value in segregation of genera and useless when only flowering specimens are available. All Old World *Albizia* species have pollen that is consistently in 16-grained polyads. To date, with the exception of *A. carbonaria*, all the New World species that have been examined conform in this character. Therefore, we are transferring *A. carbonaria* to *Pithecellobium*, the genus most closely allied to *Albizia* in morphological and palynological characters. We are limiting the genus *Albizia* to those species which only have 16 pollen grains per polyad.

Pithecellobium carbonaria (Britton) Niez. & Nevl.

Albizia carbonaria Britton, Sci. Surv. Porto Rico & Virgin Islands 6: 348, 1926. (TYPE: *C. L. Bates s.n.*).

Albizia malacocarpa Standley, Fl. Salvador 96, 1925; nomen nudum. N. Am. Flora 23: 44, 1928. (TYPE: *Calderon 2042*).

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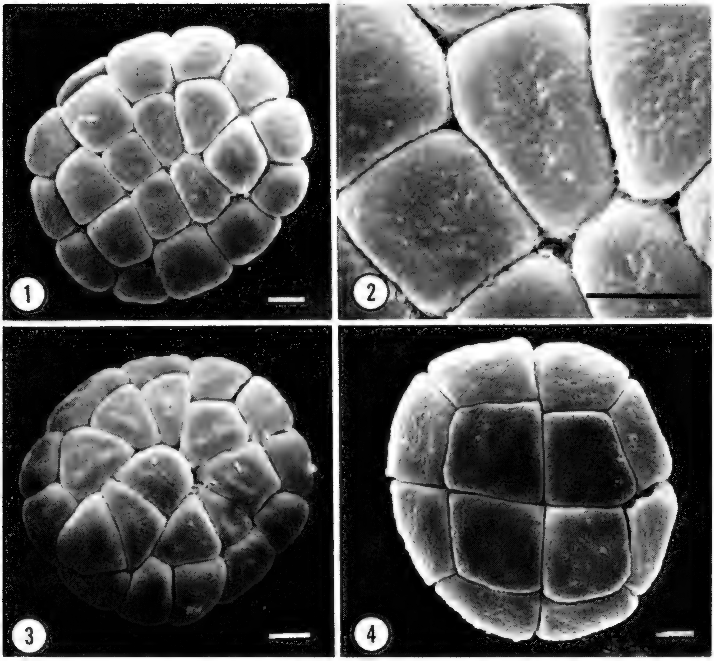
TABLE 1:

GENUS	POLLEN GRAINS/POLYAD	DISTRIBUTION
Affonsea	32	New World
Albizia	16	Old & New World
Archidendron	16	Old World
Calliandra	8 or 16*	Old & New World
Cedrelinga	16	New World
Enterolobium	32	New World
Inga	16 to 32	New World
Lysiloma	16	New World
Pithecellobium	16 to 32	Old & New World
Pseudosamanea	32	New World
Samanea	32	New World
Serianthes	16	Old World
Wallaceodendron	16	Old World

***Calliandra* as presently circumscribed consists of at least two genera. Those with an 8-grained polyad may not belong in the Ingeae.

The pollen data comes from a compilation of our studies, Sorsa, and Guinet; the distribution data is from Hutchinson.



FIGURES 1-4. - Scanning Electron Micrographs (line = 10 u): 1 & 2, *Pithecellobium carbonaria*; 3, *Pithecellobium daulense*; 4, *Albizia retusa*.

PSEUDOSTELLARIA JAMESIANA, COMB. NOV., A NORTH AMERICAN REPRESENTATIVE OF A EURASIAN GENUS

William A. Weber[1] and Ronald Hartman[2]

Stellaria jamesiana Torrey is a common and conspicuous element in the forest flora of the Southern Rocky Mountains of Colorado and across the western United States in the mountains of Wyoming, New Mexico, western Texas, Utah, Nevada, northern Arizona and in the Cascade-Sierra ranges of Washington, Oregon and California. It has always held an anomalous position in that genus because of its shallowly notched petal with a U-shaped sinus. For this reason Shinners (1962) transferred the taxon to *Arenaria*. His preoccupation with the petal character unfortunately may have caused him to ignore equally obvious characters which ally *S. jamesiana* not so much to *Arenaria* as to *Pseudostellaria* Pax (1934), a Eurasian genus likewise characterized by having shallowly notched petals. Furthermore, *Pseudostellaria* displays perennial rhizomes with napiform tubers scattered along them as swellings or in fascicles at the bases of the aerial stems. Because of the fragility of the attenuate stem bases most specimens of *Stellaria jamesiana* are collected without underground parts. In most species of *Pseudostellaria* the showy flowers are usually barren, the few fruits being borne on cleistogamous flowers from the lower leaf-axils. In *Stellaria jamesiana* most of the flowers are barren but a few are fertile and evidently not cleistogamous.

The chromosome numbers reported for *Pseudostellaria* are 2n=32 for *P. europaea* (Favarger 1961) and 2n=12, 14 for *P. palibiniana* (Lee 1969) suggesting base or secondary base numbers for the genus to be x=6, 7 and 8. Many more counts are needed. Löve, Löve & Kapoor (1971) reported 2n=26 for *S. jamesiana*. We consider this count unreliable because no voucher specimen was deposited in COLO and several others by the same student collector were misidentified. Hartman has determined the chromosome number of *S. jamesiana* recently in material from Wyoming: Carbon County, ca. 3.2 mi W of Sandstone Ranger Station, T13N R88W S12, 2500 m.s.m., July 1979, Hartman & Coffey 8957 (RM) to be 2n=ca.96, which would suggest a base number of x=8 or 16. This harmonizes with the reports for *Pseudostellaria*.

In *S. jamesiana* the rhizomes sometimes have only swellings along their length, but well-developed individuals have massive clusters of napiform tubers a centimeter or more wide and up to

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ten cm long. The few fruit-bearing flowers are almost always the first blossoming members of simple dichasia. The mature ovary contains two seeds plus one or two aborted ovules. Seed ornamentation consists of low, smooth, elongated ridges from which several short, narrow ones "flow" pectinately from their slopes to meet those of adjacent ridges.

The capsule is extraordinary because of its mode of dehiacence. The pedicel becomes deflexed from its base, turning the apex of the capsule toward the ground. Upon dehiscence the seeds fall away and the capsule valves *spread out flat and their tips roll back and under several turns,* creating the aspect of a round saucer lacking any points, the shiny insides of the valves being fully exposed. Whether this is unique to the species or may be matched in other species of *Pseudostellaria* remains to be seen.

Accordingly, we propose the following transfer:

PSEUDOSTELLARIA JAMESIANA Torrey (Weber & Hartman, *comb. nov.,* based on *Stellaria jamesiana* Torr., Ann. Lyc. N. Y. 2:269. 1827.

In proposing *Pseudostellaria,* Pax described its phytogeography as follows: "Die etwa 10 Arten umfassende Gattung stellt ein Tertiärrelikt Ostasiens dar" and listed the species as occurring in China, adjacent Japan, Korea, eastern Tibet, Transbaicalia, Himalaya, Afghanistan and Altai. The distribution of the more recently segregated European species, *P. europaea* Schaeftlein, from SE Austria, N Jugoslavia and NW Italy, is that of an outlier of an essentially Asiatic genus. A few additional species have been added from the areas mentioned by Pax. This realignment of *Stellaria jamesiana* with *Pseudostellaria* reinforces the emerging pattern of the Southern Rocky Mountain Flora as one having a strong Asiatic element probably dating back to the Tertiary, a feature which greatly impressed Sir Joseph Hooker a century ago when he visited Colorado with Asa Gray (Huxley 1918, p. 220).

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BOOK REVIEWS

Alma L. Moldenke

"COASTAL VEGETATION" 2nd Edition by V. J. Chapman, viii & 292 pp., 115 b/w fig., 31 tab. Pergamon Press, Oxford, Toronto, & Elmsford, New York 10523. 1976. $9.50 flexicover & $17.50 clothbound.

This new edition has been increased in scope from just British coastal vegetation to that of both sides of the North Atlantic, even including the tropical mangroves of southern Florida. This book from the typewriter and (wet) field studies of a learned ecologist should be of use to university students in Great Britain, northern Europe and the eastern United States. The text considers basic ecological principles affecting coastal vegetation such as zonation, succession, community analysis and autecology in sand dunes and their slacks, the drift line, shingly beaches, coastal cliffs, salt marshes and the mangroves that replace them in the tropics. They are mainly treed, with *Rhizophora mangle* and *Avicennia germinans* dominant. This edition offers much valuable material to readers.

"PLANTS CONSUMED BY MAN" by B. Brouk, x & 479 pp. & 391 b/w line draw. Academic Press, London, San Francisco, & New York, N. Y. 10003. 1975. $39.25.

So very much valuable and interesting information on this topic has been incorporated into the illustrated concise outline form of this book on over 300 plants used the world over as Cereals and pseudocereals, Vegetables including macrofructifications of fungi, Fruits, Nuts, Plant extracts of starch, oil, protein, sugar, gums, vegetable food dyes, wood, smoke, Flavourings, Beverages, Fumitories and masticatories, Fermentative microorganisms in cheeses, vinegars. At the close of each chapter there is a morphological survey of the specific plant structures involved. This is virtually an encyclopedia with readily available accurate information often enhanced by derivation of terms and early history of use.

"BEHAVIOUR ASPECTS OF PARASITE TRANSMISSION" edited by Elizabeth U. Canning & C. A. Wright, xi & 219 pp., 6 b/w tab., 44 fig. & 42 photo. Academic Press, London & New York, N. Y. 10003. 1973. $20.00.

This book, an interesting first in this interdisciplinary field, is published as Supplement I of the Zoological Journal of the Linnean

Society of London Volume 51, 1972, so making available the 13 papers, their useful bibliographies and their questions-answers to a much larger and later audience than was privileged to attend this symposium. The first editor represents the British Section of the Society of Protozoologists and the second the British Society of Parasitologists and also the Linnean Society. The papers cover such topics as behavior of digenetic trematodes, monogeneans and larval nematodes; circadian and seasonal rhythms in blood parasites (microfilariae, plasmodia, trypanosomae, diurnal carriers of loa to man and crepuscular or nocturnal carriers to monkeys); host-finding and media of tsetse flies in their "following swarms"; human behavior in the transmission of parasitic mainly tropical diseases and their radiations as graphically described by a medical naturalist, sense organs in trematode micromedia and hematophagous insects; etc. Students and researchers in parasitology, entomology, ethology, human and animal medical problems will find valuable material here. The print is particularly easy to read.

"GUIDE TO THE NATIONAL WILDLIFE REFUGES" by Laura & William Riley, xv & 653 pp., 181 b/w line-dot maps & 27 color photos. Anchor Press of Doubleday, Garden City, N. Y. 11530 & New York, N. Y. 10017. 1979. $14.95.

"The [more than 380] national wildlife refuges of the United States are unmatched by those of any other country in the geographic span they cover, the diversity of habitat they provide, and the variety and numbers of wild creatures they harbor...... The book tells where these refuges are, how to get there, what there is to see and do, where a visitor can stay or camp nearby, best times to visit, any special equipment needed, and how to get more information." This collection of carefully compiled information should prove helpful for travel planning and for folks who respect Nature as do the authors.

"TREES OF THE NORTHEAST COLORING BOOK" by Stefen Bernath with captions by Mildred E. Faust, ii & 46 pp., 45 b/w & 2 color end plates of drawings. Dover Publications, New York, N. Y. 10014. 1979. $1.50 paperbound.

There seems to be a market especially among hobbyists who like to visualize things and have their distinctive characteristics pointed out correctly by outline drawings such as these. For 45 conifer and broadleaf trees, their general outline, their leaf shape and arrangement, their flowers, seeds and fruits, and their barks show in the outlines as distinctive characters. The captions give common and scientific names and items of interest.

"CENTRAL PARK - A Photographic Guide" by Victor Laredo (photographs). & Henry Hope Read (text), xiii & 80 pp., 121 b/w photos & 1 map. Dover Publications, New York, N. Y. 10014. 1979. $4.50 paperbound.

That "Central Park is one of the world's great urban parks" is proven in the text, legends and well printed nostalgic (back to a few years, to a few or more decades, or to a century or more) photographs. There are the bird watchers peering through their binoculars, the now vanished conservatory and greenhouses, statuary of many kinds and times including the Egyptian obelisk, "Cleopatra's Needle", with its hieroglyphs continually being eroded away as prophesized by its translator, Dr. Charles E. Moldenke, the zoo with the people often as interesting as the animals, and the silent background foliage and branches of trees and shrubs in all seasons.

"THE STARS BELONG TO EVERYONE - How To Enjoy Astronomy" by Helen Sawyer Hogg, xii & 274 pp., 36 b/w fig., 24 pl. & 8 tab. Doubleday & Company, New York, N. Y. 1976. $12.50.

This author surely knows how to share her childhood enthusiasms for the stars above. They ripened into a longtime professional career at the University of Toronto and a weekly newspaper column on "The Stars" for the "Toronto Star".

"This book attempts to give explanations for celestial happenings. The magnificence of nature is all around and above us. I hope this book will add to your enjoyment of it." The book unfolds interesting surveys of the heavenly bodies and special items culled from literature accessible to the researcher. In the chapter on "Natural Events in the Earth's Atmosphere" there is an illustration of the Leonid shower of 1833 as seen over Niagara Falls, but a larger, better printed one would have been much more effective.

"GROUNDWATER POLLUTION IN EUROPE" edited by John A. Cole, xi & 547 pp., 138 b/w fig. & 46 tab. Water Information Center, Huntington, N. Y. 11743. 1974. $26.00.

Here are the proceedings of a conference organized by The Water Research Association in Reading, England, in September 1972. that should be available to many more advanced students, technicians, hydrologists and those government officials responsible for water availability and safety in their areas. There are 54 papers grouped topically with 14 well presented discussions with such papers as "Safeguarding the Water Supplies in Uppsala, Sweden", "Colliery Spoil Heaps", re nitrates "Travel Time from Surface to Well", "Studies for the Prevention of Oil Pollution near Bratislava, Czechoslovakia" and "Flow Tracing Using Isotopes". As human population, desires and technology increase the application of such studies becomes increasingly important.

"ILLUSTRATED ENCYCLOPEDIA OF INDOOR PLANTS" by Kenneth & Gillian Beckett, 224 pp., 128 color & 278 b/w draw. Doubleday & Company, Inc., Garden City, N. Y. 11530. 1976. $12.95.

"There must be some basic urge in all of us to have some living greenery around us. Walk around any city area from shopping mall to office blocks and plants are there, living happily in central heating and with artificial light.....This desire for a little bit of garden indoors seems to have begun last century when people moved from the countryside into the towns and became nostalgic for what they had lost."

The introduction gives general instructions for plant selection and care. It is followed by a helpful glossary and the very distinctive color plates. The text covers over 800 genera and 2000 species arranged alphabetically by scientific name, common name, plant family and brief descriptive and growing notes. The line drawings are particularly well done. The index at the back lists alphabetically the common names and their scientific equivalents. The genus *Clerodendrum* is still represented by the incorrect spelling, *Clerodendron*, throughout; the specific epithet of *C. thomsonae* is correctly spelled in the index but not in the text. This publication will prove handy to have in the house along with the potted plants., even if you should not believe plate labels 22 and 23 (which are reversed) and 32 (which actually depicts *Clerodendrum speciosissimum* rather than *C. splendens*.

"TERRESTRIAL VEGETATION OF CALIFORNIA" edited by Michael G. Barbour & Jack Major, xi & 1001 pp., 60 b/w fig., 90 photo, 39 maps & 131 tab. A Wiley-Interscience Publication of John Wiley & Sons, London, Sydney, Toronto & New York, N. Y. 10016. 1977. $47.50.

"Statewide review chapters on climate, flora, and the geological history of major vegetation types preface the main portion......and are first subdivided into six floristic provinces: Californian (9), Sierran (3), Pacific Northwest (3), Great Basin (2), Hot Desert (2), and Channel Islands" (1), with the numbers after each indicating the number of papers about subdivisions or distinctive features. "Photographs have been limited to cases where a real sense of the vegetation can be thereby conveyed" helping one to recall plants from lists. Each vegetation chapter begins with a diagrammatic state map highlighting the major locations of the vegetation types discussed and in the back-pocket there is a 1 : 1 million detailed map by Küchler which should excellent. My review copy of this excellent, valuable book came without the back-pocket and map, leaving me feeling cheated. Nevertheless, I would so much appreciate a few hundred free hours to mull over this study while recalling our previous trips to California and especially those "in the field" all over the state under the guidance of our son Andy mentioned in the preface for his "innovative review of pollination ecology and vegetation" that had to be omitted along with other chapters when this tentative work swelled beyond a feasible size. This book will prove to be of inestimable value to teachers and/or students in all schools in California and to researchers elsewhere of comparable vegetation areas.

"TAXONOMY, PHYTOGEOGRAPHY AND EVOLUTION" edited by D. H. Valentine, xi & 431 pp., 43 b/w fig., 39 tab., 1 photo & 59 maps. Academic Press, London NW1 & New York, N. Y. 10003. 1972. $25.75.

Under the aegis of the Linnean Society of London, the Botanical Society of the British Isles and the International Organization of Plant Biosystematists, this symposium was held at the University of Manchester for the presentation of 26 papers to 200 members and guests from 18 nations and since then for the students and researchers who have had or will have access to these important presentations. The introductory section of the book contains an important paper by Stebbins on "Ecological Distribution of Centers of Major Adaptive Radiation of Angiosperms" setting forth the principle of genetic unitormitarianism with the processes of evolution operating in the past essentially as they do now but on different phenotypes. The next section is on major geographical disjunctions in relation to evolution and migrations with particularly important papers by Kornaś, by Hara, and by Solbrig among others. The next section is on endemism and treats the flora of the Canary Islands, the relicts of Crete, the origin of endemics in the California flora, and the role of hybridization in the Hawaiian Islands. Another section deals with geographical evolution in certain genera [Raven on *Epilobium,* van Steenis on *Nothofagus,* etc.] and families. The last section has Baker's interesting "Migration of Weeds". This is truly a worthwhile publication.

"THE HOG BOOK" by William Hedgepeth, v & 273 pp., 19 b/w photo & 26 fig. Doubleday & Co., Inc., Garden City, N. Y. 11530. 1978. $10.00 clothbound & $6.96 paperbound.

This "hogology" might appeal to some readers who like their information on porcine husbandry, history and art slurped with some supposed mystique and odd conversation.

"Ökosystemforschung" edited by Heinz Ellenberg. xiv & 280 pp., 101 b/w fig., 25 tab. & 3 photo. Springer Verlag, New York, N. Y., Heidelberg & 1 Berlin 33. 1973. $12.40 or DM.39 paperbound.

The 17 papers herein comprise the report of the symposium under the auspices of the German Botanical Association and the Association for Applied Botany at Innsbruck. They deal with various phases of biomass production in benthic plants, bacteria, zooplankton, the end products, *Phragmites communis, Utricularia vulgaris* and some land plants. The last paper, by the editor, is a very carefully organized "Klassification der Ökosysteme nach funktionalen Gesichtspunkten" on several levels: mega-, makro-, neso-, mikro- and nano-. I am most impressed with the detailed, carefully constructed figures, such as fig. 1 which is a model of an integral ecosystem. This is an important work for ecologists and their students to be aware of.

"GRASSLAND SIMULATION MODEL" edited by George S. Innes, xxvi & 298 pp., 87 b/w fig., 1 map, 45 tab. & 3 photo. Springer-Verlag, Heidelberg, 1 Berlin 33 & New York, N. Y. 10010. 1978. $22.80.

Appearing as Volume 26 in the Ecological Series, this study planned before 1968 is the major open-literature description of a comprehensive, pioneering ecological modeling effort, "one of the major outputs of the United States Grassland Biome Study, a contribution to the International Biological Program....The extensive development of grazing-land system models awaited the advent of large, fast electronic computers.....because of the complexity of the systems being analyzed and the nature of the models used to simulate systems. The objectives of the model were to simulate biomass dynamics in a variety of grassland types and the response of the system to irrigation, fertilization, and cattle grazing. Some of the papers are: on SIMCOMP as the computer language used, on abiotic, mammalian and grasshopper consumers, decomposition and nitrogen-flow submodels, on sensitivity analyses and critiques.

Such IBP reports as this are important.

"AN ILLUSTRATED GUIDE TO POLLEN ANALYSIS" by P. D. Moore & J. A. Webb, iv & 133 pp., 33 b/w fig., 8 tab., 1 map & 48 photo. pl. Halsted Press of John Wiley & Sons, Inc., New York, N. Y. 1978. $19.95.

This text will prove to be of increasing importance for college and university courses and for palynological research in "the field", laboratories and herbaria because of the descriptions, keys, glossary and wide range of excellent illustrations making it an excellent lab manual. Applications of pollen analysis are varied and important as, for instance, in tracing the history of plant species, groups and communities and therefore habitats, climatic history and man's influence upon the environment. Other already successful applications have been in dating deposits. studying pollen and spore air contents and their effect upon man's own health and that of his cattle and crops, melissopalynology and criminology. Directions are given for pollen countings and pollen diagram constructions as well as for the interpretations of these diagrams or collations of spectra as dynamic records of vegetational history.

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A NEW SPECIES OF ROUPALA (PROTEACEAE) FROM VENEZUELA

Julian A. Steyermark
Instituto Botánico, Caracas
Venezuela

ROUPALA GRIOTII Steyermark, sp. nov.

Arbor 3-metralis, ramis bubalino-tomentosis; foliis petiolatis, petiolis 1.2-6 cm longis tomentosis; laminis rigide coriaceis integerrimis subtus pallido-viridibus late ovatis vel late ellipticis apice longiacuminatis basi acutis 8-15 cm longis 3-8.5 cm latis supra glabris subtus pallido-strigillosis vel glabrescentibus; nervis lateralibus utroque latere 5-6 apicem versus curvatis ante marginem desinentibus ubique tenuibus subtus leviter impressis; inflorescentiis axillaribus 15-20 cm longis 2-2.5 cm latis multifloris, rhachidi pallido-brunneo-tomentosis, pedunculis 1.5-2.5 cm longis; perianthio 10-13 mm longo, tubo 7-8 mm longo supra medium 2 mm lato basin versus 1.5 mm lato extus dense pallido-brunneo-villosulo intus glabro, lobis ligulatis 6-7 mm longis 1.1 mm latis extus dense pallido-brunneo-villosulis intus glabris; antheris lineari-oblongis 3-4 mm longis 0.5 mm latis; pistillo 9.5 mm longo, stylo 8 mm longo glabro; ovario ovoideo 1.5 mm longo 1.2 mm lato minute strigilloso; disco 4-lobato 0.8-0.9 mm alto, lobis deltoideo-orbicularibus subobtusis 0.7 mm longis 0.8 mm latis; pedicellis frugiferis 2 mm longis tomentellis; fructu oblique obovoideo apice rotundato abrupte apiculatoque basi abrupte angustato substipitato 1.5-2 cm longo 1-1.3 cm lato extus minute pallido-tomentelloso; seminibus suborbiculari-ovatis extremitatibus rotundatis alatis 13 mm longis 10.5 mm latis, corpore brunneo triangulari-obconico 7 mm longo 8 mm lato, ala 2-4 mm lata.

Type. VENEZUELA: TERRITORIO FEDERAL AMAZONAS: gallery forest bordering tree savanna with Platycarpum orinocense, vecindades del río Coro-Coro y del aeropuerto de Yutaje, lat. 5°35'N, long. 66°10' W, alt. 250 m, 22 Feb 1979, "tree 3 m tall; leaves coriaceous, stiff, deep green above, pale green below; flowers with green style and pale brown, reflexed perianth", Julian A. Steyermark, Marcel Griot Casanova, and Parker Redmond 117920 (Holotype: VEN).

This species is related to R. montana Aubl., from which it may be distinguished by the densely brown tomentose rachis, flowers with spreading hairs, shorter peduncle and pedicels, and smaller, differently shaped fruit. From R. dissimilis Pittier, placed under synonymy of R. montana by Sleumer (Bot. Jahrb. 76 (2): 170-171. 1954. Proteaceae americanae), R. griotii differs in the shorter pedicels, pubescent petioles and leaf-blades, and more densely tomentose pubescence of spreading hairs on rachis, pedicels, and perianth. It also resembles *Panopsis suaveolens* (Kl. & Karst.) Pittier, but that species has strongly revolute leaves which are rounded to subcordate at the base.

Roupala griotii is named in honor of Marcel Griot Casanova, an enthusiastic plant collector, and highly competent, versatile air pilot, who has successfully guided the author several times to interesting collecting grounds in the Territorio Federal Amazonas of Venezuela.

RESURRECTION OF VIOLA LANAIENSIS BECKER
HAWAIIAN PLANT STUDIES 90

Harold St. John
Bishop Museum, Box 19000A, Honolulu 96819, Hawaii, USA.

The recent collection of the Lanai violet in flower by S. L. Montgomery had caused the writer to reexamine it and compare it with Viola Helena Forbes & Lydgate, the similar plant on Kauai. Rock (1911: 6) described the Lanai plant as V. Helena, var. lanaiensis, and Skottsberg accepted this classification. Independently, and using a different type specimen, Becker(1916: 214) classed the latter as V. lanaiensis Becker. Skottsberg studied two collections of V. Helena and ten of var. lanaiensis, many of these specimens being meager.

The writer has now investigated these to plants, and notes the differences between them, which he considers sufficient to recognize each as a species.

Viola Helena Forbes & Lydgage, Bishop Mus., Occas. Papers 4(3): 218, and figure, 1909; Skottsb., Göteborg Bot. Trädg., Meddel. 13: 506-510, 1940; St. John, Pacif. Trop. Bot. Gard. 1: 238, 1973.

This has the stipules 11-13 mm long, the base narrowly lanceolate, the tip acuminate, and it is remotely short glandular ciliate; well formed blades linear lanceolate, the secondary veins almost straight, running directly to the teeth; upper petal 9 mm long; lateral and lower petals bearded; capsule valves 9-10 mm long.

Holotype: Hawaiian Islands, Kauai Island, Wahiawa Mountains, May 1908, J. M. Lydgate (BISH).

Specimens Examined, all from Kauai: Wahiawa Mts., along bank of stream, Aug. 1909, C. N. Forbes 214.K.

Viola lanaiensis Becker, Bot. Centralbl., Beih. 34: 214, 1916.

V. Helena Forbes & Lydgate, var. lanaiensis Rock, College of Hawaii, Publ., Bull. 1: 6-7, 1911; Skottsb., Göteb. Bot. Trädg., Meddel. 13: 508-510, figs. 38-39, 1940; St. John, Pacif. Trop. Bot. Gard., Mem. 1: 238, 1973.

This is distinguished by having the stipules 8-10 mm long, the base boradly deltoid, the tip long acuminate and long fimbriate; well formed blades narrowly elliptic and acute at each end; secondary veins of blades arcuate, the outer half diffusing, and only indirectly connected to the teeth; upper petal 14 mm long; petals glabrous; capsule valves 10.5-13.5 mm long.

Holotype: Hawaiian Islands, Lanai Island, 1851-55, J. Remy 532 (L.).

Specimens Examined, all from Lanai: Kaiholena Valley, June 1913, C. N. Forbes 24.L.; June 1913, 197.L.; Mts., e. end, June 1912, 282.L.; upper part of mountain, Sept. 21, 1916, A. S. Hitchcock 14,651; Hauola Gulch, 2,000 ft alt., 30 Aug. 1979, S. L. Montgomery; Kaiholena, 3/17/14, G. C. Munro 111; Lanaihale, Munro; Lanai Hale and Haalelepakai, boggy ground, 3,200 ft alt., July 25, 1910, J. F. Rock 8,046 (holotype of V. Helena, var. lanaiensis Rock.

The Lanai plant still has the Kauai one as its closest relative, but it is concluded that they are distinct species. Both are shrubs with woody stems.

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CONSIDERATION OF *BARKLYA* AND THE SUBTRIBES OF THE CERCIDEAE (CAESALPINIOIDEAE: FABACEAE)

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The proper placement of *Barklya syringifolia* F. Muell., Prince's Feather, a spectacular plant of northeast and eastern Queensland and the north coast of New South Wales, Australia, has been dubious until recently. Bentham (1864) referred the monotypic genus *Barklya* to the Sophoreae, although remarking that it approaches some Caesalpinioideae near *Bauhinia* in leaf and floral morphology, but has the petal aestivation descending and the embryo curved as in the Papilionoideae. Baillon (1870) found the petal aestivation to be irregular and intermediate between the two types, but never with the uppermost overlapping both laterals and as a result referred it to the Caesalpinioideae. Hutchinson (1964) placed it in the Cadieae of the Fabaceae (=Papilionoideae of authors). Yakovlev (1972) referred it to the caesalpinioid tribe Bauhinieae along with *Griffonia* and *Bauhinia*. Inclusion of *Barklya* with *Griffonia* and *Bauhinia* by Yakovlev was made on the basis of the crescentic hilum of the seed as in *Bauhinia* and unknown elsewhere in the Fabaceae as well as in the similarities in leaf morphology. Corner (1976) also noted the unusual hilum of *Barklya* along with several anatomical features of the seed which suggests a relationship with *Bauhinia* from which he questions if it is distinct. Roger Polhill (pers. comm.), in reviewing the placement of *Barklya* in the Sophoreae, also suggests it may be better placed in the Cercideae. Peter Goldblatt (pers. comm.) reports a chromosome number of 2n=26 which is in line with the Cercideae (2n=24, 26, 28), but not the Cadieae (2n=18, 20, 22). After examining specimens of flowering and fruiting material of *Barklya syringifolia*, the author has found the species to be easily accommodated within *Bauhinia* on the basis of seed, floral, and leaf morphology and the transfer to that genus is proppposed.

Bauhinia syringifolia (F. Muell.) Wunderlin, comb. nov.
Basionym: *Barklya syringifolia* F. Muell., Journ. Linn. Soc., Bot. 3: 158. 1859.

The tribe Cercideae, or Bauhinieae of some authors, has always been considered as a natural alliance of genera since Bentham (1840, 1865) even though there has been considerable disagreement as to the number of genera (Wunderlin, 1976). However, recent studies by the author have shown that the tribe can be divided into two discrete subtribes which are recognizable on the basis of fruit and seed morphology. The following classification is proposed.

Tribe *CERCIDEAE* Bronn, De Formis Pl. Legum. 131. 1822.
Type genus: *Cercis* L.

Subtribe *CERCIDINAE*

Trees or shrubs, unarmed and without tendrils, rarely with hooked branches below inflorescences; fruits with narrow dorsal wing or semilunate with gynophore and persistent style appearing confluent with dorsal margin or oblique and with laterally attached gynophore and persistent style; seeds with circular hilum, funicular aril-lobes absent.

1. *Cercis* L. - 6 species in warm temperate northern hemisphere.
2. *Griffonia* Baill. - 4 species in tropical west Africa.
3. *Adenolobus* (Harv. ex Benth.) Torre & Hillc. - 2 species in southwestern Africa.

Subtribe *BAUHINIINAE* (Benth.) Wunderlin, stat. nov.

Basionym: Tribe *Bauhinieae* Benth., Hook. Journ. Bot. 2: 74. 1840.

Type genus: *Bauhinia* L.

Trees or shrubs (sometimes semiscandent) with or without intrastipular spines (rarely shrubs with tendrils) or lianas (rarely vines) with or rarely without simple tendrils; fruits flat, woody to thin-valved, dehiscent or indehiscent, never with dorsal wing, nor semilunate with gynophore and persistent style appearing confluent with dorsal margin, nor oblique with laterally attached gynophore and persistent style; seeds with crescentic hilum, funicular aril-lobes present.

4. *Bauhinia* L. - *Ca.* 225 species, pantropical.

It is evident that the large and diverse genus *Bauhinia* should be further subdivided into a number of infrageneric units and such a revision is in preparation in collaboration with Professor Kai and Supee Larsen of the Botanical Institute, Aarhus University, Aarhus, Denmark.

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NOTES ON NEW AND NOTEWORTHY PLANTS. CXXX

Harold N. Moldenke

In order to bring the nomenclature of the Verbena Family more in line with current taxonomic practice, the following transfers are in order:

ACANTHOLIPPIA TRIFIDA var. *REICHEI* Mold., stat & nom. nov.
Lippia gracilis R. A. Phil., Anal. Univ. Chile 90: 620. 1896 [not *L. gracilis* Schau., 1847].

DURANTA REPENS f. *CANESCENS* (Mold.) Mold., stat. nov.
Duranta repens var. *canescens* Mold., Phytologia 1: 436. 1940.

DURANTA REPENS f. *GRANDIFLORA* (Mold.) Mold., stat. nov.
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ADDITIONAL NOTES ON THE GENUS *VITEX*. XIII

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Vitex Tourn.

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Bentham (1876) comments that "In Benth. Fl. Austral. v. 66 drupa

Viticis errore 4-pyrena dicitur; endocarpium undique continuum est v. rarissime vix separabile".

Pobéguin (1906) cites *Kouroussa 230, 232, 682, 810, & 1255, Teliko 799,* and *Timbo 741* from the Republic of Guinea as unidentified species of *Vitex* known locally as "ba coudou nê", "coudou", and "koukoui".

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Recent collectors describe this species as a large, fast-growing, deciduous shrub, 1.5--7 m. tall, aromatic, spreading or dense, with several stems, the branches erect to ascending, the foliage pungent-spicy when crushed, with the aroma of lavender or garden sage, the flowers pleasantly lavender-scented when bruised. The corollas are said to be "lilac" in color by Blackburn (1952) and Graf (1963), "violet or blue" by Dean (1968), "light hyssop-violet" by Turrill (1962), "pale-violet" by Makins (1936) and Munz (1968), and "bright-violet" by Parker (1924). They are said to have been "violet-blue' on *Shinners 8582,* "blue-violet" on *Gillis 8449,* "light-purple" on *Bayliss BS.6236,* "purple or lighter" on *Witham 304,* "mauve" on *Bayliss BS.5095 & 7270* and *Sykes 16/68,* "bright-mauve" or "lavender-mauve" on *Bayliss BS.4542,* and "purplish outside, dark-purple within on *Abedin 7403.*

Recent collectors have found this plant growing in thickets, *Pinus sylvestris* forests, in partial shade on blackland clay, in sandy loam, on seashores, on mostly limestone soil, in dry riverbeds, and on dry riverbanks, at altitudes of sealevel to 1300 meters, flowering from June to August, in fruit in July, August, and October.

Embarger (1960) reports the chromosome number of *Vitex agnus-castus* as 2n = 24 and the same number is reported by Paterman (1935), while Sugiura (1936), Paterman (1938), and Sharma & Mukhopadhyay (1963) report 32; Darlington & Wylie (1956) say"x = 6, 8". Löve (1971) reports the number as 2n = 32, based on *Murin & Sheikh s.n.* from Iraq. Trelease (1967) illustrates the longitudinal and cross-section views of the twigs, as well as the appearance of the leaf-scars and buds. His reference, however, to C. K. Schneider's "f. 191" seems to be an error since that figure in Schneider's work has nothing whatever to do with *Vitex agnus-castus.* Similarly, Imboden's statement that this is a "tree or shrub glabrous to tomentose or villous throughout -- from Baja California to Sonora [Mexico] and Chihuahua to Oaxaca" is quite erroneous -- probably meant to apply to *V. mollis* H.B.K. instead. Etchison adds that "This is an aromatic tree that grows to 30 feet [and] is found in dry sunny situations. I doubt if *Vitex agnus-castus* ever attains a height of more than 15 feet. Theophrastus, however, according to Knobloch (1948), in his "definitions of the various classes into which plants may be divided" asserts that *V. agnus-castus* is one that "increases in stature under cultivation, so that they become trees and yet they belong to the class of shrubs".

Speta (1977) says that "an der Ansatzstelle der Filamente befinden sich mehrzellige, verzweigte Haare, deren Kerne dicht mit feinen Kristallamellen angefüllt sind".

Serbanescu-Jitariu & Mitroiu (1973) describes the pollen, based on *Herb. INCEF 3335,* as follows: "subprolat; 3-colpat; văzut apical 26--46,8 mu in diam., din profil inalt 33,8--46,8 mu, lat 26--33,8 mu. Polenul scuturat din antere şi văzut cu ochiul liber, este galben, în apă la microscop, portocaliu brun, iar in chloralhidrat, galben-cenuşiu. Sporoderma crassisexinată cu o grosime de 2,6 mu; exina prezintă în secţ. optică o structură tehilat-baculată, iar suprafaţa este aciperită cu veruculi neuniform distribuiţi. Colpii 2/3 din raza microsporilor, sînt înguşti şi ascuţiţi spre capete."

Battandier & Trabut (1902) report that *V. agnus-castus* occurs in the littoral zone in Algeria and Tunisia; Maire asserts that it is both "cultivated and escaped" in Egypt; Fedtschenko (1913) lists it as cultivated in Turkestan (Russia). Bayliss records it as wild in Zululand and as cultivated in the "subtropic area of

South Africa" [Transvaal]; Knoche (1974) lists it as cultivated in the Balearic Islands. Marco & Mossa (1973) describe it as Euromediterranean and report it as "rare" on Sardinia. Innamorati (1973) found it in Morocco, while Roberty (1974) lists it as cultivated in what was French West Africa. Humbert (1958) encountered it in the northern and central Sahara: "Sud oranais, rare (Vallée de la Zousfana et probablement ailleurs; lits d'oueds, bord des mares". Speta (1977) records it from the island of Brac, Jugoslavia. Bischoff (1831) asserts that it is sometimes cultivated in Germany; Priszter (1971) says that it is cultivated in Hungary and offers seed of it as his seed no. 1672 in trade. Molina (1976) lists it as cultivated in Honduras, while Adams (1972) reports it cultivated on Jamaica. Sherk & Buckley (1968) refer to it as "hardy" in Canada only in the province of British Columbia. Radford & al. (1964) found it "rare in pastures" in Darlington County, South Carolina, where it flowers in June and July. McGregor & al. (1977) report it from Cleveland, Custer, Grady, and Payne Counties, Oklahoma. Hyland (1967) reports it cultivated in Maryland, grown from seed no. 263177 from Israel, 17720 from Baja California Norte, Mexico, 269411 from Afghanistan, 307618 from Turkey, and 259959 collected by Gentry in Mexico.

Sweet (1826), Bean (1956), and Fletcher (1972) tell us that *V. agnus-castus* is "said to have been cultivated in the British Isles since 1570", introduced from Sicily; Loudon (1832) give the date as "1590". Stalter (1972) found it in Georgetown County, South Carolina; Greuter (1976) reports it from Psaya island in the Aegean Sea. Patzak & Rechinger (1967) give its natural distribution as "Regio Mediterranea, Asia austro-occidentalis et centralis usque ad Turcomaniam et montes Pamir-Alaz", asserting that the type population "Habitat in Siciliae ad Napolis paludosis".

Bicknell (1896) found the species "along roads and torrents" in western Liguria (northwestern Italy), while Sommier & Caruana Gatto (1915) record it from Comino, Cozo, and Malta islands, noting that "A Malta à quasi distrutto. A Gozo forma ancora in alcuni luoghi dei piccoli boschetti. Varia a fiori bianchi." Huber says that it "is occasionally cultivated" in west tropical Africa; LeGrand (1887) lists it from France and southern Germany; Pampanini (1930) lists it doubtfully from Cyrenaica: "La presenza del *V. Agnus-castus* spontaneo a Tocra mi è incerta perchè il Dotti H. Scaetta lo segnalò senza alcuna indicazione in Proposito, mentre in seguito....lo indicò come coltivato." Lakela & al. (1976) report it "planted, escaping locally" in the Tampa Bay area of Florida, blooming there in spring and summer; Bouloumoy (1930) lists it from streamsides in Lebanon and Syria. Parker (1924) writes that it is cultivated on the plains of the Punjab where "It is very hardy both as regards cold and drought". Horowitz (1969) calls it "a hydrophile among trees on the banks of the Jordan river" in Palestine. Munz (1968) notes that it is "Found in alkali sink e. of Weedpatch, Kern Co.", California; Maheshwari (1963) reports it from "shrubberies of parks and gardens" in Delhi, India. Linnaeus (1753) and Raeuschel (1797) report it from Sicily.

According to Bayliss it flowers in the autumn in South Africa. Quézel & Pamukçuoglu (1973) report finding it growing with *Phragmites communis, Holoschaemus vulgaris, Paliurus australis,* and many *Ephedra fragilis* in maritima zone areas. Picci reports it from Molara island off the coast of Sardinia. The Browns (1972) found it becoming naturalized in Maryland. Dean (1968) avers that it "Grows in gardens, roadsides, waste places" on the coastal plain from Florida to Texas and north to North Carolina [U.S.A.] Bailey (1972) reports that "Like *Buddleia,* this species may die back to the ground in severe winters" but actually is hardy in Zone 7 in the United States.

Turrill (1962) says "a *V. negundo* L. foliolis lanceolatis vel anguste lanceolatis, corolla circiter 8 mm. longa, staminibus styloque exsertis, corollae lobis plusminusve aequilongis inter alia recedit". Jafri & Ghafoor, in a personal communication to me, add that "in *V. agnus-castus* the leaflets are 5--7 and the cymes sessile or subsessile, forming a subcylindrical narrow inflorescence, the flowers fragrant, while in *V. negundo* the leaflets are 3--5, the cymes are often somewhat lax and panicled, forming a pyramidal inflorescence, and the flowers are not fragrant."

Palmer & Pitman (1972) remind us that "agnus-castus" is derived from the Greek hagnos and the Latin castus, both signifying "chastity". They also note that "The generic name *Vitex* is said to be derived from the Latin vieo, meaning 'to plait', because of the flexibility of the shoots. Pliny used the name for a willow-like species which has ever since been known as the 'chaste tree', for the remarkable reason that it is believed to have the power of subduing the passions. 'For that the dames of Athens', Pliny assures us, 'during the feasts of the goddess Ceres....made their pallets and beds with the leaves thereof, to coole the heat of lust and to keep themselves chaste for the time'."

Little, Woodbury, & Wadsworth (1974) give a rather detailed distribution for *V. agnus-castus:* "Native of the Mediterranean region from southern Europe and Morocco to western Asia including Turkey, Iraq, and Pakistan, but widely planted for ornament and escaping from cultivation and naturalized in tropical and subtropical regions including West Indies. Also southeastern United States from Florida to Texas and California and north to New York and beyond, where the plants are killed to the ground in winter."

Emberger (1938) says "Le Gattilier est répandu dans tout le bassin méditerranéen jusqu'en Asie Centrale. Le centre de dispersion du genre est l'Asie Sud-orientale. Notre espèce est la seule Verbénacée ligneuse d'Europe et de l'Afrique septentrionale [this is untrue: other woody *Verbenaceae* in north Africa are found in the genera *Chascanum, Svensonia, Clerodendrum, Lantana, Premna,* and *Vitex*].....Il n'est pas douteux que cette espèce est chez nous un survivant tertiaire." He also says that "Ce petit arbre habite le bord des rivières et le lit des Oueds intermittents de la plaine et des basses montagnes de tout le Maroc jusque dans l'Anti-Atlas, mais dépasse rarement l'altitude de 1.000 mètres. Il forme, avec le Laurier-rose et les *Tamarix* le fond décoratif de notre végétation ripicole."

Van Melle (1943) reviews the characters of *V. agnus-castus* and *V. negundo* as cultivated shrubs, telling us that they are both "highly decorative, tender-wooded shrubs which, in mild climates, grow to a considerable height and width but are best treated in our zone by way of die-back shrubs; that is, pruned close to their base every spring and then permitted to put on their annual growth, to a height of 3 or 5 feet, on which they will bear their showy terminal panicles of small, fragrant flowers which, in the better forms, are a good lavender-blue.

"In *V. Agnus-castus* these are arranged the more showily in panicled spikes, appearing in July to September; in *V. Negundo* they come in loose panicles, in July and August.

"In both kinds the total effect of the foliage is grayish, the leaves having a gray-woolly hairiness on the lower surface....... They are effective, but rather exotic-looking and erect shrubs, not easily blended in the border and perhaps better used by way of garden accent plants or 'cut-back' garden hedge-rows. They flower at a time when there is not much else in bloom among the shrubs and, in the better, lavender-blue forms, contribute a worth-while decorative note to the small landscape.

"They thrive well in light, sandy soils, in full sun. Being coarse-rooted and difficult to dig with a ball of earth, they are best transplanted bare-rooted, in the spring.

"When they are treated as die-backs, the tenderness of the top-growth need not worry one. The roots are hardy enough; and should an occasional plant be lost in severe winters, these shrubs are worth planting again."

Spach (1840), speaking of it in France, says: "Cette espèce.... est commune dans l'Europe méridionale, aux borde des ruisseaux et dans l'autres localités humides; elle fleurit en juillet et en août. On la cultive comme arbrisseau d'ornament, mais, dans le nord de la France, elle ne résiste pas aux hivers rigoureux, à moins d'être plantée dans une situation abritée."

Among the many vernacular names reported for *V. agnus-castus* are the following: "Abraham-balme", "Abraham's balm", "Abrahamsbaum", "agneau chaste", "agno casto", "agno-casto", "agnos", "agnus", "agnus castro", "agnus castus", "agnusperma", "agonos", "aignel chaste", "alfadgi", "alfagi", "alfagradi", "aloc", "amerine", "angarf", "aoubré dé pèbré", "arbor Abrahae", "arbre au poivre", "arbre-au-poivre", "ariegna", "árvore de vastidade", "athlak", "bangaleh", "bantafelon", "bardé", "barmagh aghaji", "bish", "blue vitex", "bou mettin", "castóm", "chaste-lamb-tree", "chaste tree", "chaste-tree", "chastetree", "chast-lamp-tree", "chast tree", "chast-tree", "chencherenche", "common chaste-tree", "common chastetree", "daribrahim", "elaeagnon Theophrasti", "elcaseiro", "el-kharomâ", "erba dé la chînchas", "European chaste tree", "felfel", "felfélé barri", "folfol es-saqâleba", "gang", "gatillier", "gatillo casto", "gattilier", "gattilier commun", "gatt-saonzé", "gemeiner Müllen", "gonak", "gwanik", "hab-el-faked", "habbolfaghd", "hemp tree", "hemp-tree", "hemptree", "herbe sainte", "hhabb el faqed", "incienso japonēs", "indian-spice", "indianspice", "kafē Ebrahim", "kaff maryam", "kaf mariem", "kaf Miryam" [=the hand of Mary], "kef-mariem", "Keuschbaum", "Keusch-Lamm", "Keuschlamm", "Keuschlammstrauch", "Keuschstrauch", "kherouâc", "lăcanu", "lăgomu", "lecristicum", "le gattilier", "lignu castu", "ligos", "ligus", "ligusperma", "lygea", "mala di suerta", "malagueta", "marmandai", "marwand", "marwandi", "Mexican lavender", "Mönchspfeffer", "Mönchspfefferbaum", "monk's pepper", "monks' pepper", "monks pepper tree", "monks peppertree", "monk's pepper tree", "monk's pepper-tree", "monk's-pepper tree", "Müllen", "non's peppertree", "palo santo", "pandj-angosht", "panjangusht", "parkleuys", "pèbrē", "pébriè", "pébrié fé", "pébriè saoubadjé", "petit poivre", "phontâfelyoune", "pichot pèbrē", "pichoun pèbrē", "pimenteira silvestre", "piper agreste", "piperella", "piper monachorum", "poivier", "poivre des moins", "poivre sauvage", "rēnuka", "sage tree", " sage-tree", "sagetree", "salix alexandrina", "salix amerina", "salix graeca", "salix grossa", "salix marina", "salix maritima", "sambhālu-ke-bij", "sanguis ibis", "saulle de mer", "saulx de Gaule", "saulx gauloise", "sauz gatillo", "sauzgatillo", "Schaafmüllen", "Schafmülle", "shadjaratē Ebrahim", "shajerat Ebrahim", "the chaste tree", "totsane", "tree of chastity", "true chastetree", "vitex", "vitex agnus castus", "vitex arborea", "vitgē", "vitice", "wild-lavender", "wild pepper", "ycearea", "yerba Louisa", "zalitzunkia", "zoukhamçate-acabéē", "zuccatorium", "zuccozaria", "zucoraria", and "zu-khamsata aurak" [=the five-halved].

Many authors have listed medicinal and economic uses -- or purported ones -- for *Vitex agnus-castus*. Hartwell (1971) says that a broth made from the herbage is used to treat "superfluities of uterus" and hardness of the liver or spleen, an elixir is used for tumors, a decoction and sitzbath for hardness of the uterus and induration of the spleen, an oil and ointment for various "hardnesses or stiffnesses", and fomentations and cataplasms for induration of the spleen, corns, and chronic indurated tumors. Parks (1937) tells us that "The leaves and blossoms are used by Latin people as a preventive against moths". Innamorati (1973) says that it is used "per le malattie delle vie urinarie e dei rene". According to Grieve (1967) "The fresh ripe berries [drupes] are pounded to a pulp and dused in the form of a tincture for the relief of paralysis, pains in the limbs, weakness, etc.", while Polunin & Huxley (1966) report its use as an anti-aphrodisiac, but carefully point out that "fresh seeds have an aromatic pungency that some consider aphrodisiac". They also report the plant's use in the treatment of eye diseases and stomach-ache and as a source of yellow dye. Uphof (1968) asserts that the "herb has been used for centuries as an antiaphrodisiac" and as the source of a volatile oil; the young twigs are used in basketry; the fruits are employed as a substitute for pepper and are also supposed to be antiaphrodisiac; "the plant was regarded since antiquity as a symbol of chastity".

Polunin (1969) asserts that *V. agnus-castus* is a plant of "Damp places on the littoral, by streams" in Mediterranean Europe, flowering there from June to September -- "A shrub well known since classical times and associated with chastity; it is used medicinally and is a source of a yellow dye. The fruits are used for seasoning and the twigs for basket-making". De Capite (1969) describes the leaf, stem, and root anatomy in detail and reports that an alcohol extract from the leaves is active, the ether extract even more active, and the aqueous extract inactive against *Micrococcus pyogenes albus,* but no activity is seen against *Escherichia coli.*

Lewis & Elvin-Lewis (1977), along with Arevalo (1966), repeat the statement that the seeds have supposed antiaphrodisiac properties in "decreasing libido", while Al-Rawi (1964) reports the bitter-tasting seeds are boiled in ghee and given to horses in the treatment of colic, while the entire plant is used in the treatment of eye and stomach disorders and "pains due to chills; one who has caught a cold takes a bath in water boiled with the leaves". Lust (1974) avers that the plant "exhibits hormone-like properties". Burkill (1966) states that *V. agnus-castus* is "a plant used by the Romans and Greeks, both internally and for poulticing", its oil containing "cineol and other substances". According to Tornabene (1891), speaking of this species: "De virtute antivenerea hujus speciei, quam veteres et praesertim Graeci extollebant, supervacaneum est loqui, cum inter res commentitias nunc habeatur. Medici laudarunt ut remedium ad hysteriam et gonorrhaeam; sed hoc quoque exoletum." Hartwell (1971) reports a poultice made from the leaves useful in treating inflammatory tumors, while the poultice made from the seeds is used to treat hard tumors, hardness of the liver and spleen, scirrhus of the liver, and induration of the liver.

Trease & Evans (1972) also mention the antiaphrodisiac properties of the fruits, "formerly official in Spanish pharmacopeia.... In 1657 the apothecary Richard Tomlinson wrote 'it cohibits the motion of the sperm, and allayes venereous fancies in the night as well as Rue seed, for which cause the Athenian matrons in their Feasts to Ceres, the better to custodite their chastity strewer their beds with its leafs'. The constituents resemble those of the European vervain." The long-used drug made from this plant is known as "agnus castus" or "semen agni casti". Dymock & al. (1893) report that "The berries [really drupes!] are imported into India and are considered to be astringent, resolvent, and deobstruent, and useful for removing obstructions of the brain and liver; they are also given for enlargement of the spleen and dropsy...The seed.. has been found to contain a peculiar bitter principle called Castine, a volatile acrid substance, a large quantity of free acid and fat oil. In Greece the fresh and rather unripe berries are said to be added to the must of the grape to render the wine more intoxicating, and prevent it from turning sour."

Lonicer's herbal (1679) summarizes the uses of *Vitex agnus-castus* in his day as follows: "Die Natur der Schaaffmülle ist zu erwärmen und zusammen zu ziehen....Der Same genützt / benimmt die

Wassersucht ; legt die Unkeuschheit. Ist gut wider gifftige Stich und Bisz der Thier. Wer dieser Blätter undersich in sein Bettstatt legt / dem vertreibt es alle Fleischliche Anfechtung. Ist vielleicht desz Strohes / darauf die Barfüsser Münch ligen. Diser Beerlin eins Quintlins schwer mit Wein getruncken / zuvor gestossen / treibet den Weibern ihre Krankheit / zertheilt die Winde im Leib / und löschet die Begierde der Ehelichen Wercke ausz. Für gifftiger Thier Bisz soll man diese Frucht gebrauchen/ Deszgleichen die Weiber / so übel säugen / dann es mehret ihnen die Milch/ Es bekompt auch wol denen Miltz- und Lebersüchtigen / so sich vor der Wassersucht besorgen. Zu viel gebraucht / schwächet es das Haupf und macht schlaffen. Das Laub zertnirscht / den Safft heraus getruckt / damit gesalbet / heilst die Spinnenstich. Das Laub in Wein gesotten / mit Honig vermischt / und den Mund damit gewaschen / heilet Mund- und Zahngeschwär. Mit Wasser gesotten / und damit gewaschen / heilet es alle Risz und Schrunden am Hindern / sonderlich den Weibern / so etwas an heimlichen Orten entzündet werden / denen soll man ein Fomentum oder Bähung ausz dem Laub machen / und sie darüber setzen. Es schreibt Dioscorides / dasz / wer dieses Baums Zweige in der Hand habe / der sei sicher vor den Wölffen." Emberger (1938) notes only the one supposed use: "Les fruits remplacent le Poivre et ont la réputation d'être antiaphrodisiaques. Pour cette raison le Gattilier était pour les Anciens le symbole de la pureté". Spach (1840) says: "Les feuilles ont une odeur désagréable. La fruit, auquel les anciens attribuaient, sans trop de raisons, des vertus anti-aphrodisiaques, a une saveur âcre et aromatique, analogue à celle du poivre: ce fruit s'emploie en guise d'épices, dans des contrées où le Gattilier abonde."

Burlage (1968) asserts, erroneously, that *V. agnus-castus* is a "Native of China and India". He asserts also that the seeds are "reported to be sedative and a perfume is made from the flowers". Perrot & Paris (1971) repeat that "La plante est très anciennement réputée comme anaphrodisiaque, d'où son nom. l'infusé est sédatif et antispasmodique....La plante renferme une huile essentielle, un glucoside chromogénique, l'agnoside, et des pigments flavoniques". Lázaro (1921) repeats that "Los frutos se usaron como antiafrodísiacos". Bouchhez (1843) says that the plant "s'en servent pour lier les mains de leurs morts". Parsa (1949) reports that "le bain de feuilles bouillies dans l'eau est employé pour guérir les enfants qui ont attrapé froid"; also "employé contre les maladies du l'oeil et les coliques" and "les graines sont données aux chevaux contre la colique une noire. Un tissu bouillie avec ses feuilles prend une teinte noire."

Bush-Brown (1963) points out that *V. agnus-castus* tolerates sandy soil, dry places, and city conditions. The Nehrlings (1968) affirm that it is fairly drought-resistant, more rugged than appearances would indicate, surviving heat and poor or dry soils in the bright sun, and is actually better performing under such conditions than most cultivated shrubs. The stems winterkill, but the roots send up new shoots that flower in the same year -- it is best to cut the plant back to stubs each year.

Gomma & al. (1978) found in the leaves and fruits five flavonoids (casticin, isovitexin, isovitexin xyloside, orientin, and isoorientin) and two iridoids (aucubin and agnoside). In preliminary tests these compounds showed a marked inhibitory activity against 3 bacterial pathogens. Fernandez (1947) found rubber in the roots. Schimmel (1908) found cineol, sabinene, and a quinone in the volatile oil from the leaves and this volatile oil was also analyzed by Hänsel (1910). Gibbs (1974) reports leucocyanin absent from the leaves, the HCl/methanol test negative, and negative results with the juglone test in the leaves, bark, and wood, but "a blue fluorescence" results. Kariyone (1965) found that the so-called "vitexin" from the seeds of *Vitex agnus-castus* differs from the "vitexin" obtained from *V. lucens* and so he proposes the former henceforth be known as "casticin", it being 5,3'dihydroxyl-3,6,7,4' tetramethoxylflavone. He also isolated agnuside from the leaves (1964) which he says is "probably the p-hydroxbenzoic ester of aucubin" (1962). Katyuzhanskaya (1977) describes the composition of the organic acids isolated from CO_2-extracts of *V. agnus-castus* fruit. Belic & al. (1961) also isolated casticin from Yugoslavian material of this species. Cole & al. (1968) sprayed plants of this species with Dow latex 12-R. a styrene-butadiene latex, in two concentrations, the control plants sprayed with water. After one year the plants sprayed with the chemical in lower concentration had made significantly more growth than the controls; those sprayed with the higher concentration did not significantly increase growth, possibly owing to a slight phytotoxicity.

Alexopoulos (1940) records the fungus, *Phoma viticis* Celotti, on the leaves of *V. agnus-castus,* Voronov (1922) records *Leptosphaeria casta* Voronov from the dry twigs, and Thornberry (1966) lists *Cercospora viticis* Ell. & Ev. (a leaf-spot) and *Phymatotrichum omnivorum* (Shear) Dug. (a root-rot) from Louisiana, Texas, and Oklahoma. Kobayashi (1970) found that *Valsa ceratosperma* (Tode) Maire makes black pustules on the bark of cankered or dead stems and branches of this host in Japan. Mound & Halsey (1978) assert that it is host to the whitefly, *Bemisia tabaci* (Gennadius) Takahashi in Egypt; this based on a report by Azab & al. (1970).

Guinet & Sauvage (1954) cite *Becibissa 409* and *Lejouad 497* from Morocco; Maheshwari (1963) cites his no. *220* from Delhi, India; Patzak & Rechinger (1967) cite *Sintenis 645* from Iran; and Jafri & Ghafoor, in a personal communication to me, cite *Abedin 7403* from cultivation in Pakistan.

It is perhaps worth noting that the Blackwell polynomial cited by Gmelin (1796) seems definitely to belong to the synonymy of *V. agnus-castus* var. *diversifolia* (Carr.) Schelle, but the illustration given by Blackwell (1751) shows leaflets that are plainly and completely entire and therefore illustrate the typical form of *V. agnus-castus* L.

Material of *V. agnus-castus* has been misidentified and distributed in some herbaria as *V. macrophylla* Hort., *V. negundo* L., *V. pseudonegundo* Hand.-Mazz., and *V. rehmannii* Gürke. On the other hand, the *Fogg s.n.* [July 18, 1969], distributed as typical *V. agnus-castus*, actually represents f. *latifolia* (Mill.) Rehd., *Griffith 6059* and *Zohary, Amdursky, & Grizi s.n.* [14.11.1951] are var. *pseudo-negundo* Hausskn., *Pratt s.n.* [October 7, 1964] is *V. negundo* L., *N. Chevalier 12* is *V. negundo* var. *intermedia* (P'ei) Mold., and *Stefani s.n.* [10 mai 1903] is not verbenaceous. *Jerabek s.n.* [June 1945], cited below, is a mixture with *Petrea volubilis* f. *pubescens* (Mold.) Mold. and *Herb. Missouri Bot. Gard. 116201* is a mixture with something non-verbenaceous (probably *Aleurites moluccanum*). The illustration in Viertel (1970) is labeled as depicting *V. agnus-castus*, but shows all the leaflets plainly sessile.

Additional citations: NORTH CAROLINA: Rockingham Co.: *Leonard & Russ 2562* (Au--284927, Bl--251048,, Ld, N, Tu--179458, Ws). ARKANSAS: Nevada Co.: *D. M. Moore 420469* (Ws). LOUISIANA: East Baton Rouge Par.: *Taylor s.n.* [May 18, 1899] (Lv). Tangipahoa Par.: *H. R. Wilson 232* (Lv). OKLAHOMA: Payne Co.: *Harn 56* (Au--122932). TEXAS: Bastrop Co.: *Duval 134* (Au--291212). Brown Co.: *McKnight 16* (Au--244321, Ld). Tarrant Co.: *A. Ruth 993* (Ws). Travis Co.: *Correll & Correll 34288* (Ld); *Harpin, Waldorf. & Barkley 13081* (Bl--53477). OREGON: Benton Co.: *W. M. Smith s.n.* [VIII/9/1959] (Se--197037). MEXICO: Nuevo León: *Etchison 55* (Au--297432). FRANCE: *Boulos s.n.* [17.5.1961] (Gz); *Lamaroux s.n.* [Provence] (T). SPAIN: *Sennen 36008* (Ws). AUSTRIA: *Noë s.n.* (Pd). GREECE: *Kuntze s.n.* [Cyclopi, 16/6/67] (W--2506585); *Nitzelius s.n.* [Litochoron, 8/10/1963] (Go); *Saint-Lager 3* (Ba); *Zuccarini s.n.* (T). AEGEAN ISLANDS: Chios: *Lüdtke 595* (Mu), *596* (Mu). Kos: *Sauer & Sauer 13894* (Mu). ITALY: *Robertson s.n.* [Scala di Salonse, 1829] (T); *Tenore s.n.* [1840] (Mu--614). CYPRUS: *Casey 1632* (Ba). CORSICA: *Aellen 1856* (Ws). YUGOSLAVIA: Dalmatia: *Servola s.n.* (Mu--615). Fiume: *Noë 329* [Reichenb. Fl. Germ. 2289] (N). Illyria: *Tommasini s.n.* [Monpalcone] (Ba). Istria: *Untchj s.n.* [Pola, 8-9-88] (Mi), *s.n.* [2.8.1899] (Gz). RUSSIA: Transcaspia: *Michelson 87* (Mu). MOROCCO: *D. Fairchild 74* (W--1349467), *82* (W--1349471); *Garnett 38/7* (Mu). EGYPT: *G. Maire 141* (Gz); *Romee s.n.* [18.3.1968] (Gz). SOUTH AFRICA: Cape Province: *Bayliss BS.5095* (W--2670629), *BS.7270* (Mu). TURKEY: *Manissadjian 290* (Mu), *326* (Mu); *Stutz 453* (N). AFGHANISTAN: *W. Griffith 6059* (Mu--1342). INDIA: State undetermined: *Herb. Schreber s.n.* [India orientalis] (Mu--603). CULTIVATED: Alabama: *Justice 525* (Ba). Arizona: *Simonian 361* (Tu--172595); *Thornber s.n.* [June 13, 1903] (Au). California: *Jerabek s.n.* [November 1944] (Sd--34534), *s.n.*[June 1945] (Sd--36463); *McClintock s.n.* [July 14, 1943] (Ba); *Moran 2458* (Ba); *Witham 304* (Sd--71836). Egypt: *Boulos & Tanadros s.n.* [Dokki] (Gz); *Hassib s.n.* [22/12/1927] (Gz); *Mahdi 34* (Gz), *146* (Gz), *s.n.* [4.8.63] (Gz, Gz), *s.n.* [18.8.63] (Gz, Gz), *s.n.* [10/11/63] (Gz, Gz), *s.n.* [9/6/65] (Gz, Gz, Gz), *s.n.*[23.5.65] (Gz, Gz, Gz), *s.n.* [18/8/68] (Gz, Gz, Gz), *s.n.* [3/6/70] (Gz, Gz, Gz), *s.n.* [10/12/72] (Gz, Gz, Gz); *Runkewitz s.n.* [18/11/1933] (Gz); *Sisi s.n.* [22/5/1973] (Gz, Gz); *V.*

Täckholm s.n. [28/10/1959] (Gz, Gz); *Täckholm & Elsayed 269* (Gz), *337* (Gz), *s.n.* [8/1/1961] (Gz, Gz), *s.n.* [28/11/1961] (Gz), *s.n.* [17/5/1962] (Gz, Gz, Gz), *s.n.* [24/5/1962] (Gz, Gz). Florida: *Gillis 8449* (Ac, Ba, Ft, Ft); *Meebold 27509*(Mu); *P. O. Schallert 365* (Bl--208625). Germany: *Herb. Schreber s.n.* (Mu--674). Kentucky: *Denniston s.n.* [June 24, 1929] (Ws). Louisiana: *Boyd s.n.* [June 3rd 1898] (Lv); *Joor s.n.* [Baton Rouge] (W--2607108); *Pecoy s.n.* [May 19, 1899] (Lv); *Pratt s.n.* [May 20, 1899] (Lv). Mexico: *Imboden 74* (Au--297434). New Zealand: *Sykes 16/68* [Herb. Bot. Div. DSIR 173231] (Ld), *630/65* [Herb. Bot. Div. DSIR 157634] (Ac). North Carolina: *Biltmore Herb. 1786* [Sept. 27, 1897] (Ws); *LeClair s.n.* [June 26, 1937] (N); *D. Pratt s.n.*[10/17/64] (Lv); *P. O. Schallert s.n.* [7/10/31] (Ws). Pakistan: *Abedin 7403* (Kh, Ld). Poland: *Baenitz s.n.* [Silesia, 15.9.1910] (Gz, Gz). South Africa: *Bayliss BS.4542* (Ba, N, W--2616806), *BS.6236* (Mu, N, W--2744925). South Carolina: *Rodgers & Mullens 67086* (Bl--215442, N, Se--234702). Texas: *Hansen, Hansen, & Nee 1811* (Ws); *Purvis 8* (Au--248392); *R. Runyon 4258* (Au--269633, Au--269643, Au--269673), *5445* (Au--270204), *124761* (Au--269536); *Saichuk 73* (Lv); *Shinners 8582* (Ba). Virginia: *Allard 11391* (Se--134451). LOCALITY OF COLLECTION UNDETERMINED: *Happe s.n.* [in Europa australi] (Mu--607); *Herb. Missouri Bot. Gard. 116201* (E).

VITEX AGNUS-CASTUS f. *ALBA* (West.) Rehd.

Additional & emended synonymy: *Agnus castus, flore albo* Cup., Hort. Cath. 4. 1696. *Vitex agnus castus albidus* Desf., Tabl. École Bot., ed. 1, 53. 1804. *Vitex agnus-castus albidus* Desf., Tabl. École Bot., ed. 2, 64. 1815. *Vitex agnus-castus* b. *flore albo* Gussone, Fl. Sic. Prodr. 2: 147, in syn. 1828. *Vitex agnus-castus* var. *alba* Rehd. ex C. K. Schneid., Illustr. Handb. Laubholzk. 2: 594. 1911. *Vitex agnus-castus* cv. *"Alba"* Enari, Ornament. Shrubs Calif. 170. 1962. *Vitex albiflora* Hort. ex Turrill, Curtis Bot. Mag. 174: pl. 400, in syn. 1962.

Additional bibliography: Cast., Hort. Mess. 24. 1640; Cup., Hort. Cath. 4. 1696; Cup., Hort. Cath. Suppl. Alt. 6. 1697; Desf., Tabl. École Bot., ed. 1, 53 (1804) and ed. 2, 64. 1815; Gussone, Fl. Sic. Prodr. 2: 147--148. 1828; Voss in Vilm., Blumengärt. 1: 829. 1895; Baerecke, Anal. Key Ferns Flow. Pl. Atl. Sect. Middl. Fla. 115. 1906; C. K. Schneid., Illustr. Handb. Laubholzk. 2: 594. 1911; Sommier & Caruana Gatto, Fl. Melit. Nov. 234. 1915; Makins, Ident. Trees Shrubs 259. 1936; W. Trelease, Pl. Mat. Decorat. Gard. Woody Pl., ed. 5, imp. 1, 146. 1940; E. L. D. Seymour, New Gard. Encycl., ed. 3, 1292 (1944), ed. 4, 1292 (1946), and ed. 5, 1292. 1951; Blackburn, Trees Shrubs East. N. Am. 302. 1952; Bean in Chittenden, Dict. Gard. 2249. 1956; Wyman, Shrubs Vines Am. Gard. 351 & 352. 1956; Hatton, Hand. Pl. Flor. Orn. 368, fig. 727. 1960; Enari, Ornament. Shrubs Calif. 170. 1962; Turrill, Curtis Bot. Mag. 174: pl. 400. 1962; E. L. D. Seymour, New Gard. Encycl., ed. 6, 1292 (1963) and ed. 7, 1292. 1964; Everett, Reader's Digest Compl. Book Gard. 447. 1966; Mold., Phytologia 16: 494. 1968; A. & I. Nehrling, Easy Gard. Drought-Resist. Pl., imp. 1, 226. 1968; W.

Trelease, Pl. Mat. Decorat. Gard. Woody Pl., ed. 5, imp. 2, 146. 1968; Mold. in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1340 & 1878. 1970; E. L. D. Seymour, New Gard. Encycl., ed. 8, 1292. 1970; Mold., Fifth Summ. 1: 31, 61, 205--207, 266, 373, 385, & 386 (1971) and 2: 710--713, 717, & 922. 1971; Priszter, Delect. Sem. Spor. Pl. Hort. Bot. Univ. Hung. 59. 1971; Wyman, Gard. Encycl., imp. 1, 1171 (1971) and imp. 2, 1171. 1972; Fletcher in Hillier, Man. Trees Shrubs, ed. 2 & imp. ed 2, 416. 1972; Mold., Phytologia 23: 419 & 427 (1972) and 25: 244. 1973; Williamson, Sunset Gard. Book, ed. 3, imp. 11, 440. 1973; A. & I. Nehrling, Easy Gard. Drought-Resist. Pl., imp. 2, 226. 1975; L. H. & E. Z. Bailey, Hortus Third 1162. 1976; D. E. Clark, Sunset New West. Gard. Book, ed. 4, imp. 2, 498. 1979; Jones & Luchsinger, Pl. Systemat. 302. 1979.

Gussone (1828) reports this color form of the species from Sicily. Desfontaines (1804) calls it the "vitex agnus castus à fleurs blanches" and "vitex agnus-castus blanc" (1815). Priszter (1971) lists it as cultivated in Hungary, offering seeds in exchange as his seed no. 1673. Cornman's collection, cited below, cultivated in Massachusetts, was gown from seed secured in New Jersey. The form has been collected in anthesis in September.

Additional citations: CULTIVATED: Massachusetts: *Cornman A.A. 976-34-B* (Ba). New Jersey: *A. L. Moldenke s.n.* [Plainfield, Sept. 7, 1968] (Ps--367), *s.n.* [Plainfield, Sept. 1, 1972] (Ps--1438).

VITEX AGNUS-CASTUS f. *CAERULEA* (Rehd.) Mold., Phytologia 44:135. 1979.

Additional synonymy: *Vitex agnus-castus* var. *caerulea* Rehd. ex C. K. Schneid., Illustr. Handb. Laubholzk. 2: 594. 1911. *Vitex agnus-castus caerulea* Trelease, Pl. Mat. Decorat. Gard. Woody Pl., ed. 5, imp. 1, 146. 1940. *Vitex agnus-castus caerulea* [Rehd.] ex Correll & Johnston, Man. Vasc. Pl. Tex. 1878. 1970. *Vitex agnus-castus caerulea* Rehd. ex Mold., Fifth Summ. 2: 712, in syn. 1971.

Additional bibliography: Voss in Vilm., Blumengärt. 1: 829. 1895; Battan. & Trabut., Fl. An al. Synop. Alg. 271. 1902; Baerecke, Anal. Key Ferns Flow. Pl. Atl. Sect. Middl. Fla. 115. 1906; W. Trelease, Pl. Mat. Decorat. Gard. Woody Pl., ed. 5, imp. 1, 146. 1940; Hatton, Handb. Pl. Flor. Orn. 368, fig. 727. 1960; Burlage, Ind. Pl. Tex. 184. 1968; Mold., Phytologia 16: 492 & 494. 1968; W. Trelease, Pl. Mat. Decorat. Gard. Woody Pl., ed. 5, imp. 2, 146. 1968; G. W. Thomas, Tex. Pl. Ecolog. Summ. 78. 1969; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1878. 1970; Mold. in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1340. 1970; Mold., Fifth Summ. 1: 50, 61, 190, 206, 207, & 373 (1971) and 2: 709--712, 717, & 922. 1971; Mold., Phytologia 34: 250 (1976) and 44: 134. 1979.

The corollas are uniformly described as "blue" in this form, as opposed to the "purple", "purplish", or "lavender" of the typical form. It has been collected in flower and fruit in July. The flowers are described as being "pleasantly scented".

Additional citations: LOUISIANA: Catahoula Par.: *C. Allen 2167* (Lv). CULTIVATED: Louisiana: *DeWolf 915* (Ba). North Carolina: *P. O. Schallert 351* (Se--112297, Se--113560), *s.n.* [7/25/40] (Ws).

VITEX AGNUS-CASTUS var. *DIVERSIFOLIA* (Carr.) Schelle

Additional synonymy: *Vitex foliis digitatis serratis spicis verticillatis* Blackwell apud Gmel. in L., Syst. Nat., ed. 13, 2: 963. 1796. *Vitex agnus castus* var. *diversifolia* Schelle ex C. K. Schneid., Illustr. Handb. Laubholzk. 2: 594. 1911. *Vitex foliis digitatis serratis spicis verticillatis* L. apud Zangheri, Fl. Veg. Pinet. Raven. 189, in syn. 1936. *Vitex lat. serrat. folio* Gerarde, Herbal, ed. 3, [45]. 1975.

Additional bibliography: Blackwell, Cur. Herb. 1: pl. 139. 1751; Gmel. in L., Syst. Nat., ed. 13, 2: 963. 1796; C. K. Schneid., Illustr. Handb. Laubholzk. 2: 594. 1911; Zangheri, Fl. Veg. Pinet. Raven. 189. 1936; Mold., Phytologia 16: 494. 1968; Mold., Fifth Summ. 1: 373, 385, & 386 (1971) and 2: 710, 712, 720, & 922. 1971; Mold., Phytologia 28: 452. 1974; Gerarde, Herbal, ed. 3, [45] & 1387. 1975; Mold., Phytologia 34: 270. 1976.

Illustrations: Gerarde, Herbal, ed. 3, 1387. 1975.

Linnaeus (1796) plainly accredits the polynomial cited above to "Blackwell herb. t. 139". The reference is sometimes mis-cited as occurring on "p. 1122". The Blackwell illustration (1751), however, is of the typical form of the species, the leaflets being plainly and completely entire-margined.

The Woodbury collection, cited below, was probably taken from cultivated material, although the label accompanying it does not so indicate.

Additional citations: CULTIVATED: Egypt: *Hassib s.n.* [22/12/1927] (Gz, Gz). Florida: *Woodbury s.n.* [Coconut Grove, July 20, 1948] (Ws). Missouri: *Piehl s.n.* [19 Oct. 1968] (Ws).

VITEX AGNUS-CASTUS f. *LACINIOSA* (Ces.) Mold., stat. nov.

Synonymy: *Vitex agnus castus* β *laciniosa* Ces. in Ces., Passer., & Gib., Comp. Fl. Ital. 327. 1874. *Vitex laciniosa* Arcang., Compl. Fl. Ital., ed. 1, 886. 1882 [not *V. laciniosa* Turcz., 1863]. *Vitex agnus-castus* var. *laciniosa* Ces. ex Mold., Phytologia 23: 419. 1972.

Bibliography: Ces., Passer., & Gib., Comp. Fl. Ital. 327. 1874; Arcang., Compl. Fl. Ital., ed. 1, 561 & 886 (1882) and ed. 2, 444 & 833. 1894; Mold., Phytologia 23: 419, 437, & 438. 1972.

The original description of this variety is merely "Foglioline laciniata. Qua e là colla specie". I have not seen any original material, so it is entirely possible that his taxon may be identical with var. *diversifolia* (Carr.) Schelle.

VITEX AGNUS-CASTUS f. *LATIFOLIA* (Mill.) Rehd.

Additional synonymy: *Vitex agnus-castus* β *latifolia* Sweet, Hort. Brit., ed. 1, 323. 1826. *Vitex agnus castus* 2. *latifolia* G. Don in Loud., Hort. Brit., ed. 1, 246. 1830. *Vitex agnus-castus* f. *macrophylla* Hatton, Craftsm. Pl.-book 368, fig. 728. 1909. *Vitex agnus-castus* var. *latifolia* (Mill.) Loud. ex Turrill, Curtis Bot.

Mag. 174: pl. 400. 1962. *Vitex agnus-castus latifolia* (Mill.) Loud. ex Enari, Ornament. Shrubs Calif. 170, in syn. 1962. *Vitex agnus-castus* cv. *"Latifolia"* Enari, Ornament. Shrubs Calif. 170. 1962. *Vitex agnus castus latifolia* Nehrling, Easy Gard. Drought-Resist. Pl. 225, in syn. 1968. *Vitex agnus-castus "Latifolia"* McGourty, Plants Gard. 26 (2): 53. 1970. *Vitex albida* Lam., in herb.

Additional bibliography: Pers., Sp. Pl. 3: 361. 1819; Sweet, Hort. Brit., ed. 1, 1: 323. 1826; G. Don in Loud., Hort. Brit., ed. 1, 246. 1830; Sweet, Hort. Brit., ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 551. 1832; Loud., Arb. Fruct. Brit. 3: 1286. 1838; Sweet, Hort. Brit., ed. 3, 551. 1839; Buek, Gen. Spec. Syn. Candoll. 3: 502. 1858; Tornabene, Fl. Aetnea 3: 175 (1891) and 4: 486. 1892; Hatton, Craftsm. Pl.-book 368, fig. 728. 1909; C. K. Schneid., Illustr. Handb. Laubholzk. 2: 594. 1911; E. L. D. Seymour, New Gard. Encycl., ed. 3, 1292 (1944), ed. 4 ,1292 (1946), and ed. 5, 1292. 1951; Blackburn, Trees Shrubs East. N. Am. 302 & 356. 1952; Hatton, Handb. Pl. Flor. Orn. 368, fig. 728. 1960; Enari, Ornament. Shrubs Calif. 170. 1962; Turrill, Curtis Bot. Mag. 174: pl. 400. 1962; E. L. D. Seymour, New Gard. Encycl., ed. 6, 1292 (1963) and ed. 7, 1292. 1964; Wayside Gardens, For Autumn Plant. 115 & 117. 1964; Everett, Reader's Digest Compl. Book Gard. 447. 1966; E. Lawrence, South. Gard., ed. 2, 219. 1967; Mold., Phytologia 16: 494. 1968; Mold., Résumé Suppl. 17: 8. 1968; A. & I. Nehrling, Easy Gard. Drought-Resist. Pl., imp. 1, 226. 1968; Spring Hill Nurseries (Tipp City, Ohio), Fall Sale Cat. 23. 1968; McGourty, 1200 Trees [Plants Gard. 26 (2):] 53. 1970; E. L. D. Seymour, New Gard. Encycl., ed. 8, 1292. 1970; Mold., Fifth Summ. 1: 25, 27, 50, 205--208, 266, 267, 373, 376, 385, & 386 (1971) and 2: 710--713, 720, 721, 723, 724, 731, 784, & 922. 1971; Anon., U. S. Dept. Agr. Home Gard. Bull. 181: 3 & 20. 1972; Fletcher in Hillier, Man. Trees Shrubs, ed. 2, 416 (1972) and imp. ed., 416. 1972; Mold., Phytologia 23: 437. 1972; Skinner, Ornament. Pl. Coastal Northw. 76. 1972; Williamson, Sunset Gard. Book, ed. 3, imp. 11, 440. 1973; Whitney in Foley, Herbs Use Delight [204]. 1974; Mold., Phytologia 31: 392. 1975; A. & I. Nehrling, Easy Gard. Drought-Resist. Pl., imp. 2, 226. 1975; Wyman, Gard. Journ. 25: [45] & 46. 1975; L. H. & E. Z. Bailey, Hortus Third 1162. 1976; Mold., Phytologia 34: 270. 1976; D. E. Clark, Sunset New West. Gard. Book, ed. 4, imp. 2, 498. 1979.

Additional illustrations: Hatton, Craftsm. Pl.-book 368, fig. 728. 1909; Hatton, Pl. Flor. Ornam. 368, fig. 728. 1960; Spring Hill Nurseries (Tipp City, Ohio), Fall Sale Cat. 23 [in color]. 1968; McGourty, 1200 Trees [Plants Gard. 26 (2):] 53. 1970; Wyman, Gard. Journ. 25: [45]. 1975.

Recent collectors describe this plant as a tomentose shrub, to 6 feet tall, with a strong aromatic odor ,and numerous annual stems from a perennial base, flowering in June and August, fruiting in October. The corollas are said to have been "light-lavender" on *DeWolf & Gruns 2152* and "lilac" on *Fogg s.n.,* while Pancho says "corolla-lobes RHS [Royal Horticultural Society, London] Wisteria

Blue 640". Lawrence (1967) reports that in the southern United States this form of the species starts blooming between June 6 and 21 and ends its period of anthesis in July. Common names recorded for it are "broadleaf chaste-tree" and "broad-leaved chaste-tree". The Spring Hill Nursery (1968) describes it as a "Distinctive hardy 4 ft. shrub with star-like foliage and magnificent large, deep, lavender spire-like blooms in July and August. Delightful change of pace for the foundation". They offer it at \$2.50 for a 2-foot plant or \$1.65 for a 1--1 1/2-foot plant. The Nehrlings (1975) assert that it is somewhat hardier than the typical form and is propagated chiefly by cuttings. They claim that *V. agnus-castus* var. *macrophylla* has still larger leaves and still deeper-colored corollas, but, lacking more definite evidence, I am regarding the latter as identical to the wild broad-leafleted form. Hatton (1960) claims that the form with broad leaflets, like the typical narrow-leafleted form, has had its seeds considered anti-aphrodisiac since ancient times. This is probably true, since, contrary to claims in horticultural literature that it is a cultivar ("cv."), it is wild and surely native throughout Mediterranean Europe and is even known in fossil form there.

Vitex albida appears to be based on an unnumbered Schultes collection from cultivated material in Germany and deposited in the Munich herbarium. The specific epithet chosen implies that the corollas were whitish, but there is no evidence of this on the preserved specimen or its label.

Material of f. *latifolia* has often been misidentified and distributed as typical *V. agnus-castus* L. On the other hand, the *Jerabek s.n.* [November 1944], distributed as this form, actually does represent, instead, typical *V. agnus-castus* L.

Additional citations: CULTIVATED: Germany: *Schultes s.n.* (Mu--1343). Massachusetts: *DeWolf & Bruns 2152* [Arnold Arb. 453-51-A] (Ba). Missouri: *Piehl s.n.* [19 Oct. 1968] (Ws). New Jersey: *Moldenke & Moldenke 29213* (Ld). New York: *E. C. Baldwin s.n.* [Aug. 15, 1944] (Ba). New Zealand: *Syles 16/66* [Herb. Bot. Div. DSIR 173231] (Ld). Oklahoma: *L. C. Anderson 2390* (Ws). Pennsylvania: *Fogg s.n.* [July 18, 1969] (Ba); *J. V. Pancho 200* (Ba). South Carolina: *Rodgers & Mullens 67086* (Au--259510, Ld, Ws). MOUNTED ILLUSTRATIONS: Kelly Ornamentals fig. 45 [in color] (Z); Wayside Gardens fig. 184 [in color] (Z); Wayside Gardens, For Autumn Planting 117 [in color] (Z).

VITEX AGNUS-CASTUS var. *PSEUDO-NEGUNDO* Hausskn.

Additional synonymy: *Vitex agnus castus* var. *pseudo-negundo* Hausskn. in Bornm., Beih. Bot. Centralbl. 22 (2) [Pl. Strauss. 3]: 117. 1907. *Vitex agnus-castus* ssp. *haussknechtii* var. *pseudo-negundo* (Hausskn.) Bornm. ex Parsa, Fl. Iran 4 (1): 540. 1949. *Vitex pseudonegundo* Hand.-Mazz. ex Parsa, Fl. Iran 4 (1): 540, in syn. 1949. *Vitex agnus* var. *pseud.* Hausskn. ex Parsa, Fl. Iran 4 (1): 540, in syn. 1949. *Vitex hybrida* Mold., Résumé 384, in syn. 1959. *Vitex? hybrida* Mold. apud R. R. Stewart, Annot. Cat. in Nasir & Ali, Fl. W. Pakist. 608, in syn. 1972. *Vitex angus-castus* var. *pseudo-negundo* (Hausskn.) Hand.-Mazz., in herb.

Additional & emended bibliography: Hand.-Mazz., Ann. Hofmus. Wien 27: 408, pl. 19, fig. 1. 1913; Fedde & Schust., Justs Bot. Jahresber. 43: 159. 1922; Parsa, Fl. Iran 4 (1): 540. 1949; Al-Rawi, Iraq Min. Agr. Tech. Bull. 14: 149. 1964; Guest & Al-Rawi, Fl. Iraq 1: 84 & 106. 1966; Kandelaki, Vestn. Gruzinsk. Bot. Obšč. 3: 79--87. 1966; Patzak & Rech., Fl. Iran 43: 5--6 & 8. 1967; Brummitt & Ferguson, Reg. Veg. 61: 190. 1969; Mold., Phytologia 16: 493 & 494 (1968) and 17: 16. 1968; Daoud & Skeikh, Bull. Coll. Sci. Univ. Baghdad 11 (2): 24--44. 1970; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Anon., Biol. Abstr. 52 (5): B.A.S.I.C. S.238 & S.240. 1971; Löve, Taxon 20: 353. 1971; Mold., Fifth Summ. 1: 208, 266, 267, & 269 (1971) and 2: 712, 719, 723, 726, & 922. 1971; "N. F. G.", Biol. Abstr. 52: 2515. 1971; Rouleau, Taxon Index Vols. 1-20 part 1: 382. 1972; R. R. Stewart, Annot. Cat. in Nasir & Ali, Fl. W. Pakist. 608. 1972; Townsend, Kew Bull. 27: 148 & 149, fig. 1 (center). 1972; Anon., Biol. Abstr. 56 (4): B.A.S.I.C. S.280. 1973; "H. R.", Biol. Abstr. 56: 1847. 1973; Mold., Phytologia 25: 244 & 245 (1973) and 28: 441, 443, & 452. 1974; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; [Farnsworth], Pharmacog. Titles 7, Cum. Gen. Ind. [118]. 1975; Koiiman, Act. Bot. Néerl. 24: 462. 1975; S. & D. Talalaj, Bull. Biol. Res. Cent. Baghdad 7: 32--42. 1976; S. & D. Talalaj, Biol. Abstr. 65: 4710. 1978.

Illustrations: Hand.-Mazz., Ann. Hofmus. Wien 27: pl. 19, fig. 1. 1913; Townsend, Kew Bull. 27: 148, fig. 1 (center). 1972.

Recent collectors describe this plant as a bush or shrub, 1--4 m. tall, and have found it growing along roadsides, on riverbanks and streamsides, in gravelly sandy-clay or rocky sandy-clay loam, in dry forests and desert washes, in dry depressions and low bushy woods, and in the gravel of wadi beds, at altitudes of 11--2300 meters, flowering from May to November, fruiting in March, August, September, and November. Guest & Al-Rawi (1966) assert that it is very abundant (10--20 percent) in the Asphodeletum aestivi ecologic association on gently sloping hillsides and also is common among arborescent species along the sides of mountain streams in the forest zone associated with *Paliurus spina-christi* and *Nerium oleander*.

The chromosome number is reported by Löve (1971) as 2n = 32, Based on *Murin & Sheikh s.n.* from Iraq. The Talalajs (1978) report isolating a volatile oil of possible economic importance from the plant. The corollas are said to have been "blue" on *Andersen & Petersen 443* and *Qaiser & Ghafoor 1525*, "violet" on *Ali 1074* and *Qaiser 209*, "lavender" on *Long 417*, "purple" on *Ali & al. 1957*, and "purple with the throat white" on *Koelz 13223*.

Stewart (1972) quotes Parker to the effect that this plant is cultivated in gardens on the plains of Pakistan and is best recognized by its "cylindric panicles of bright violet" flowers. The leaflets on *Rechinger 10714* are extra large, greatly resembling those of *V. negundo* L.

Patzak & Rechinger (1967) distinguish this taxon from its close relatives in the area which it naturally occupies as follows:

Flores plerumque in inflorescentias simplices vel paniculatas dispositae; cymae sessiles vel subsessiles; folia plerumque 5--7-na.

Labium inferius corollae intus non barbatum....*V. agnus-castus*.

Labium inferius corollae intus barbatum........................ *V. agnus-castus* var. *pseudo-negundo*.

Flores plerumque laxe paniculatae; cymae manifeste stipitatae; foliola plerumque 3--5-na.........................*V. negundo*.

Jafri & Ghafoor, in a personal communication to me, separate them similarly:

Leaflets 3--5; cymes often somewhat lax and panicled, forming a pyramidate inflorescence; flowers not fragrant....*V. negundo*.

Leaflets 5--7; cymes sessile or subsessile, forming a subcylindrical narrow inflorescence; flowers fragrant.

Lower corolla-lobes glabrous or slightly pubescent at the base only......................................*V. agnus-castus*.

Lower corolla-lobes densely ciliate or pubescent................ *V. agnus-castus* var. *pseudo-negundo*.

Townsend (1972) separates them thus:

Lower lip of corolla glabrous, or with a few sparse hairs at the basal angles only...........................*V. agnus-castus*.

Lower lip of corolla bearded with a semicircular line of hairs at the base

Inflorescence with the lateral cymes more congested; inner surface of calyx with the intermediate veins more or less zigzag above or tending to merge into the reticulate secondary venation extending from the middle of the tube upwards; petiolule of central leaflet to 1 cm. long................. *V. agnus-castus* var. *pseudo-negundo*.

Inflorescence with the lateral cymes laxer; inner surface of the calyx with the intermediate veins straight and almost reaching the sinuses, the secondary venation at most looping-anastomosing and never reticulate in the tube; petiolule of central leaflet to 2 cm. long...........*V. negundo*.

Handel-Mazzetti (1913) cites *Bornmüller 1536, Handel-Mazzetti 1970,* and *Sintenis 1305* from Mesopotamia and lists the variety also from Iran. Jafri & Ghafoor cite *S. I. Ali 1074, Azher 32 & D-5, Hamid Ali 5 & C-7, Nath 2430, Qaiser 203 & G-2, Qaiser & Ghafoor 1525,* and *Sultanul Abedin 6727* from Pakistan, where, they say, it is called "marwan" and flowers from May to July. They give its overall distribution as southwest Asia eastward to Afghanistan and Pakistan. Stewart (1972) cites, also from Pakistan, *Aitchison 446, Harsukh 20615, Lace 3619, Patzak & Rechinger s.n.,* and *Popov 308*. Patzak & Rechinger (1967) cite the following: IRAQ:*Bornmüller 1536; Guest 800, 865, & 1953; Haley 58; Helbaek 1225 & 1786; Makki 557; Rechinger 9612, 10714, & 11246; Sutherland 16; Thesiger 1202*. IRAN: *Bent & Wr. 503-609; Bornmüller 5128; Grant 15895; Koelz 15444 & 18447; Rechinger 1308, 3996, 5362, & 5778; Shar 1305E; Stapf s.n.;*

Stutz 959. RUSSIA: Turkmanskaya: *Litw. 2407*. AFGHANISTAN: *Gabriel 37/3; Kerst. 265; Koeie 2090; Koelz 13223; Lindb. 1960/931; Rechinger 19268 & 32403; Volk 1320*. PAKISTAN: *Aitchison 446; Bhola s.n.; Harsukh 20615; Lace 3619; Popov 308; Stewart, Blatt, & Fz. 1435 & s.n.* They give the overall distribution as "Asia austro-occidentalis a Turcia et Syria et Kurdistan orientem versus usque ad Afghanistan et Pakistan."

Material of this variety has been widely misidentified as typical *V. agnus-castus* L. or as *V. negundo* L.

Additional citations: EGYPT: *Bot. Dept. Herb. s.n.*[Kharga Oasis, Feb. 1931] (Gz, Gz). ISRAEL: *Amdursky 280* (N); *Zohary, Amdursky, & Grizi s.n.* [14.11.1951] (Ba). JORDAN: *V. Täckholm s.n.* [6/8/1962] (Gz), *s.n.* [July 1962] (Gz, Gz). IRAQ: *Agnew & Barkley s.n.* [27-5-1962] (N, N); *F. A. Barkley 32Ir3356* (N); *Barkley & Agnew 3290* (N); *Barkley, Wahab, & Oraha 6824* (N); *Brahim M. 6119* (N); *K. H. Rechinger 10714* (Mu). IRAN: *Haltenorth s.n.* [27.9.1960] (Mu); *K. H. Rechinger 43617* (Mu); *Rechinger & Rechinger 5778* (Ba). AFGHANISTAN: *Andersen & Petersen 443* (N); *Griffith 6059* (Pd); *Koelz 13223*(W--2193776); *L. E. Long 417* (W--2189847); *Podlech 16145* (Mu), *16825* (Mu), *17162* (Mu), *18545* (Mu), *18581* (Mu), *19196* (Mu), *19901* (Mu), *21692* (Mu); *K. H. Rechinger 19268* (Mu), *32403* (Mu), *37025* (Mu), *37547* (Mu). PAKISTAN: Baluchistan: *Abedin & Hussain 6727* (Kh); *Qaiser 209* (Kh); *Qaiser & Ghafoor 1525* (Kh); *K. H. Rechinger 29984* (Mu), *30985* (W--2637734); *Rechinger, Rechinger, Aellen, & Esfandiari 3996* (Ba, Mu). Northwest Provinces: *Ali 5* (Kh), *1074* (Kh); *K. H. Rechinger 19617* (Mu). Sind: *Ali, Farrofi, & Abedin 1957* (N). West Punjab: *Iman 32* (Kh).

VITEX AGNUS-CASTUS var. *PSEUDO-NEGUNDO* f. *ALBIFLORA* Mold.

Additional bibliography: Mold., Phytologia 15: 87. 1967; Mold., Fifth Summ. 1: 266 (1971) and 2: 922. 1971.

VITEX AGNUS-CASTUS f. *ROSEA* Rehd.

Additional synonymy: *Vitex agnus-castus* var. *rosea* Rehd. apud Turrill, Curtis Bot. Mag. 174: pl. 400. 1962.

Additional bibliography: Voss in Vilm., Blumengärtn. 1: 829. 1895; Blackburn, Trees Shrubs East. N. Am. 302. 1952; Wyman, Shrubs Vines Am. Gard. 351 & 352. 1956; Mold., Phytologia 8: 26--27. 1961; Turrill, Curtis Bot. Mag. 174: pl. 400. 1962; Everett, Reader's Digest Compl. Book Gard. 447. 1966; Mold., Fifth Summ. 1: 207 & 373 (1971) and 2: 712, 721, & 922. 1971; Wyman, Gard. Encycl., imp. 1, 1171 (1971) and imp. 2, 1171. 1972; Mold., Phytologia 23: 437 (1972) and 34: 250. 1976; D. E. Clark, Sunset New West. Gard. Book, ed. 4, imp. 2, 498. 1979.

The corollas on the Brown collection, cited below, are said to have been "pink" when fresh.

Additional citations: LOUISIANA: Winn Par.: *C. A. Brown 7920* (Lv).

VITEX AGNUS-CASTUS f. *VARIEGATA* Mold.

Additional synonymy: *Vitex agnus-castus* cv. *"Variegata"* L. H. &

E. Z. Bailey, Hortus Third 1162. 1976.

Additional bibliography: Mold., Phytologia 16: 495. 1968; Brummitt & Ferguson, Reg. Veg. 61: 190. 1969; Mold., Fifth Summ. 2: 710, 711, 922, & 970. 1971; L. H. & E. Z. Bailey, Hortus Third 1162. 1976.

VITEX AJUGAEFLORA Dop

Additional bibliography: Wangerin, Justs Bot. Jahresber. 56 (1): 668. 1936; Fedde & Schust., Justs Bot. Jahresber. 56 (2): 286. 1937; Mold., Phytologia 16: 495. 1968; Mold., Fifth Summ. 1: 303 & 373 (1971) and 2: 712 & 922. 1971.

Additional citations: INDOCHINA: Annam: *Poilane 6844* (W--2602629--cotype).

VITEX ALTISSIMA L. f., Suppl. Pl., imp. 1, 294. 1791.

Additional & emended synonymy: *Mail-elou* Rheede, Hort. Malab. 5: 1--2. 1685. *Mail-eloû* Rheede, Hort. Malab. 5: pl. 1. 1685. *Vitex trifolia major indica, fructu carnoso, floribus minoribus & rarioribus* Breyn, Prod. Fasc. Rar. Pl., ed. 1, 2: 106. 1688. *Mailelou* Rheede apud Adans., Fam. Pl. 2: 12 & 200. 1763. *Vitex appendiculata* Willd., Gesell. Naturforsch. Freunde Berlin, ser. 2, 4: 203. 1803 [not *V. appendiculata* Rottb., 1885]. *Vitex altissima* Roxb. ex Wall., Numer. List [48], no. 1755, hyponym. 1829. *Vitex appendiculata* Wight ex Wall., Numer. List 86, no. 1755C. 1831. *Vitex latifolia* Wight ex Wall., Numer. List 86, no. 1755C. 1831; Steud., Nom. Bot., ed. 2, 2: 777. 1840 [not *V. latifolia* Blume, 1837, nor Lam., 1788, nor Mill., 1768]. *Vitex pubescens* β *appendiculata* Wight ex D. Dietr., Syn. Pl. 3: 611, in syn. 1843. *Vitex altissima* Heyne ex Mold., Phytologia 5: 197, in syn. 1955. *Vetex altissina* Kurup, Journ. Bomb. Nat. Hist. Soc. 75: 325, sphalm. 1978.

Additional & emended bibliography: Rheede, Hort. Malab. 5: 1--2, pl. 1. 1685; Breyn, Prod. Fasc. Rar. Pl., ed. 1, 2: 106 (1688) and ed. 2, 2: 106. 1739; Adans., Fam. Pl. 2: 12 & 200. 1763; L. f., Suppl. Pl., imp. 1, 294. 1781; Lam., Encycl. Méth. Bot. 2: 614. 1788; Raeusch., Nom. Bot., ed. 3, 182. 1797; Willd., Gesell. Naturforsch. Freunde Berlin, ser. 2, 4: 203. 1803; Roxb., Hort. Beng. 46. 1814; Moon, Cat. Indig. Exot. Pl. Ceyl. 1: 46. 1824; Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; G. Don in Loud., Hort. Brit., ed. 1, 246. 1830; Wall., Numer. List 86. 1831; G. Don in Loud., Hort. Brit., ed. 2, 246. 1832; Loud., Hort. Brit., ed. 2, 551. 1832; G. Don in Loud., Hort. Brit., ed. 3, 246. 1839; J. Grah., Pl. Bomb. 155--156. 1839; Sweet, Hort. Brit., ed. 3, 551. 1839; Thwaites, Enum. Pl. Zeyl. 2: 244. 1839; D. Dietr., Syn. Pl. 3: 611. 1843; Voigt, Hort. Suburb. Calc. 469. 1845; Buek, Gen. Spec. Syn. Candoll. 3: 501 & 502. 1858; Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 1, 244. 1861; Gamble, List Trees Darj. Dist. 61. 1878; Gamble, Man. Indian Trees, ed. 1, 297, 298, & 522. 1881; Trimen, Journ. Ceyl. Br. Roy. Asiat. Soc. 9: [Syst. Cat. Flow. Pl. Ceyl.] 69. 1885; Trimen, Handb. Fl. Ceyl. 3: 356--358. 1895; Nairne, Flow. Pl. West. India 247. 1894; Cooke, Fl. Presid. Bombay. ed. 1, 3: 428 & 429. 1905; Brandis, Indian Trees, imp. 1, 503 & 504, fig. 175. 1906; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Parad. Man. Bot. 2:] 69. 1911; H. J. Lam, Verbenac. Malay. Arch. 369 & [371]. 1919; Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 48. 1921; Troup, Silvicult. Indian Trees 2: 776. 1921; Alston in Trimen, Handb. Fl. Ceyl. 6: Suppl. 232. 1931; L. f., Suppl. Pl., imp. 2, 294. 1936; Alston, Kandy Fl. 64 & [65]. 1938; Kanjilal, Das, Kanjilal, & De, Fl. Assam 3: 479, 483, & 561. 1939; P. A. Russell, U. S. Dept. Agr. Pl. Invent. 159: 26 & 221. 1957; Cooke, Fl. Presid. Bombay, ed. 2, imp. 1, 2: 508--510. 1958; Abeywickrama, Ceyl. Journ. Sci. Biol. 2: 217. 1959; Worthington, Ceyl. Trees 348. 1959; Puri, Indian Forest Ecol. 1: 31, 148, 149, 153, & 176. 1960; Gaussen, Legris, & Viart, Ind. Counc. Agr. Res. Veg. Map Ser. 1: 24, 40, & 41. 1962; Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 2, 244. 1964; Qureshi, Sympos. Ecol. Res. Humid Trop. Veg. 127 & 128. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2277. 1966; Cooke, Fl. Presid. Bombay, ed. 2, 2: 508--510. 1967; Ellis, Swaminathan, & Chandrabose, Bull. Bot. Surv. India 9: 12. 1967; Gaussen, Legris, & Viart, Ind. Counc. Agr. Res. Veg. Map Ser. 4: 26. 1967; Kammathy, Rao, & Rao, Bull. Bot. Surv. India 9: 208 & 224. 1967; Ramaswamy, Bull. Boc. Soc. Beng. 21: 96. 1967; Sebastine & Vivekanathan, Bull. Bot. Surv. India 9: 166, 167, & 178. 1967; Vajravelu & Rathakrishnan, Bull. Bot. Surv. India 9: 43 & 44. 1967; J. L. Ellis, Bull. Bot. Surv. India 10: 1-7. 1968; Gunawardena, Gen. Sp. Pl. Zeyl. 147. 1968; Mold., Phytologia 16: 495--496 (1968) and 17: 11--13, 23, 45, 47, 50, 54, & 56. 1968; Mold., Résumé Suppl. 16: 10. 1968; Vajravelu, Joseph, & Chandrasekaran, Bull. Bot. Surv. India 10: 78. 1968; Legris & Blasco, Inst. Franç. Pond. Trav. Sec. Scient. Techn. 8 (1): 67. 1969; Agarwal, Wood-yield. Pl. India 67--68. 1970; Blasco, Inst. Franç. Pond. Trav. Sec. Scient. Techn. 10: 149, 173, & 426. 1971; Brandis, Indian Trees, imp. 2, 503 & 504, fig. 175. 1971; Mold., Fifth Summ. 1: 269, 279, 281, 303, 328, 337, & 373 (1971) and 2: 570, 712, 713, 720, 726, 728, 729, 922, 969, & 970. 1971; Anon., Biol. Abstr. 53 (10): B.A.S.I.C. S.266. 1972; Mold., Biol. Abstr. 53: 5252. 1972; Mold., Phytologia 23: 423 & 438. 1972; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 663. 1973; R. R. Rao, Stud. Flow. Pl. Mysore Dist. [thesis] 2: 755. 1973; Rao & Razi, Journ. Mysore Univ. B.26: 103. 1973; Serbanescu-Jitariu & Mitroiu, Act. Bot. Hort. Bucurest. 1972-73: 116. 1973; Vartak, Bull. Indian Nat. Sci. Acad. 45: 253. 1973; Mani, Ecol. Biogeogr. India [Illies, Monog. Biol. 23:] 189, 200, & 772. 1974; Mold., Phytologia 28: 445, 460, 465, & 468. 1974; Hocking, Excerpt. Bot. A.25: 380. 1975; Menninger, Color Sky 10. 1975; Zimmerm. & Ziegler in Zimmerm. & Milburn, Transp. Pl. 1 [Pirson & Zimmerm., Encycl. Pl. Physiol., ser. 2, 1]: 502. 1975; L. H. & E. Z. Bailey, Hortus Third 1162. 1976; Meher-Homji, Feddes Repert. Spec. Nov. 88: 120. 1977; Subramanian & Kalyani, Indian Forest. 103: 113 & 117. 1977; Kurup, Journ. Bomb. Nat. Hist. Soc. 75: 325, 329, & 332. 1978; Sharma, Shetty, Vivekan., & Rathakrish., Journ. Bomb. Nat. Hist. Soc. 75: 16 & 33. 1978; Speangers & Balasubramanian, Trop. Ecol. 19: post

92. 1978.

Additional illustrations: Rheede, Hort. Malab. 5: pl. 1. 1685; Brandis, Indian Trees, imp. 1, 503, fig. 175. 1906; Alston, Kandy Fl. [65], fig. 347. 1938; Worthington, Ceyl. Trees 348. 1959; Brandis, Indian Trees, imp. 2, 503, fig. 175. 1971.

Recent collectors describe this species as a large shrub or small to very large tree, 2.5--33 m. tall, spreading, the bole often to 1.2 m. long, the crown to 10 m. wide, the trunk fluted, 15--90 cm. in diameter, the branches compressed, channelled, drooping, the branchlets tetragonal, dark-green, sulcate, the wood smooth, heavy, weighing 58--60 pounds per cubic foot, even-textured, varying from light olive-gray to brownish-gray or grayish-brown, capable of being seasoned, quite durable in water, very tough, disease-resistant, termite-proof, polishing well, not easily split, not readily warping, the bark varying from brown or tan to dull-brown, pale orange-brown, light-tan, ochraceous, yellowish, gray, grayish-white, yellowish-gray, or "creamish-yellow", fissured or cracked longitudinally, peeling off in narrow strips 2--3 cm. wide or in 2 x 2.5 inch scales, leaving sandy-colored scars, loose, rough, yellow and fibrous within, the living bark soft, yellow or dark-yellow, 5--10 mm. thick, the leaves compound, usually trifoliolate ("tripalmate"), papyraceous, acuminate, bronze-colored, usually appearing in March, the old leaves deciduous at about the same time, the inflorescence terminal, paniculate, flexuous or pendulous, the "cymes scorpioid", the flowers small, few, fragrant, the calyx pale-rusty or pale-brown, with a dull-violet base, the filaments pale-purple or white, the anthers black, the connective blackish, and the fruit drupaceous, round or spherical, about the size of a pea or 3/8ths inch long, at first green, later turning dark-blue, blue-black, purplish, purple, or black, smooth, often with small white dots, the pericarp fleshy, juicy at maturity.

The corollas are described as "white, tinged with blue" by Nairne (1894), Cooke (1905), and Sharma & al. (1978), "pale-violet or white" by Worthington (1959), or "cream-colored, with a white lip" by the Baileys (1976). Collectors also describe the corollas in various ways: "white" on *Saldanha 13974*, "white with prominent purple lip" on *Saldanha 16938*, "white, lower lip bluish-purple" on *Cramer 4366*, "blue" on *Hladik 855*, *Mueller-Dombois & Comanor 67072528*, *Ripley 135*, *Stevens 472*, and *Sweeney s.n.*, "bluish" on *Fosberg & Sachet 53010* and *Saldanha 14365*, "pale-blue" on *Comanor 567* and *Kostermans 23289 & 23478*, "bluish-purple" on *Jayasuriya 1262*, "bluish-purplish" on *Sumithraarachchi DBS.508*, "purplish-blue" on *Sumithraarachchi DBS.462* and *Waas 1267*, "purplish-blue, lower lip blue" on *Jayasuriya 1990*, "purple" on *Cooray 69111730R* and *Ramamoorthy & Gandhi F.F.P.2752*, "bluish-purple with middle lobe of lower lip deep-purple" on *Amaratunga 1023*, "lilac" on *Bernardi 14304*, "violet-blue with lower lip a darker shade, white around margin" on *Davidse & Jayasuriya 8393*, "pale-violet" on *Amaratunga 175*, *Bernardi 15240*, and *Kostermans 26007*, "very light-pink, lower lobes dark-violet with a yellow stripe at base of tube, the tube with maroon tinge" on *Davidse 7338,* "mauve-pink" on *Amaratunga 268,* "lower lip purple, side lobes and upper 2 lobes purplish-white"on *Saldanha 16553,* "limb border lavender, paler within, center lavender" on *Fosberg & Jayasinghe 57119,* and "corolla-tube dull pale-violet, white-hairy, with darker longitudinal dashes under the lip. 4 upper petals outside pale, inside light-blue, lip outside light-blue, inside with yellow base, further up violet-blue" on *Jacobs XI.K.6.*

Recent collectors have encountered *V. altissima* on steep forested slopes and exposed windswept rocky outcrops, in dry deciduous secondary forests and dry forests in general, in evergreen or semi-evergreen forests, wet deciduous forests, intermediate forests, and "disturbed uneven forests yo 10 m. tall", in jungles and dry-zone jungles, at the edges of forests or jungles, and in the forested margins of rock outcrops, on sandy, light-colored, sandy-pebbly, or "brown-red clayey-lateritic-loamy" soil, even in regions of more than 56 inches annual rainfall, from sealevel to 1100 m. altitude, in flower in January and from March to November, in fruit in April and from July to January.

Ramamoorthy & Gandhi, as well as Saldanha, report the species as "common" in Mysore, India, although the latter collector also found it only "occasional" in some localities. Ellis & al. found it growing along roadsides in Kerala, citing their *nos. 20488 & 24004*; Vajravelu & al. (1968) list it as "common" in Kerala, citing *Joseph 17138,* and (1967) "common" also in Madras, citing their *no. 24106.* Sebastine & Vivekanathan (1967) refer to it as "rare" in the Cheevapara region of Kerala, but as a "common tree on [the] western slopes of the Devicolam range", citing their *no. 25337.* Ellis (1968) found it in Andhra Pradesh, citing his *no. 25554.* Kurup (1978) asserts that it inhabits "tropical wet rainforests in [the] western Ghats, forming [the] top storey with *Messua ferrea, Hopea parviflora,* etc." Agarwal (1970) records it from "Bombay, Canara, Madras forest distrs., Cochin (Kerala), and Ceylon". Shetty & al. (1978) refer to it as "common" and cite *Rathakrishnan 37981* and *Sharma 35725.* Speangers & Balasubramanian (1978) found it growing in dry tropical semi-evergreen forests of southeastern India with *Canthium dicoccum, Manilkara hexandra, Hemidesmus indicus,* etc., in monsoon stream areas.

Gaussen & al. (1967) found *V. altissima* "in the intermediate storey of the Toona-Garuga Series"; Ramaswamy (1967) cites his *no. 2707* from Savandurga. Kammathy & al. (1967) encountered the tree in dry deciduous forests in Mysore, citing *Barnes s.n.* Qureshi (1965) records it from Madras, while Gamble (1881) says that the "Tree [is] only found in the southern Sāl forests". Puri (1960) lists it from the top and middle layers of tropical evergreen forests of several luxuriant strata with an understorey of many ferns and tall herbs in northern Kanara of the western coast of Malabar; in the top storey of southern tropical wet evergreen forests in southern Coimbatore the tree is 10--25 m. tall. In Assam, Kanjilal & al. (1939) report that it ascends to 4000 feet altitude, the hard close-grained wood "valuable for building construction, furniture, carts, boats, oil-mill pestles, etc."

Nairne (1894) describes the species as "plentiful" in southern Concan and Canara, asserting that it is "A beautiful tree when in flower". Clarke (1885) gives its distribution as the "Deccan Peninsula, especially the west side, up to 4000 ft., common". Troup (1921) tells us that "The tree stands a moderate amount of shade, especially in youth; it produces root-suckers. Growth, according to Gamble, 8 to 9 rings per inch of radius, giving a mean annual girth increment of 0.7 to 0.78 in." It is also said to "regenerate anywhere around". Cooke (1958) gives its distribution as only west peninsular India and Ceylon, citing *Dalzell & Gibson s.n., Law s.n.,* and *Stocks s.n.* from Concan and *Dalzell & Gibson s.n., Talbot s.n.,* and *Woodrow s.n.* from Kanara, where he says that it is "plentiful" and "abundant" in evergreen forests, and that its wood is used for building purposes, furniture, and carts, being in much demand in northern Kanara.

The Baileys (1976) give the species' distribution as Pakistan, India, and Sri Lanka, asserting that it is a "Valuable timber tree used in cabinet work and building construction". Agarwal (1970) says that "It is considered very good for house-construction, flooring, in well-construction, for carts, felloes of wheels, furniture and rarely for sleepers [=railroad ties]. It can be tried for tool handles." Railroad ties made of this wood are said to last 30 years.

In Sri Lanka most authors and collectors describe the species as abundant. Thwaites & Hooker (1861) say that it is "Common in forests, up to an elevation of 3000 feet", citing *Thwaites C.P. 1958,* and noting that "This tree produces one of the most valuable timbers in the island for building and other purposes". Worthington (1959) lists it from the "low country, dry zone, but also found elsewhere, the wood used for furniture, wagons, and railroad ties". He collected it in the submontane region on the dry zone border. Hallier (1918) found it in cultivation, citing his *no. C.241,* deposited in the Hamburg herbarium. Trimen (1895) comments: "A valuable timber-tree. Wood hard, heavy, close-grained, smooth, tough, durable, grey; the carpenters distinguish several varieties. The bark is used as a fomentation in rheumatic swellings. The wood affords a yellow dye, which is not much employed". It would be interesting to know if the carpenters' varieties correspond in any way with the two taxonomic varieties here accepted.

Also in Sri Lanka Bernhardi says "arbor obvia tota in insula frequens, cortice claro, inflorescentiae candalabriformes". Davidse & Sumithraarachchi, as well as Comanor and Sohmer, refer to *V. altissima* as "common" in the forests, but Fosberg & Jayasinghe refer to it as "infrequent". Cooray calls it a common subcanopy tree in low-stature evergreen forests dominated by *Mischodon zeylanicus* on reddish soil. Cramer reports it "common in open dry country", while Fosberg & Sachet found it "common at edge of forest around extensive granite outcrops". Kostermans reports it common in both deciduous and evergreen forests, while Hladik reports it "common in dry zone near irrigation tank [lake] where undergrowth has been cut"; Mueller-Dombois encountered it as common in shallow sand between outcropping rocks along roadsides; he and Jayasuriya report it "rather common in jungle forests", while he and Comanor affirm that it is a "prominent upper canopy tree at forest edges next to villu grassland". Ripley describes it as common in "flushes". Sumithraarachchi came upon it in jungles.

Sweet (1826), Don (1830), and Loudon (1832) all assert that *V. altissima* was introduced into English gardens from Sri Lanka in 1802. It is also cultivated in Maryland and Florida, on the basis on material imported from India by Menninger and represented by *P. A. Russell 194521*. *Jacobs XI.K.6* was collected from cultivated material in Java.

Vernacular names reported by recent collectors and/or authors include the following: "ahoi", "anhvi", "arong", "ashoi", "banalgay", "bulgi", "inhet-longhing", "jadh-gach", "kada-manakku", "kaddamanakku", "kaddamananakku", "maila", "mairole", "mayilei", "mee-yan", "meeyan-mililla-gass", "milla", "mililla-gass", "miyan-milla", "mon-awal", "sapu-milla", "selong-phang", "tall chaste-tree", "tallest chaste-tree", and "tin-patte".

Linnaeus' original (1781) description of *V. altissima* is: "VITEX foliis ternatis integerrimis, panicula verticillata: spicis verticillatis, bacca trisperma. Habitat in vastis sylvis Zeylonae. *König*. Foliola ovata, utrinque acuminata, supra glabra, subtus pubescentia." *König 77*, in part, from Sri Lanka, in the Linnean Herbarium in London, is the nomenclatural holotype. It is worth noting here that Moon (1824) correctly maintains *V. altissima* as a distinct species separate from what he calls *V. pubescens* (=*V. pinnata*), both in Sri Lanka. The *V. pubescens* of Vahl, referred to in the synonymy above, is *V. pinnata* and it is to this taxon that Moon was obviously referring. The date of publication of the *V. pubescens* Heyne is erroneously given as "1824" by Santapaugh & Waugh (1963).

The *Cooray 69111730R* collection, cited below, was gathered as a voucher for ecologic observations. Similarly, *Ripley 78, 135, & 247* were collected as vouchers for primate ecology studies. Lewis, on the label accompanying the collection cited below, comments that this "tree [is] taller and straighter than the ordinary 'milla'".

It is worth noting here that *Kostermans 23478* is only very sparsely puberulent, rather than pubescent, on the lower leaf surfaces. Worthington (1959) erroneously refers to the fruits as "berries" -- they are drupes. The illustration given by Alston (1938) certainly looks more like *V. negundo* L. than it does *V. altissima*! *Fosberg 56373* is accompanied by a label asserting that the plant was a "somewhat depressed spreading somewhat woody herb, flowers orange, closed in afternoon, occasional in fencerow along weedy roadside" -- obviously a case of mixed labels or some other stenographic mixup. Similarly, the label with *Sohmer 8237* in the New York and Washington herbaria asserts that the plant had "flowers orange". A letter to me from Dr. Sohmer, dated June 17, 1977, says "I have gone back to my field book and find that for my collection *8237* I had only the following notation down: '50 ft. high tree'. There is nothing about flower color in my notes, and

I assume that either an enthusiastic typist added the notation to the label that you saw, or it was mistakenly transferred from somewhere else."

Rheede's illustration (1685) is often cited as representing f. juv. *alata,* but it plainly depicts the typical adult form of *V. altissima*. The name, *V. pinnata* has been applied mistakenly to *V. altissima* by many authors and collectors, notably by Alston (1931, 1938) and Abeywickrama (1959) among authors and by Amaratunga, Cooray, Cramer, Dittus, Hladik, Mueller-Dombois, Mueller-Dombois & Comanor, Ripley, Sohmer, Waas, and Worthington among collectors. It has also been misidentified as *V. trifolia* by Sohmer, Sumithraarachchi, and others.

The *Kostermans 24109* and *Moldenke & al. 28188, 28189, 28220, 28228, & 28238,* distributed as typical *V. altissima,* actually represent f. *subglabra* Thwaites, while *Flock 362* and *Rodgers MRC. 164* are *V. bunguensis* Mold.

Additional & emended citations: INDIA: Karnataka: *Collector undetermined s.n.* [Mysore] (Pd); *Ramamoorthy & Gandhi H.F.P.2752* (W--2653611); *Saldanha 13974* (N), *14365* (N), *15116* (W--2653612), *16553* (N), *16938* (N); *W. D. Stevens 472* (Ln--232352); *Talbot s.n.* [N. Canara] (Pd). Kerala: *Hohenacker 115* (B, Mu--620, Mu, Mu, N, S, S), *s.n.* [prope Mangalore] (B); *Stocks, Law, &c. s.n.* [Malabar, Concan, &c.] (Br, Mu--622, N, Pd, S, W--2497091, W--2497123). Tamil Nadu: *Kostermans 26007* (W--2828795); *G. Thomson s.n.* [Mont. Nilghiri & Kurg] (M, Mu--621, Pd, S); *R. Wight 2325* (B, Mu--1344, Mu--1345, Pd, Pd, S, S). State undetermined: *Wallich 1755* (Pd), *1755c* (Pd). SRI LANKA: *Amaratunga 175* (Pd), *268* (Pd), *1023* (Pd); *Bernardi 14304* (W--2765949), *15240* (N, W--2808311); *Comanor 567* (N, W--2762569), *576* (N, Pd, W--2762570); *Cooray 69111730R* (Ac, N, W--2612109); *Cramer 4366* (W--2807756); *Davidse 7338* (Ld, W--2803773), *7446* (Ld, W--2806274); *Davidse & Jayasuriya 8393* (Ld, W--2808657); *Davidse & Sumithraarachchi 8153* (Ld), *9075* (Ld, W--2808696); *Dittus WD.69102302* (W--2765146, W--2803412), *WD.71090606* (W--2805422); *F. R. Fosberg 56373* (N, W--2811402); *Fosberg & Jayasinghe 57119* (Ld); *Fosberg & Sachet 53010* (Ld, N), *53011* (Tu); *Gardner s.n.* [Jaffna, C.P.1958] (Pd, Pd); *Hladik 855* (Pd, W--2761100); *Jayasuriya 1262* (Ac, Ld), *1990* (Ld, W--2807845); *Kostermans 23289* (Ac), *23478* (Ac, N); *J. P. Lewis s.n.* [Mulliativu] (Pd, Pd); *Moldenke, Moldenke, Dassanayake, & Jayasuriya 28329* (Gz, Ld, Pd, W--2764534); *Moldenke, Moldenke, & Jayasuriya 28256* (Ac, Pd, W--2764523); *Mueller-Dombois 67081404* (Pd, W--2586025A), *68102114* (N); *Mueller-Dombois & Comanor 67072507* (Pd, Pd, W--2586024A), *67072528* (Pd, W--2586023A); *Reitz 30027* (Ac, W--2762786); *Ripley 78* (Pd, W--2719624), *135* (Pd, W--2719619), *189* (Pd, W--2715939), *247* (W--2719625); *Sohmer 8210* (N, W--2808328), *8237* (Lc, N, W--2807754); *Sohmer & Jayasuriya 10673* (N); *Sumithraarachchi DBS.462* (W--2807746), *DBS.508* (W--2807761); *Thwaites C.P.1598* (Pd); *Waas 1267* (W--2807769); *Wirawan s.n.* [Wilpattu, 15.9.68] (Pd, W--2612111); *Worthington 383* (K), *1325* (K), *3764* (K), *4506* (K), *4906* (K), *5013* (K),*5552* (K), *s.n.* [Kandy, Oct. 24, 1957] (K). THAILAND: *Phengklai, Tamura, Niyomdham, & Sangkachand 4269* (Z). CULTIVATED:

Florida: *Gillis 8390* (Ft, Z). Java: *Herb. Hort. Bot. Bogor. IV.A.64* (W--449140); *Jacobs XI.K.6* (Ba).

VITEX ALTISSIMA f. juv. *ALATA* (Willd.) Mold., Phytologia 28: 468. 1974.

Synonymy: *Vitex alata* Willd., Gesell. Naturforsch. Freunde Berlin, ser. 2, 4: 203. 1803 [not *V. alata* Kurz, 1885, nor Roxb., 1803, nor Schau., 1885, nor Wall., 1947]. *Vitex alata* Roth ex G. Don in Loud., Hort. Brit., ed. 1, 246. 1830. *Vitex appendiculata* Rottl. ex C. B. Clarke in Hook. f., Fl. Brit. India 4: 584, in syn. 1885 [not *V. appendiculata* Willd., 1803]. *Vitex altissima* var. *alata* Trim. ex J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. 69. 1911. *Vitex altissima* var. *alata* (Willd.) Mold., Revist. Sudam. Bot. 5: 2. 1937. *Vitex altissima* f. *alata* (Willd.) Mold., Phytologia 22: 126. 1971.

Bibliography: Rheede, Hort. Ind. Malab. 5: 1--2, pl. 1. 1685; Breyn, Prod. Fasc. Rar. Pl., ed. 2, 106. 1739; Adans., Fam. Pl. 2: 12 & 200. 1763; Willd., Gesell. Naturforsch. Freunde Berlin, ser. 2, 4: 203. 1803; Roxb., Hort. Beng. 46. 1814; Roth, Nov. Pl. Sp. 316. 1821; Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; G. Don in Loud., Hort. Brit., ed. 1, 246 (1830) and ed. 2, 246. 1832; Loud., Hort. Brit., ed. 2, 551. 1832; G. Don in Loud., Hort. Brit., ed. 3, 246. 1839; J. Grah., Pl. Bomb. 156. 1839; Sweet, Hort. Brit., ed. 3, 551. 1839; D. Dietr., Syn. Pl. 3: 611. 1843; Schau. in A. DC., Prodr. 11: 685. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 501. 1858; Dalz. & Gibs., Bomb. Fl. 201. 1861; Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 1, 244. 1861; Kurz, Forest Fl. Brit. Burma 2: 269, 272, & 612. 1877; C. B. Clarke in Hook. f., Fl. Brit. India 4: 584. 1885; Nairne, Flow. Pl. West. India 247. 1894; Trimen, Handb. Fl. Ceyl. 3: 358. 1895; Cooke, Fl. Presid. Bombay, ed. 1, 428 & 429. 1905; Brandis, Indian Trees, imp. 1, 504. 1906; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Perad. Man. Bot. 2:] 69. 1911; Lam. & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 48. 1921; Mold., Revist. Sudam. Bot. 5: 2. 1937; Mold., Geogr. Distrib. Avicenn. 40. 1939; Mold., Prelim. Alph. List Inv. Names 49 & 50. 1940; Mold., Alph. List Inv. Names 52. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 55, 75, & 102. 1942; Menninger, 1947 Cat. Flow. Trees 25. 1946; Menninger, Introd. Offer Flow. Tree Coll. [1]. 1946; Razi, Journ. Mysore Univ. 7 (4): 64. 1946; Mold., Alph. List Inv. Names Suppl. 1: 16. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 128, 165, & 200. 1949; Menninger, 1953 Cat. Flow. Trees 16. 1953; Menninger, 1955 Price List n.p. 1954; Mold., Phytologia 5: 200--202. 1955; Cooke, Fl. Presid. Bombay, ed. 2, imp. 1, 508 & 510. 1905; Puri, Indian Forest Ecol. 155. 1960; Dale & Greenway, Kenya Trees 593. 1961; Thwaites & Hook. f., Enum. Pl. Zeyl., imp. 2, 244. 1964; Cooke, Fl. Presid. Bombay, ed. 2, imp. 2, 508 & 510. 1967; Agarwal, Wood-yield. Pl. India 67. 1970; Brandis, Indian Trees, imp. 2, 504. 1971; Mold., Phytologia 22: 126. 1971; Anon., Biol. Abstr. 53 (10): B.A.S.I.C. S.266. 1972; Mold., Biol. Abstr. 53: 5252. 1972; Mold., Phytologia 23: 423. 1972; Rao & Razi, Journ. Mysore Univ. B.26: 103. 1973; Mold., Phytologia 28: 465 & 468. 1974; Hocking, Excerpt. Bot. A.25: 380. 1975; Menninger, Color Sky 10. 1975.

Although long regarded as a separate species or as a distinct variety of *V. altissima* L.f. by numerous authors in the past, it seems from field observation that this taxon is merely a "juvenile form" of *V. altissima* distinguished by its leaves having more or less broadly winged petioles, the wings being 8--16 mm. wide, continuous, dilated, basally cordate and subamplexicaul. Such leaves are also found on the turions or "watersprouts" often produced on the periphery of the stumps of cutdown mature individuals. They may also be seen on seedlings and on the "suckers" sent up from underground runners. Some authors have also observed that the leaves on non-flowering branches of mature trees may have somewhat broader margins on their petioles than are seen on those of neighboring flowering branches on the same tree. This was confirmed by my wife and myself in the field in Sri Lanka. In our experience, however, these nowhere approach the width of the wings seen on the juvenile plants, turions, and seedlings. On seddlings the lowermost leaves may even be unifoliolate. Some authors (e.g., Clarke, 1885) assert that in this juvenile form the leaves are often 5-foliolate instead of the normal 3-foliolate of mature trees.

Numerous writers describe the flowers and fruits of *"Vitex alata"*, but it seems most likely that they are referring, not to this form, but to *V. limonifolia* Wall., *V. peduncularis* Wall. or *V. peduncularis* var. *roxburghiana* C. B. Clarke, which are the taxa regarded as *"V. alata"* by Kurz, Roxburgh, Schauer, and Wallich.

Agarwal asserts that *"V. alata* Heyne" grows in the western part of peninsular India and is "common on [the] Western Ghats in evergreen forests", the wood described as grayish-brown, moderately hard, rough, capable of being seasoned, taking a fair polish, appearing to be durable, and weighing 26 kg. per cubic foot. He adds that "Although from the available records its useful property is not found but from the specimens it appears that it can be usefully exploited for cabinet work & in construction purposes". Cooke (1958), under the name *V. altissima* var. *alata* Trimen, asserts that it differs from the typical variety in having its "Petioles always rather broadly winged, widened and cordate at the base; leaflets very finely pubescent above, densely grey-pubescent beneath; flowers more laxly arranged", flowering in April and May, citing it from Concan (*Nimmo s.n.*), Deccan (*Bhiva s.n.*), "S. M. Country" (*Law s.n.*), and Kanara *(Talbot s.n.)*. It would appear from this that he, at least, had seen flowering specimens with the "juvenile" leaf characters.

Dale & Greenway (1961) aver that "*Vitex alata* Heyne, an Indian species, has been collected from the Gogoni forest, Kwale district [Kenya]: it should not be regarded as indigenous without further collection".

Puri (1960) found what he called *V. altissima* var. *alata* in the "first storey with *Lagerstroemia, Sideroxylon,* and *Holigarna* spp. in dense evergreen tropical forests" in northern Kanara. He adds that there "The middle storey is poor or absent; likewise ground cover except for seedlings of the trees". This implies that the trees were not only flowering, but were producing fruit and seedlings.

Sweet (1826) and Loudon (1832) agree that "*V. alata* Roth" was introduced into cultivation in England from the "E. Indies" in 1818, but Don (1830) gives the date of introduction as 1820.

Clarke (1885) describes "*V. alata* Heyne" as having "leaves 3-foliolate [but some branches, apparently of this, collected by Shuter, Law, and Stocks, have some of the leaves 5-foliolate], leaflets subsessile broadly lanceolate subentire mature glabrate above thinly pubescent beneath, wing of the petiole broad cordate at base, panicles terminal compound fulvous-villous, corolla scarcely 1/4 in., drupe 1.5 in. diam." He cites *Rottler s.n.* and *Van Royen s.n.* from Madras and *Cleghorn s.n.* from Mysore, commenting: "Scarcely differs from *V. altissima* but by the wing of the petiole, which is 1/3 -- 2/3 in. wide, continuous [in *V. altissima* sometimes winged upwards], dilated, cordate and subamplexicaul at the base; leaflets 2 1/2 in. wide [in *V. altissima* 1 3/4 in.]."

Trimen (1895) gives the same description given by Cooke, but adds this interesting comment to the effect that "var. *alata* Trimen....is kept as a species in Fl. B. Ind., but not given for Ceylon. Mr. J. P. Lewis informs me that it has a different habit of growth to the ordinary tree, being taller and straighter. He found a few trees only at Vavaddai and Neduchaddikkulam". This, again, implies that at least Lewis had seen tall mature trees with the petiolar characters of *alata*.

Lam & Bakhuizen van den Brink (1921) distinguish the two taxa (regarded by them as 2 separate species) as follows:

Petioles 3.8--6.2 cm. long, winged toward the apex, the wings rotundate, altogether 0.8--1 cm. broad; leaflets somewhat pubescent beneath....................................*altissima*

Petioles 7--15 cm. long, winged toward the base, sometimes also towards the apex, the wings 0.4--1.5 cm. broad; leaflets pubescent beneath.......................................*alata*

Nairne (1894) says for "*V. alata*": "scarcely differs from the last [*V. altissima*], but the wing of the petiole is more pronounced, and the leaflets sometimes 5, flowers pale-yellow, or tinged blue [in *V. altissima* white tinged with blue]. S. M. country and Wari (D.). Konkan (Lisboa)." Here, again, it is implied that flowering trees with the *alata* characters have been seen, and, furthermore, that the corollas differ in color.

In this connection, Dr. Richard J. Brumpton, in a letter to me dated March 28, 1975, says: "I have read with interest your report and conclusions about *Vitex alata* as the juvenile form of *V. altissima*.......Let me confess that my interest is genetic rather than taxonomic; the kind of observation which you cite begs the whole question of 'control of differentiation'. It is indeed hard to imagine the mechanism capable of switching the phenotype between juvenile and adult stages. (In this part of Britain we see an allied phenomenon in that the leaves on lower branches of holly are more heavily thorned than those in the upper part of the tree)." In this connection it is worth pointing out here again that juvenile leaves with very different morphological characters are often seen in *Acacia* and *Eucalyptus,* even with differences in phyllotaxy in some cases, and numerous juvenile forms of gymnosperms have been awarded formal nomenclatural status [vid., Rehder, Man. Cult. Pl., ed. 2 (1940) 53, 54, 59, 60] as well as the well-known case of *Moultonia singularis* Balf. f. & W. W. Sm.

Clarke (1885) says after his description of "*V. alata* Heyne": "Dalz. & Gibs. Bomb. Fl. 201, not of Schauer, nor of Kurz", implying, I suppose, a binomial, *V. alata,* accredited to Dalz. & Gibs. and one accredited to Kurz; however, since he does not actually write out these homonymous binomials I am not recognizing them as having been effectively published and they do not appear in the synonymy given by me. *Vitex alata* Schau. is a synonym of *V. limonifolia* Schau.; *V. alata* Roxb. is *V. peduncularis* f. juv. *roxburghiana* (C. B. Clarke) Mold.; and *V. alata* Wall. is *V. peduncularis* Wall.

The only common or vernacular names listed for *V. altissima* f. juv. *alata* are "baruna", "milla", and "winged chaste-tree". The *Mail-elou* Rheede, often included in its synonymy, apparently belongs, rather to that of typical *V. altissima* L. f.

On *Worthington 2332* the lowest leaves are unifoliolate. The collections represented by *Alston 1328 and Moldenke & al. 28122, 28192, & 28252* were all (according to their accompanying labels) taken from "a young plant" or a "sapling" and *Moldenke & al. 28223* from "watersprouts from a cutdown stump - neighboring mature trees without broad wings". *Meijer & Balakrishnan 135* bears labels reading "tree bole 15 ft., crown 20 ft., girth 6 ft., bole fluted and twisted at base, inner bark orange-brown, sapwood ochre, hard" -- obviously taken from a mature tree, but there are no inflorescences on the herbarium sheets and the leaves are all of the *alata* type! Most important, however, is the R. Wight collection, cited below, from India which has the broadly alate petioles of *alata* and also inflorescences in full anthesis!

Material of *V. altissima* f. juv. *alata* has often been identified and distributed in herbaria as typical *V. altissima* L. f. or as its f. *subglabra* Thwaites. On the other hand, the *J. P. Lewis s.n.,* distributed as "*V. alata*", actually seems to be typical *V. altissima* L. f.

Citations: INDIA: Andhra Pradesh: *Santapau 20799* (Xa); *Santapau & Wagh 20697* [Wagh 2748] (Xa); *Wagh 1306* (Xa), *2859* (Xa). State undetermined: *R. Wight s.n.* [Peninsula Ind. orientalis] (N). SRI LANKA: *Alston 1328* (Pd); *Collector undetermined s.n.* (Pd); *Fosberg & Ripley 51942* (Pd, W--2764803); *König 77* in part [Herb. Linn. 811/3] (Ls, N--photo, Z--photo); *Meijer & Balakrishnan 135* (Pd, W--2716026); *Moldenke, Moldenke, Dassanayake, & Jayasuriya 28192* (Ac, Gz, Kh, Ld, Pd, Tu, W--2764435); *Moldenke, Moldenke, & Jayasuriya 28223* (Ac, E, Gz, Kh, Ld, Pd, Tu, W--2764478), *28252* (E, Pd, Tu, W--2764516); *Moldenke, Moldenke, Jayasuriya, & Sumithraarach-*

chi 28122 (Ac, Gz, Kh, Ld, Pd, W--2764553); *Mueller-Dombois & Comanor 67062530* (W--2586022A), *68102501* (W--2612108); *Ripley 246* (Pd); *Worthington 2332* (K). GREATER SUNDA ISLANDS: Java: *Backer s.n.* [Sept. 1903] (Bz--24714); *Koorders & Koorders-Schumacher 44484b* [449*] (Bz--23800), *44720b* (Bz--23799). Sumatra: *Bal 30* (Bz--23801); *Teijsmann 4287 H.B.* (Bz--23802). CULTIVATED: Florida: *Menninger s.n.* [Stuart, August 8, 1946] (N); *H. N. Moldenke 21477* (Z). India: *Voigt s.n.* [H. B. Seramp.] (Cp, N--photo, Z--photo). Java: *Herb. Bur. Agric. Manila IV.A.64* (N); *Herb. Hort. Bogor. XI.K.7* (Bz--25856, N), *XI.K.7a* (Bz, Bz, Bz, N), *XII.B (VI) 28* (Bz--25857, Bz--26246, Bz, Bz, N). Netherlands: *Herb. Lugd.-bat. 908267-237* (Le); *Royen 87* (E--photo, Le, N, N--photo, Z--photo), *777* (Le).

VITEX ALTISSIMA f. *SUBGLABRA* Thwaites

Additional & emended synonymy: *Vitex zeylanica* Turcz., Bull. Soc. Imp. Nat. Mosc. 36 (2): 223. 1863 [not *V. zeylanica* Burm. f., 1768]. *Vitex altissima* var. *zeylanica* (Turcz.) C. B. Clarke in Hook. f., Fl. Brit. India 4: 584. 1885. *Vitex altissima* var. *zeylanica* Clarke ex J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. 69. 1911.

Additional & emended bibliography: Thwaites & Hook. f., Enum. Pl. Zeyl. 244. 1861; Trimen, Journ. Ceyl. Br. Roy. Asiat. Soc. 9: [Syst. Cat. Flow. Pl. Ceyl.] 69. 1885; Trimen, Handb. Fl.Ceyl. 3: 358. 1895; J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Perad. Man. Bot. 2:] 69. 1911; Mold., Phytologia 16: 496. 1968; Mold., Fifth Summ. 1: 281 & 373 (1971) and 2: 713, 731, & 922. 1971; Mold., Phytologia 23: 438. 1972.

This is a form of questionable validity. It is described as having its mature leaf-blades "quite glabrate beneath" and 5 in number. In several collections cited below they are, indeed, apparently completely glabrous on both surfaces, but in others the depressions in the veinlet reticulation beneath are microscopically puberulent much as might be seen if the hairs were all mechanically brushed off from the typical form. Most of the specimens seen by me have 3 leaflets. More field work is needed to ascertain if this form is worth maintaining. Trimen (1895) says that it "is scarcely worth notice". Clarke (1885) cites *Thwaites s.n.* and *Walker s.n.* from Sri Lanka.

It should be noted that Burman's *V. zeylanica* is actually a species of *Stereospermum* in the *Bignoniaceae,* but it effectively precludes the use of the epithet, *"zeylanica",* by Turczaninow (1863) and therefore also by Clarke (1885). Turczaninow's *V. zeylanica* is based on *Gardner 674* from Sri Lanka.

Recent collectors describe *V. altissima* f. *subglabra* as a large subcanopy tree, 4--20 m. tall, the trunk 1 m. or more in girth, to 20 cm. in diameter, with steep buttresses, the bole 15 feet tall, the crown 20 feet wide, the bark "ochraceous-rosy-red" or light pinkish-brown, with many cracks, soft, 1 mm. thick, the living bark orange-brown, 3 mm. thick, the inner bark yellow when freshly cut, the sapwood ochre, the leaves 3- or 5-foliolate, the fruit green "when mature" [more probably when immature!], borne in "bunches on scorpioid cymes". They have found it growing in jungles and jungle margins, in submontane forests on steep hillsides, in low-stature evergreen forests dominated by *Mishodon zeylanicus* on reddish soil, "amongst cultivated land" and in "forest confines in open" in the wet zone, at low altitudes to elevations of 2500 feet. Kostermans refers to it as "common" and the Moldenkes refer to it as "rather abundant", bur Bernardi claims it to be "rare". It has been collected in anthesis in January, May, and June, and in fruit in January and October. Worthington comments that in the wet zone in Sri Lanka the leaves have "very long drip-points" as compared to those in drier districts.

The corollas are said to have been "pink" on *Kostermans 24109*, "pale-violet" on *Amaratunga 1343*, and "pale-blue and lilac" on *Bernardi 14183*. *Moldenke & al. 28238* exhibits one leaf with 5 leaflets; *no. 28189* was taken from a tree where only some branches had somewhat alate leaves, others non-alate, and the same situation was found on the tree from which *no. 28188* was taken; the trees from which *nos. 28228* and *28238* were taken had many leaves exhibiting narrow wings on the petioles.

It should be mentioned that, in spite of what Clarke asserts (1885), Thwaites, in the 1861 work cited by Clarke, actually does not propose a trinomial name for the subglabrous-leaved tree. His statement (for *V. altissima*) is merely "Folia subglabra vel subtus molliter pubescentia, petiolo saepe plus minus alato".

The only vernacular name specifically reported for this form is "milla".

Material of this form has been identified as typical *V. altissima* L. f. by many workers and also as *V. pinnata* L. and so distributed in herbaria. On the other hand, the *Collector undetermined s.n.* at Peradeniya and *Ripley 246*, distributed as this form, actually represent f. juv. *alata* (Willd.) Mold.

Additional citations: SRI LANKA: *Amaratunga 1343* (Pd); *Balakrishnan & Jayasuriya NBK.886* (N, Pd, W--2720184); *Bernardi 14183* (W--2766472); *Kostermans 24109* (Ac, Pd, W--2716116); *Meijer 412* (Pd, W--2718562); *Moldenke, Moldenke, & Jayasuriya 28220* (Ac, Gz, Kh, Ld, Pd, Tu, W--2764494, Z), *28228* (Ac, E, Gz, Kh, Ld, Pd, Tu, W--2764489), *28238* (Ac, E, Gz, Kh, Ld, Pd, Tu, W--2764480); *Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi 28188* (Ac, E, Gz, Kh, Ld, Pd, Tu, W--2764443), *28189* (Ac, E, Gz, Kh, Ld, Pd, Tu, W--2764442); *Mueller-Dombois 68102114* (Ld, Pd, W--2612110); *Sohmer, Jayasuriya, & Eliezer 8271* (Lc, N, W--2807753); *Waas & Peeris 540a* (W--2803418); *Walker s.n.* [Ceylon] (Pd--type); *Worthington 2528* (K), *3672* (K).

VITEX ALTMANNI Mold.

Additional bibliography: Mold., Phytologia 15: 227. 1967; Mold., Fifth Summ. 1: 328 (1971) and 2: 922. 1971.

VITEX AMANIENSIS Pieper

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber.

57 (2): 402. 1938; Mold., Phytologia 15: 227. 1967; Mold., Fifth Summ. 1: 238 (1971) and 2: 922. 1971.

Tanner describes this species as a tree, 8 feet tall, growing in groups, the stem single, the flowers aromatic, and the corollas "mauve". He encountered it in thickets on rich brown loam, flowering in October. He records the vernacular name, "mnegege", and asserts that the roots are used medicinally for "sharp pains in the stomach", the roots being boiled and the resulting liquid drunk.

Additional citations: TANZANIA: Tanga: *Tanner 3315* (N).

VITEX AMBONIENSIS Gürke

Additional & emended bibliography: Gürke in Engl., Pflanzenw. Ost-Afr. C: 340. 1895; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 317, 329, & 330. 1900; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 403. 1838; H. N. & A. L. Mold., Pl. Life 2: 81. 1948; J. K. Jacks., Journ. Ecol. 44: 353. 1956; Dale & Greenway, Kenya Trees Shrubs 593. 1961; Watt & Breyer-Brandwijk, Med. Poison Pl. S. East. Afr., ed. 2, 1055 & 1454. 1962; Mold., Phytologia 16: 496 (1968) and 17: 42. 1968; Van der Schijff, Check List Vasc. Pl. Kruger Natl. Park 81. 1969; Mold., Fifth Summ. 1: 234, 238, 241, 245, 246, 248, 252, 257, & 373 (1971) and 2: 713, 720, 789, 922, & 923. 1971; Palmer & Pitman, Trees South. Afr. 3: 1950, 1951, 1954--1955, 1957, & 1962. 1972.

Additional illustrations: Palmer & Pitman, Trees South. Afr. 3: 1954. 1972.

Ward encountered this species in sandy soil in the green-tree veld, at 200 feet altitude, flowering in November, and describes it as a shrub, 18 feet tall, with mauve corollas. Dale & Greenway (1961) assert that in Kenya it inhabits the scrub and forest edge in the coastal districts. They record the vernacular name, "mufudu", and cite *Jeffery K.152, Napier 6327,* and *Van Someren 64* from Kenya. Van der Schijff (1969) cites *Lam 27, "C.5434",* and *Van der Schijff 152, 740, 2902, & 3689* from Kruger National Park. Watt & Breyer-Brandwijk (1962) list the vernacular name, "mialali", and note that the plant is a Swahili antidote for snake-bite.

Palmer & Pitman (1972) list the common names, "Amboni vitex" and "mupfumbu-pfumbu", and say that the species "enters South Africa in the north eastern Transvaal and northern Zululand, and South West Africa in the Caprivi Strip, growing in coastal and inland bush, often on quartzite ridges, in scrub forest, and in savannah. In Zululand it is a particularly common species around False Bay. In South Africa it is usually a small or medium-sized tree, either bushy or straggling, or a shrub, although in tropical Africa it is reported up to 14 m. high. The bark is rough and gray or brown, the branches slender, and the young twigs covered with yellow-brown or mustard-coloured hairs...The flowers are white, lilac or purple, or sometimes 2-coloured, with a calyx that is red-brown and velvety -- as are the bracts....The fruits, ripe about April, are large -- up to 3.8 cm. in diameter -- oval, green spotted with white when young, turning purple, with a conspicuous saucer-like calyx. They are said to be inedible." [to be continued]

MAESA (MYRSINACEAE) IN MICRONESIA

By F. R. Fosberg and Marie-Hélène Sachet

The genus Maesa has many, mostly ill-distinguished species in the Indo-Pacific region. Four of these, one with three varieties, occur in Micronesia, all probably endemic. We present a tentative treatment with descriptions and a key. Two of the species and one variety are described here as new.

Maesa Forsk., Fl. aeg.-arab. 66, 1775.--Mez. Pflanzenr. IV, 236: 15-54, 1902.--A. C. Smith, Jour. Arn. Arb. 54: 3-36, 1973.

Shrubs or small trees, leaves simple, margins entire to dentate, pinnately veined, with secretory canals in the tissues, sometimes appearing as glandular lines or areolations on the surfaces; flowers in simple or branched racemes, these one or more in an axil, or in loose terminal panicles, with bracts at bases and apices of pedicels; flowers 4- or 5-merous, sepals imbricate or not at bases, margins often glandular-erose, surfaces usually gland-dotted; corolla deeply or shallowly lobed, tube included in or somewhat exserted from the calyx; anthers inserted in front of and below corolla lobes; ovary inferior or partly so, ovules many on a central placenta, hypanthium with or without longitudinal ridges or glandular lines, style short, from a lobate disk, stigma subcapitate to somewhat lobate; fruit baccate, crowned by persistent calyx, seeds loose or coherent in a mass embedded in pulp.

A. C. Smith (Jour. Arn. Arb. 54: 3-6, 1973) in discussing the Fijian Maesa species, has aptly described the taxonomic problems presented by this genus. The Micronesian species, though fewer, are fully as difficult. Here is offered a tentative treatment of the Micronesian species with a key which, it is hoped, may enable others to name specimens and possibly delimit populations in the field. Two new species and one new variety are described.

A character used in this key which may be unfamiliar, perhaps peculiar to the Myrsinaceae and especially to Maesa, is the presence of what have been called "nervilliform lines" (Mez), "resiniferous lines" (Mez), or "secretory canals"

(Smith) in the tissue of the leaves. These are not always evident in dried specimens though frequently more so in cleared preparations. In certain species, including 3 out of the 4 Micronesian ones, they show up as fine sinuously parallel lines forming a network or areolation, easily mistaken for a venation pattern. However, this areolation, dark in color, is seen, when magnified, to be independent of the network of veins. In the following key and descriptions, it is only mentioned if it shows up at least on the under surface of relatively young leaves in dried specimens. The areolation is usually somewhat elongate parallel to the principal side veins.

Key to Micronesian Taxa

1. Flowers tetramerous, young growth pilose.. *Maesa canfieldiae*

1. Flowers pentamerous, young growth scurfy to subglabrous...2

   2. Nervilliform lines forming an areolation with cells elongate parallel to the lateral nerves..............3

      3. Immature fruit with prominent vertical dark lines, stigma included in calyx, lenticels large, abundant on branches................. *Maesa walkeri*

      3. Immature fruit not lineate, stigma slightly exserted from calyx in young fruit, lenticels present but small and not abundant .... *Maesa palauensis*

   2. Nervilliform areolation lacking or at least not easy to see (*Maesa carolinensis*)..........................4

      4. Pedicels about 1 mm long or less.................................. *Maesa carolinensis* var. *subsessilis*

      4. Pedicels over 1 mm, elongating to 3-4 mm, becoming reflexed in fruit...............................5

         5. Leaves mostly broadly obovate, contracted to an acute or attenuate base............................ *Maesa carolinensis* var. *carolinensis*

5. Leaves mostly broadly ovate to very broadly elliptic, base founded to subcordate .... Maesa carolinensis var. kusaiensis

Maesa canfieldiae Fosberg & Sachet, n. sp.

Frutex vel arbuscula ramulis bruneolis minute lenticellatis brevi-pilosis, folia oblonga vel anguste ovata vel obovata acuminata marginibus subintegris supra sparse strigulosis infra costis venisque brevi-pilosis nervilliformi-lineolatis longi-areolatis, petiolis 1-1.5 cm, racemis axillaribus solitariis 1-2 cm longis vix ramosis sparse pilosulis, bracteis pedicellorum grandis vix connatis late ovato-deltoideis hispidulis lineatis, flore 4-mero, corolla tubo 203 plo lobis, bacca globosa lineata. (Typus: Angaur, Canfield 693 (US)).

Shrub or small tree, with slightly zigzag brown minutely lenticellate shortly pilose branchlets; leaves oblong to narrowly ovate or narrowly obovate, apex prominently acuminate, base rounded, margin subentire, upper surface sparsely appressed hirtellous, under surface paler, pilosulous on midrib and principal veins, with fine "nervilliform lines" parallel with main nerves, forming an elongate areolation quite visible to naked eye, petiole 1-1.5 cm, shortly pilose; racemes axillary, solitary, 1-2 cm long, not or very rarely branched, sparsely pilosulous, rhachis-bracts minute, acuminate, notably pilosulous, pedicels 1-2 mm long, bracts at their summits large, broadly ovate-deltoid, slightly carinate, slightly connate at least on one side, hispidulous, lineate, margin slightly glandular-erose; flowers 4-merous, calyx lobes broadly ovate, obtuse, lineate, glandular, hypanthium strongly glandular, corolla with tube 2-3 times the length of the lobes, sub-urceolate, strongly and closely lineate, lobes rounded to obtuse, some slightly mucronulate, anthers included, orbicular, on short filaments, inserted part-way up tube, style very short, included in calyx in fruit, stigma truncate, depressed in center; immature fruit globose, with many raised longitudinal dark brown lines, mature fruit globose, about 5 mm diameter, white, juicy, sweet, edible; seeds obpyramidal, mature ones unavailable.

This species is known only from Angaur, Palau, and is said by the local inhabitants to have only been known to them since World War II. It may well be an introduction from elsewhere, but we have not been able to match it. It seems closest to to obtuse or slightly bluntly acuminate, lower surface minutely puncticulate, veins 5-8 on a side, petiole 2-4 cm; racemes slender, up to 10 cm, scarcely scurfy, very densely flowered, pedicels to 4 mm, becoming reflexed, rhachis bracts ovate-triangular, bracts at summit of pedicel very broadly ovate, with very wide hyaline margins, margins of bracts and calyx lobes glandular-erose, calyx lobes broadly triangular-ovate, obtusish to acute, scarcely auriculate, black-dotted; corolla tube slightly exceeding calyx, lobes rounded, with dark veins when dry; style somewhat exserted from calyx in young fruit, stigma small, peltate.

Endemic to Ponape.

Caroline Is.: Ponape: s.l., Kanehira 837 (US), 1634 (US), 1557 (P); Langar, Hallier 92 (HBG, US); Paue, Monte Santo, 700 m, Ledermann 13586a (B, syntype, here designated as lectotype); Patapat, Abh. des Tols, 20-600 m, Ledermann 13187 (B, syntype).

Maesa carolinensis var. kusaiensis Fosberg & Sachet, n. var.

Folia late ovata vel late elliptica basi rotundata vel subcordata, rachidibus racemorum juniorum spadiceis-furfuraceis a var. carolinensis divergens. (Typus: Hosokawa 6341 (US)).

Leaves broadly ovate to very broadly elliptic, base rounded to subcordate, apex obtuse to broadly and bluntly slightly acuminate, petiole 1-3 cm; racemes only very shortly or scarcely pedunculate, rhachis and pedicels brownish scurfy when in flower. Otherwise as in var. carolinensis.

Endemic to Kusaie.

Caroline Is.: Kusaie: without loc., Kanehira 1359 (US); H. F. Moore 82 (US); Malemu, utwa, Fenkol-sanroku, VII. 31, 1933, Hosokawa 6341 (US, holotype, 2 sheets).

Maesa carolinensis var. subsessilis Hosokawa, Jour. Jap. Bot. 13: 612-613, 1937.

Leaves as in var. carolinensis but usually somewhat narrower (except in Hallier 93 and Evans 1263), petiole 1-2 cm, racemes usually fascicled, on dwarf branchlets, 2-4(-5) at a node, not pedunculate, not or scarcely scurfy, pedicels mostly

M. papuana Warb., to which it keys in Mez monograph (Pflr. IV, 236: 16-23, 54, 1902), and to M. tetrandra (Roxb.) A. DC., to which it keys in Backer and Bakhuizen, Flora of Java 2: 195, 1965. From M. papuana it differs in the abundant pilose rather than scurfy indument and the much larger leaves with longer petioles. From M. tetrandra it differs in the rounded rather than ovate-triangular corolla lobes, the included rather than exserted stamens, the much shorter leaf-pubescence, and the prominent rather than obscure or absent nervilliform areolation. It agrees with both these species in the long corolla tube and tetramerous flowers.

Caroline Is.: Palau Is.: Angaur I.: along road NE of boat basin, 3 m, Canfield 693 (US, holotype); along old road, parallel to and W of airstrip, 4 m, Canfield 210 (US); 0.6 mi. E of boat basin, 3 m, Canfield 416 (US); along road above S bank of NW lake, 10 m, Canfield 759 (US); along road 1/4 mi. W of S end of airfield, 3 m, Canfield 767 (US).

Named for the collector of all of the known specimens, Miss Joan Canfield, former Smithsonian Peace Corps volunteer botanist who made notable collections in Palau in 1977-1979.

Maesa carolinensis Mez, Bot. Jahrb. 56; 535, 1921.

Shrub or small tree, young parts and racemes glabrous to somewhat scurfy, twigs rather prominently lenticellate; leaves with medium to broad blades, not noticeably nervilliform-areolate, margins entire to slightly undulate, petioles much shorter than blades; racemes 1 to usually several in an exil, nearly as long as leaf blades, pedicels becoming reflexed, bracts minute, those at summit of pedicel to 2 mm long; flowers 5-merous, corolla tube included in calyx; immature and mature fruit without vertical lines or ridges, about 3 mm diam. (Type: Ponape, Ledermann 13586a (B)).

Endemic to Eastern Caroline Islands, one variety each on Truk, Ponape and Kusaie.

Maesa carolinensis Mez var. carolinensis

Glabrous, leaves tending to be broadly obovate, up to 24 cm long contracted to an acute or attenuate base, apex rounded less than 1 mm long, even in fruit; calyx lobes rounded, tending to become acute in young fruit, disk very small, stigma included in persistent calyx.

Endemic to Truk Group.

Caroline Is.: known from Moen, Dublon, Fefan, Tadiu, Eten, Tol islands. Vernacular name "erenippoi."

Caroline Is.: Truk: s.l. Koidzumi in 1915 (US); Moen I., 100-400 m, Evans 1263 (US, BISH); Dublon I., Hosokawa 6540 (US); Tol I. Hosokawa 8322 (US, isotype); Mt. Tumital, Fosberg 24454 (US, BISH, Fo); "auf dem Tolowan," Hallier 93 (HBG, US).

Maesa palauensis Mez, Bot. Jahrb. 56: 536, 1921.

Maesa sp., Kawagoe, Bull. Kagoshima Imp. Coll. Forestry 3: 188, 1918.

Shrub or small tree, branchlets slightly zigzag, only moderately lenticellate, youngest parts rusty scurfy; leaves very broadly elliptic or ovate to suborbicular, apex bluntly somewhat acuminate or acutish to obtuse or rounded, base obtuse to rounded or subtruncate, margin irregularly slightly undulate, slightly revolute, main veins 6-8, nervilliform areolation of under side of young leaves tending to be dark and areolae somewhat elongate parallel to direction of main veins, crossed by occasional heavier veins, petiole 2.5-5 cm long; racemes 3-8 cm long, not pedunculate, well-developed ones with one to several branches near base at nearly 90° to rachis, not particularly scurfy even when young, bracts at bases of pedicels about 1 mm long, ovate triangular, the pair at summit of pedicels similar, slightly broader, slightly acuminate or not; calyx lobes triangular-ovate, usually somewhat acuminate, somewhat hyaline-margined, slightly glandular-erose; coralla tube included or somewhat exserted from calyx, lobes rounded; style included in calyx, even in fruit, very short, stigma scarcely larger than style, obscurely lobate, center tending to be depressed, disk lobate, decurrent on style; fruit globose, fleshy, about 3 mm thick, white or pinkish white, crowned by somewhat appressed or connivent calyx lobes, at least when immature not lineate. (Type: Palau, Koror, Ledermann 14084 (probably destroyed)).

Most easily distinguished from M. carolinensis by the visible nervilliform areolation on young leaves and the more frequently branched racemes.

Known only from the Palau Islands, widely distributed there. Vernacular names "ngalibeab," "detimel," "bleagd."

Caroline Is.: Palau: "Coral Is." Kanehira 2547 (US); S Babeldaob, Airai Munic., along airport road W of Gihmel R., Canfield 579 (US); NE Koror, 1/2 mi. S of Koror-Babeldaob bridge, 4 m, Canfield 569 (US); 5-10 m, "ngalibeab" (sterile), Fosberg 32100 (US, BISH, Fo, NY); north section, 25 m, Hosaka 3324 (US, BISH, Fo, NY); Ngermid, Salsedo 344 (US); Tor Uil I.: between Koror and Malakal, 3 m, "detimel," Fosberg 47604 (US, BISH, Fo); Todai-yama, Kanehira 1869 (US, P); Urukthapel: east end of island, 1 m, Fosberg 32020 (US, BISH, Fo, NY, L); s.l., Dutton 89 (US, BISH, Fo); south side of SW peninsula 1-2 m, Fosberg 32228 (US, BISH, Fo, NY, L); Dutton 89 (US, BISH, Fo); Peliliu: Tuyama s.n. in 1937; Blackburn 284 (US, BISH); Purple Beach, east coast, coral spit, 2 m, Fosberg 32007 (US, BISH, Fo, NY, L); Angaur: northwest corner of island, 25 m, Fosberg 25898 (US, BISH, Fo, NY, L); NW Angaur, S of NW Pond, 10 m, Canfield 698 (US); roadside midway between Lakes A & D, 10 m, Canfield 207 (US).

Maesa walkeri Fosberg & Sachet n. sp.

Maesa sp. Fosberg, Checklist Guam Pl. 79, 1960.

Frutex vel arbuscula, ramulis castaneis, conspicue albo-lenticellatis, glabris praeter pars juvenibus spadiceo-furfuraceis; folia ovata vel late-ovata plerumque acuta basi rotundata vel subcordata saepe inaequalibus, marginibus leviter dentatis vel subintegris, petiolis gracilis 1-3 cm; racemis axillaribus maxime 9 cm raro ramosis, pedicellis 2-4 mm, post anthesin reflexis, bracteis deltoideis; lobis corollis 5, orbicularibus in sicco venosis; bacca globosa lineata 5-6 mm diametro. (Typus: Rota, Fosberg 31858 (US)).

Shrub or small tree, to at least 3 m tall, branchlets reddish brown, conspicuously white-lenticellate, not or scarcely zigzag, glabrous except youngest growth brown-scurfy; leaves ovate to broadly ovate, varying greatly in size from plant to plant, 5-12 cm long, apex usually bluntly acute, rarely obtusish, base rounded to truncatish or subcordate, frequently the two sides somewhat unequal, margins shallowly dentate to subentire, midrib red, nerves 5-9 on a side, reddish, tending to be somewhat closer together near base, nervilliform areolation clear beneath, somewhat elongate parallel to nerves, petioles slender, 1-3 cm long; racemes up to 9 cm long, usually much less, rarely branched, with pedicels nearly to base, bracts firm, triangular, acute, pale or, rarely, black margined, pedicels becoming reflexed in fruit, 2-4 mm long; calyx lobes broadly ovate, acutish, slightly glandular-erose; corolla white, tube subequal with calyx, lobes orbicular, auriculate, abundantly marked with dark red or brown veins when dry; anthers orbicular, about 0.5 mm across, on short filaments; style about 0.5 mm long, funnel-shaped at apex, stigmatic margin irregularly 5-lobed; fruits globose or subglobose with numerous fine vertical lines or ridges when almost mature or mature, 5-6 mm in diameter, fleshy, translucent white or pink when mature, soft, with little flavor but somewhat refreshing when eaten; seeds dark brown, roughly tetrahedral, angular, about 1 mm long, surface dull, cellular-reticulate.

Probably closest to M. palauensis, but differing in unbranched racemes and conspicuously lined immature fruits. Known only from Rota and Guam in the southern Marianas.

Marianas Is.: Rota: road to Sabana area, 200-400 m, Sachet 1800 (US, BISH); west end of island above Songsong, 200-300 m, Sachet 1778 (US, BISH, POM, MO, L); second terrace from top, 320m, Fosberg 31858 (US, holotype, BISH, Fo, NY, L, isotypes); trail up to Sabana region, 150-250 m, Evans 2134 (US, BISH, Fo, NY, L).

Guam: south peak of Mt. Lamlam, 380 m, Fosberg & Evans 46243 (US, BISH, Fo, MO, L); ridge south of Mt. Lamlan, 385 m, Fosberg 35331 (US, BISH, Fo, NY, L); track from Cetti Bay lookout to top of Mt. Lamlan, 200-405 m, Evans 1721 (US, BISH, Fo, NY, L); Mt. Lamlam, 370 m, Fosberg 46249 (US, BISH, Fo, NY); Moran 4708 (US), Moore 243 (US).

Dedicated to Dr. Egbert H. Walker, for many years a leading authority on the Myrsinaceae.

BOOK REVIEWS

Alma L. Moldenke

"WHY BIG FIERCE ANIMALS ARE RARE. An Ecologist's Perspective" by Paul Colinvaux. viii & 256 pp. Princeton University Press, Princeton, New Jersey 08540. 1978. $9.50.

This is a small, easy-to-read collection of essays that seem deceptively more like written out chats easy to pick up but hard to put down because of the effective explanations to basic questions like the title, why the sea is blue, and many more. "All the machinations of life in ecosystems must be products of the process of natural selection.....which designs species." Every species has its niche (place in the grand scheme of things) and its breeding strategy to leave the largest possible number of surviving offspring, yet the total numbers remain the same because the number of habitats (for niches) is about the same - resulting in "a tenuous peaceful coexistence of the living things on earth. But eventually one kind of animal [guess?] found it possible to keep occupying new niches at will, always adding the niche-spaces of others to its own......inevitably hostile to the interest of almost all the other kinds, for it engages in aggressive competition, instead of peaceful coexistence." There is much, much more that you will find on reading and rereading this book. Do get yourself a copy.

"POPULATIONS IN A SEASONAL ENVIRONMENT" by Stephen D. Fretwell, xxiii & 217 pp., 64 b/w fig. & 13 tab. Princeton University Press, Princeton, New Jersey 08540. 1972. $14.00 clothbound & $4.95 paperbound.

This is the fifth of the valuable Monographs in Population Biology series produced by this press under the general editorship of R. J. MacArthur who with E. O. Wilson also authored the first and now most famous monograph, "The Theory of Island Biogeography".

The preface explains the use of the hypothetico-deductive philosophy and the construction and validity of a model. The first three chapters demonstrate a population analysis technique that accommodates seasonal features - important since most organisms live in some kind of seasonal environment. The next group considers how a bird species population behaves during a particular season. One of the objectives of population ecology is "to find systems in nature analogous to those we work under ourselves.....; perhaps man's economic and social life can be subjected to the same kind of comparative analysis that his physiology now receives." There is important reading here.

"A GUIDE TO THE BIRDS OF VENEZUELA" by Rodolphe Meyer de Schauensee and William H. Phelps, Jr. & plates by Guy Tudor et al., xxii & 425 pp., 40 color & 13 b/w plates & 41 line draw. fig. Princeton University Press, Princeton, New Jersey 08540. 1978. $50.00.

Just over three decades ago the then younger Phelps showed us some of the bird wonders of Venezuela. His skills and interests were conspicuously evident then. He continues his famous father's interest so that their joint and separate collections comprise "the finest scientific collection of Venezuelan birds in the world." South America has about 33% of the birds of all the world and "little Venice" or Venezuela has 44% of them from 20 orders, 81 families, 589 genera, 1296 species and 2102 subspecies and this book has almost every species well illustrated, mostly in color.The concomitant text gives family characteristics briefly, scientific names, common English and Spanish names, sizes, basic features, habits, habitats and ranges. Endpaper maps show areas adjacent to Venezuela and most of the place names mentioned in the text. This study will prove of great use to the many, many birdwatchers and ornithologists visiting Venezuela and surrounding areas as well as the biology students at the local colleges and university. It will supercede the 1954 English and Spanish editions of Kathleen D. Phelps' "Aves de Venezuela, cien de las mas conocidas".

"SYSTEMATIC BIOLOGY - Proceedings of an International Conference", xiii & 632 pp., 60 b/w fig. & 19 tab. National Academy of Sciences Publication 1692, Washington, D. C. 20418. 1969. $16.00.

Although this conference, held at the University of Michigan, sponsored by the National Research Council, was convened back in 1967, these papers and their discussions originating from it still make important reading for students of systematics. Fortunately the book is still available. Some major topics covered are: the role of systematics in biology (E. Mayr), an historical review (F. Stafleu), its principles and concepts, systematics of plant populations (B. Ornduff), ecological aspects of the systematics of plants and of animals, molecular data in microbial, plant (J. Hunziker) and animal systematics, isolating mechanisms, comparative morphology, comparative animal behavior, comparative cytology, biometrical and computer techniques. E. O. Wilson ends his clearly analytical summary of these important papers with his inviting challenge for "pure systematics.....[whose] proprietary goals..... are among the most interesting and difficult in modern science, and they should occupy us, the best minds we can attract to join us, and our successors for many years to come."

"THE PLANT COLLECTORS OF NORTHERN MEXICO" compiled by Irving W. Knobloch, vi & 98 pp. Latin American Studies Center Monograph Series No. 17, Michigan State University, East Lansing, Michigan 48824. 1979. $3.00 paperbound.

For about 300 collectors in this area there are given vital statistics and notes such as "He started his Mexican collecting in 1885 and continued this for 26 years.....He distributed 500,000 sheets of 20,000 species of which 12% were said to be new" for PRINGLE, Cyrus Guernsey and are followed by abbreviations for the herbaria housing these collections and sources of this information. There are people who worked with the U. S. - Mexican Boundary Survey. There are those for whom plant collecting was not only a satisfying dedication but also very strenuous indeed as indicated by such phrases as "died at sea", "drowned in Costa Rica", "starved to death", and "he worked at the Academy of Natural Sciences in Philadelphia for 69 years". It is helpful to have the contents of this publication so readily and reasonably available now.

"THE UNQUIET LANDSCAPE" edited by Denys Brunsden, John C. Doornkamp & D. Ingle-Smith, 168 pp., 76 color & 148 b/w photo, 10 color & 14 b/w maps, 39 color & 38 b/w fig. Halsted Press of John Wiley & Sons, New York, N. Y. 10017. 1977. $12.95 paperbound.

The British Geomorphological Research Group originally published this study serially starting in 1975 in the Geographical Magazine (London). This all-in-one reasonably priced edition makes these beautiful photographs and the descriptive, explicative text by 21 different specialists available to many more general readers, teachers, students, and scientists in geomorphology and related fields. Mountains, rift valleys, volcanoes, landslides, rivers, deltas, lakes, seacoasts, coral islands and reefs, glaciers, deserts, savannas, equatorial forests, Karst landforms and man-made landforms are all presented very effectively. "Man's remodelling of the landscape has been achieved in the space of only 10,000 years. Furthermore, the potency of his influence will become increasingly felt with continued growth of population and technology." The world map of temperate landforms omits showing the mediterranean area in western Chile, one site of the recent comparative studies undertaken by the International Biological Program.

"BIOLOGICAL PHYSICS" by D. C. S. White, xviii & 293 pp., 118 b/w fig., 14 tab. & 3 photo. Halsted Press of John Wiley & Sons, Inc., New York, N. Y. 10016. 1974. $11.95 paperbound.

"This book is an introduction to the physical principles encountered by biologists [that] originated as a set of papers provided to undergraduates at the University of York [U. K.] attending a lecture course on Physics for Biologists during their undergraduate Biology degree." The physical topics covered are: vectors, mechanics, deformation of solids, motion of fluids, surface tension, energetics and control in biological systems, heat, electricity, magnetism, electronics, apparatics, sound, light and radioactivity with multiple biological applications and problems. Solutions, not just the answers, are given at the back of the book for the problem-questions. There are also given useful tables, making the book really helpful, especially for individual study or review.

"INTRODUCTION TO MATHEMATICS FOR LIFE SCIENTISTS" by Edward Batschelet, xiv & 495 pp. & 200 b/w fig. Springer-Verlag, New York, N. Y. 10010. 1973. $9.80 paperbound.

This work was originally published in 1971 as Volume 2 in the Biomathematics series edited by Krickeberg, Lewontin, Meyman and Schreiber. There seems to be a newer edition dated 1975 with the paperbound edition priced at $11.95 and hardcover at $27.60 which I have not yet seen. The text here at hand is designed for an introductory course for all kinds of biology and medical majors, for a reference source to find mathematical methods suitable to their research problems, for self study and as a guide for teachers. References to pertinent literature are very helpful. Omitting statistics and computer methodology which are usually presented in separate courses and understood more readily after the current text is assimilated, this book covers: real numbers; sets; relations; power, periodic, exponential and logarithmic functions; limits; graphical methods; differential and integral calculus; probability; matrices and vectors; and complex numbers.

"THE ILLUSTRATED ENCYCLOPEDIA OF TREES - Timbers and Forests of the World" edited by Herbert Edlin, Maurice Nimmo et al., 256 pp., 390 color photo, 410 color draw., 91 b/w line draw. & 3 maps. Harmony Books of Crown Publishers, New York, N. Y. 10016. 1978. $15.95.

This book provides a "feast for the eyes" with its 800 beautiful color illustrations of over 250 species of trees. The concommitant text was prepared by fourteen botanical and forestry experts of the United Kingdom. The first section deals with the structure and functioning of the living tree, the forest ecosystem, reaping the timber harvest, and the uses and products of wood. Trees can be the universal providers if man does not waste them and does replace them. "If man is to continue to base his economy on the resources he draws from the guardian forest, then he must become its dedicated protector." There follows a guide to conifers, a guide to the broadleaved trees of temperate and mediterranean areas, and then a guide to the tropical and southern hemisphere trees, including palms. Coverage is worldwide. This attractive and informative encyclopedia has a useful glossary and index and is reasonably priced. Botanical and forestry institutions, schools, even on the elementary level, as well as high schools and colleges, should find this book a good acquisition for their libraries as should the local public libraries.

"BIRDS OF PREY OF THE WORLD" text by Mary Louise Grossman & John Hamlet, photography by Shelby Grossman, 496 pp., 54 full-color plates & 478 b/w photo, 425 range maps & 646 flight silhouettes. Bonanza Books of Crown Publishers, Inc., New York, N. Y. 10016. 1964. $25.00.

The glories of this oversize book (new printing?) are the excellent, numerous color and black/white photographs highlighting so many different activities and features of hawks and owls the world over. The interesting and carefully prepared, detailed text blends well with the illustrations. The Prehistory Chapter tells of the origin of birds in the Mesozoic and of the many kinds that developed during different epochs of the Cenozoic as summarized in an illustrated 2-page chart. The fine Predators and Man Chapter traces, through cave paintings and other art forms, these birds' influence on superstitions and religions. The Ecology and Survival Chapters describe and with almost motion-picture effect show how several successful adaptations work. The Conservation Chapter relates many incidents on "man as predator upon the birds of prey, for in his enthusiasm to control their abundance in any locality, he has resorted to every annihilative device born of his inventive brain. From a variety of traps and subtle poisons to high-powered rifles and shotguns, he has now equipped himself with machines that outdistance all he pursues across land and water - he even ascends into the air, himself to hunt like a bird of prey....[Man has] the ability to kill to extinction, but also.....knowledge, and with it, responsibility."

The second part of this book is taxonomic, presenting Orders *Falconiformes* and *Strigiformes* with descriptions, illustrations, distribution maps and regional guides. For students of ornithology and ecology and "birders' looking for more information or related pursuits in bad weather this book is a treasure store!

"GARDENER'S DELIGHT" by John Seymour with illustrations by Peter Morter, 96 pp., 43 color pl. Harmony Books of Crown Publishers, Inc., New York, N. Y. 10016. 1979. $5.95.

This book is truly a delight for any gardener anywhere, plant lover, book lover, natural art enjoyer, and anyone interested in the 16th/17th century herbals, in alleged healing qualities of plants and in the history of plant food preparations. It makes a charming and inexpensive gift to give or to receive. Each beautifully colored and well drawn plate appears on the right hand side page with the plant's scientific and common name(s) and one or more illustrations. On the matching left hand is the common name(s), family, plant growth type, description often with historical quotes from Parkinson, Gerard, Culpeper, etc., preparation and use of the food and lastly planting directions. This may not sound "charming" and "delightful", but it most certainly is! The plate on spearmint, *Mentha spicata,* does not show consistently sessile leaves; nor does that of the peppermint, *M. piperata,* consistently show petiolate leaves. Are the plants or the drawings inconsistent?

"BACK ROADS OF OREGON" by Earl Thollander, 208 pp., 85 maps, 116 b/w & 6 color draw. Clarkson N. Potter, Inc., distributed by Crown Publishers, Inc., New York, N. Y. 10016. 1979. $14.95 clothbound & $8.95 paperbound.

Like the artist-author's other books in this series, this new one "is a travel guide, and on-the-spot pictorial record of landscapes and places seen......I drew this book not only because of an urge to describe to everyone what wonderful things I have seen in Oregon, but also to help others, in my small way, discover the beauty of the natural world. Without strong support from concerned people, preserving and managing the natural areas that remain will be difficult." There is beauty, charm and intimacy in the backroad sites chosen for sketches and words about the lakes and creeks, the mountain ranges and canyons, the wild flowers and sagebrush, the state parks and farmlands, the mighty rivers and ocean shores.

"IMMS' OUTLINES OF ENTOMOLOGY" Sixth Edition by O. W. Richards & R. G. Davies, 254 pp. & 95 b/w fig. Chapman & Hall, Ltd., London EC4P 4EE & distributed in the U.S.A. by Halsted Press of John Wiley & Sons, New York, N. Y. 10017. 1978. $24.95 clothbound.

The various editions of this outline have been very useful especially for agriculture, forestry, entomology and biology students as a summary of and companion to Imms' "General Textbook of Entomology" particularly in British-influenced schools and technical institutes. It could now become more widely used in the United States. This outline's 6th edition matches the text's 10th edition of 1977 and is entirely reset with many small modernizations in the physiology, phylogeny and bibliography sections. On page 105 the bedbug genus is misspelled.

"THE DYNAMICS OF ARTHROPOD PREDATOR-PREY SYSTEMS" by Michael P. Hassell, vii & 237 pp., 82 b/w fig. & 7 tab. Princeton University Press, Princeton, New Jersey 08540. 1978. $16.00 clothbound & $6.95 paperbound.

This study is No. 13 in that fine series of Monographs in Population Biology, of small size, easy-to-read printing, data set into reasonable mathematical models, text well and convincingly written, and concepts clearly developed by these techniques. With arthropods much of the data can be collected from caged specimens not only for predator-parasites that feed directly on their prey but also for insect parasitoids (14% of known species, mostly hymenops and dips) in which only the adult female searches for hosts for ovipositing. Some of this material is extrapolated for biological control of crop and food pests. Even the dangers of accidental importation of hyperparasitoids are plotted.

"CASTE AND ECOLOGY IN THE SOCIAL INSECTS" by George F. Oster & Edward O. Wilson, xv & 353 pp., 1 color plate, 86 b/w fig., & 3 tab. Princeton University Press, Princeton, New Jersey 08540. 1978. $20.00 clothbound & $7.50 paperbound.

This important new study, a prolegomenon, of the theory of caste evolution among social insects is presented as Number 12 in the Monographs in Population Biology. The entire book is organized around a series of mathematical models having "two purposes: (1) to provide an unambiguous conceptual structure for the theory, and (2) to serve as a guide for future empirical research....We have chosen to view the evolution and ecology of insect castes from the perspective of ergonomic efficiency -.....the only theme that is both unifying and sufficiently explicit to offer some hope of empirical verification -.......Natural selection generally acts to increase ergonomic efficiency".

"We feel justified in making optimization theory the cornerstone of caste theory. The rigidity of caste systems, their stability through evolutionary time, and the existence of literally thousands of species that can be examined as independent evolutionary experiments make the theoretical enterprise feasible." In between these statements in the text are the examples from those termites, wasps, ants and bees whose caste systems have been evaluated with intelligent results well worth the reading and possibly further pursuing.

"TERRESTRIAL ENVIRONMENTS" by J. L. Cloudsley-Thompson, iii & 253 pp., 23 b/w fig., 2 tab. & 6 maps. Croom Helm Ltd., London SW.11 & U.S.A. distributor Halsted Press of John Wiley & Sons, Inc., New York, N. Y. 10017. 1979. $12.95 paperbound.

The original 1975 hardcovered edition was enthusiastically reviewed in a previous issue of this journal; now this moderate (but not inexpensive) flexible-covered, small-margined edition is available to ecology students and teachers and ecologists especially who want their own (extra) small-sized copy (perhaps) to mark up with their own notes. Accordingly, this new edition is also enthusiastically welcomed as it delineates "the more important terrestrial habitats of the earth, with special respect to their influence on the fauna".

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SOME PROBLEMATIC SPECIES OF *ALBIZIA*

Christine J. Niezgoda & Lorin I. Nevling, Jr.
Field Museum of Natural History, Chicago, Illinois 60605

Like most genera of the Mimosoideae, *Albizia* is ill-separaated from its relatives (Fosberg, 1965). It is a difficult group whose taxonomy is not firm as the traditional means of distinguishing the genus on the basis of the legume is inconvenient and sometimes misleading. In a previous paper we proposed to limit the genus *Albizia* in the New World to those species which have 16-grained polyads (for further discussion see Niezgoda & Nevling, 1979). An expanison of the study of *Albizia carbonaria* brought several other species of *Albizia* to our attention. These are characterized by having 32 pollen grains per polyad rather than 16.

In the New World there are 28 species of *Albizia* that are described from this area and an additional six Old World species that have become naturalized and widespread through deliberate cultivation. Eleven of these native species have been transferred from other mimosoid genera, primarily *Pithecellobium* (apparently the closest relative to *Albizia*). Of those that have been described since 1925, eighteen have been the work of Britton and his collaborators (Killip, Rose and Wilson). Flowering material was available from about half of these species and the majority have a polyad of 16 grains (Table 1). Aside from *Albizia carbonaria*, we found three additional species with 32-grained polyads: *A. longepedata; A. marthae;* and *A. nicoyana.*

The confusing *Albizia longepedata* has gone through a long history of nomenclatural changes. The plants of this species have been placed in six genera with three epithets. The earliest valid name, *Acacia guachapele* H.B.K., was later transferred by Bentham into *Lysiloma*. A new epithet, *longepedatum*, was established in *Pithecellobium* by Pittier, who later created *Samanea samaningua* for the same species complex. Macbride, following the earlier recognition of *Pithecellobium* by Pittier, made an additional combination *P. samaningua*. Later Macbride also recognized *Pithecellobium guachapele* referring back to the earliest valid epithet. Two of the *Pithecellobium* combinations, *P. longepedatum* and *P. samaningua* have subsequently been transferred into *Albizia*. Additionally, Harms established a new genus *Pseudosamanea*, with type species *P. guachapele*, based on *Acacia guachapele*.

It is obvious from these numerous combinations that many of the authors were doubtful as to the correct generic placement of this species. Additionally, Schery (1950) notes, "This species *A. longepedata* is quite distinct from other species of *Albizia* in Panama, differing primarily by its pronouncedly umbellate, long-pedicellate flowers". Britton and Rose, who made the original combination in *Albizia* refer to this species under *Pseudosamanea* at a later date (1936). *Pseudosamanea* is a monotypic genus that is easily distinguished from other genera in the Ingeae by the enlarged and sterile central flower in mature inflorescences. It is our opinion that this is the proper placement of this species and we recognize *Albizia longepedata* as a nomenclatural synonym of *Pseudosamanea guachapele*.

Pseudosamanea guachapele (H.B.K.) Harms, Notizb. 11: 54, 1930.

Acacia guachapele H.B.K., Nov. Gen. & Sp. 6: 281, 1824. (TYPE: *Humboldt & Bonpland s.n.*).

Lysiloma guachapele (H.B.K.) Benth., Trans. Linn. Soc. 30: 533, 1875.

Pithecellobium longepedatum Pittier, Contr. U.S. Nat. Herb. 20: 464, 1922. (TYPE: *C. Werckle s.n.* US).

**Samanea samaningua* Pittier, Arb. y Arbust. n. Venez. dec 4-5: 54, 1925. (TYPE: *Pittier 11442*).

Albizia longepedata (Pitt.) Britton & Rose, Tropical Woods 11: 14, 1927.

Pithecellobium samaningua (Pitt.) Macbr., Candollea 6: 4, 1934.

Pithecellobium guachapele (H.B.K.) Macbr., Field. Bot. Vol. 13, Part 3(1): 54, 1943.

(see also: *Pithecellobium guachapele* (H.B.K.) Cowan, Mem. N.Y. Bot. Gard. 10(1): 144, 1958.)

Albizia guachapele (H.B.K.) Dugand, Phytologia 13: 389, 1966.

* Another citation for this name is: Bol. Cient. y Tecn. Mus. Com. Venez. 1: 54. 1925. This is an incorrect reference as the journal consisted of only two issues, both published in 1927. The first volume has only 48 pages. After the first two volumes it was continued as Trabajos del Museo Comerical de Venezuela.

The other two species, *Albizia marthae* and *A. nicoyana*, were described lacking fruiting material. There are very few collections of either of these species and none with mature fruits. Also the placement of *A. (?) nicoyana* was considered questionable at the time of publication. There are no substantial morphological characters present to separate these species of *Albizia* from *Pithecellobium*. However, the presence of 32-grained polyads supports their transfer from *Albizia* to *Pithecellobium*.

Pithecellobium marthae (Britton & Killip) Niez. & Nevl., comb. nov.

Albizia marthae Britton & Killip, Ann. N.Y. Acad. Sci. 35: 133, 1936. (TYPE: *H. H. Smith 296* US).

Pithecellobium nicoyanum (Britton & Rose) Niez. & Nevl., comb. nov.

Albizia nicoyana Britton & Rose, N. Am. Fl. 23: 47, 1928. (TYPE: *A. Tonduz 13885*).

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TABLE 1: Species of *Albizia* found in the New World.

SPECIES	POLYAD #	OTHER PLACEMENTS
A. adinocephala	16	= *Pithecellobium*
A. berteriana		= *Acacia*
A. carbonaria	32	= *Pithecellobium**
A. caribea	16	= *Pithecellobium*
A. colombiana		
A. coripatensis		= *Pithecellobium*
A. cubana		
+*A. distachya*	16	
A. (?) dubia		
+*A. falcataria*	16	= *Adenanthera*
A. guachapele	32	= *Pseudosamanea*
A. hassleri	16	= *Pithecellobium*
A. hummeliana		
A. idiopoda	16	= *Pithecellobium*
+*A. julibrissin*	16	
+*A. lebbeck*	16	
A. longepedata	32	= *A. guachapele*
A. (?) longipes		
+*A. lophantha*	16	
A. lundellii		
A. malacocarpa	32	= *A. carbonaria*
A. marthae	32	
A. (?) nicoyana	32	
A. niopoides	16	= *Pithecellobium*
A. (?) obliqua		
A. occidentalis	16	
A. ortegae		
A. paucipinnata		
A. pedicellata		
A. plurijuga		
A. polycephala	16	= *Pithecellobium*
+*A. procera*	16	
A. (?) purpusii	16	
A. rubiginosa		= *A. lundellii*
A. sinaloensis		
A. tomentosa	16	= *Pithecellobium*

+ Old World species.

* The new combination in *Pithecellobium* was incorrectly published in Phytologia 44: 307-312, the following is the correct citation:

Pithecellobium carbonarium (Britton) Niez. & Nevl.

MATAYBA APETALA (SAPINDACEAE) NEW FOR THE FLORA OF PANAMA

Thomas B. Croat
Missouri Botanical Garden

Since completion of the Sapindaceae in the Flora of Panama (Croat, 1976), a species of Matayba, M. apetala (Macfad.) Radlk. has been collected in the Canal Zone. This species is otherwise known only from the West Indies (Greater Antilles) and Central America north of Guatemala. It has been collected in Belize and as far north as the state of Veracruz in Mexico. The Panama locality is noteworthy in being somewhat disjunct and even more noteworthy is the fact that the species was collected in the Canal Zone in an area that has in general been well collected. It was first discovered there by Gene Sullivan, who was making his first collecting trip in the tropics. Since the species was not treated in the Flora of Panama, a complete description follows:

Matayba apetala (Macfad.) Radlk., Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 9:535. 1879.

Cupania apetala Macfad., Fl. Jam. 1:162. n. 2. 1837. TYPE: Jamaica (not seen).

C. oppositifolia A. Rich., Fl. Cub., in Ramon de la Sagra, Hist. etc de Cuba I. 292. tab. 32. 1845. TYPE: Cuba, Guanaba, in Vuelta de Abajo (not seen).

C. mexicana Turcz., Bull. Mosc. 31(1):405. 1858. TYPE: Mexico, Veracruz, near Mirador, 3,000 ft. Linden 734 (not seen).

Ratonia apetala Griseb. non Wright, Fl. Brit. W. Ind. Isl. 126. 1864. TYPE: Same as Cupania oppositifolia A. Rich.

Matayba mexicana (Turcz.) Radlk., Sitz. Bayer. Akad. 9:536. n. 482. 1879.

M. oppositifolia (A. Rich.) Britton, Scient. Surv. Porto Rico V:4(1924) 528.

M. apetala f. oppositifolia Radlk. in Urb., Symb. Antill. I 354. 1899. TYPE: Same as Cupania oppositifolia A. Rich.

Cupania verapazensis Lundell, Wrightia 5:2. 1972. TYPE: Guatemala, Baja Verapaz, Unión Barrios, Contreras 11333 (LL, holotype).

Matayba verapazensis (Lundell) Lundell, Phytologia 34:370. 1976.

Trees (5-)10-23 m high, 9-50 cm dbh; branchlets densely ferruginous with short, minute, appressed trichomes, becoming glabrous in age. Leaves parapinnate, opposite or subopposite, 8-25 cm long; petioles subterete, weakly flattened and margined adaxially, 2-5.5 cm long; rachis margined; leaflets 4-17, oblong-elliptic, to oblanceolate, usually acuminate with a bluntly rounded tip, sometimes obtuse, acute or narrowly rounded at the apex, narrowly acute to attenuate and often unequal at the base, (3-)6-12 cm long, 1-3.5 cm wide, subcoriaceous, glabrous on the upper surface, the midrib raised, the reticulate veins often prominulous, glabrous or sparsely appressed-pubescent below, later glabrous, often glandular dotted, sometimes subpapillose, the primary lateral veins 7-12, scarcely more prominent than the lesser veins, spreading at a 45-60° angle and joining a collective vein near the margin, the leaf axils usually with a few foveolate domatia, the margin entire, revolute. Inflorescence terminal and upper axillary, the flowers in slender racemiform panicles 4-20 cm long, as long as or longer than the subtending leaves; rachis densely ferruginous, appressed-pubescent; bracts deltoid, minute; peduncles usually 2-4 mm long; pedicels slender, 1.5-3 mm long; peduncles pedicel and calyces densely appressed-pubescent. Flowers with the calyx lobes ovate to elliptic to broadly ovate, acute to obtuse at the apex, 7-10 mm long; petals greenish yellow, yellow-green, or greenish, rudimentary or to 1 mm long, obovate, emarginate at the apex, clawed at the base, puberulent; disc puberulent; stamens 8, filiform, glabrous to sparsely puberulent in the lower 2/3, 2-3 mm long, the anthers ovoid, basifixed, glabrous, 0.5 mm long; ovary pubescent. Capsules distinctly stalked, reddish, 10-12(-20) mm long, sparsely appressed-pubescent when young, glabrescent, the stalk usually 3-4 mm long; seeds ellipsoidal, shiny black, 6-10 mm long, the aril fleshy, light orange, extending to the lower 1/3 of the seed.

Matayba apetala ranges from Mexico (Veracruz) and Belize to Honduras on the Atlantic slope at low elevations. The species also occurs in the Greater Antilles and in Panama, where it was collected only in premontane wet forest in the Canal Zone. It is to be expected on the Atlantic slope of Nicaragua and Costa Rica. It is distinguished from other

Central American species by its smaller, often more numerous leaflets, and the frequent presence of axillary domatia on the lower blade surface.

Panamanian collections examined: CANAL ZONE: Naval Pipeline Road N of Gamboa, from entrance to 5 km from gate, Sullivan 104 (MO). 6 km from gate Croat 37030 (AAU, C, CAS, CR, COL, DUKE, F, GH, K, LL, MEXU, MISSA, MO, NY, P, PMA, RSA, S, U, UC, VEN).

A new key to the Panamanian species of *Matayba* is provided.

a. Leaflets often foveolate in the axils beneath (with a distinct pit); leaflets usually more than 3 pairs or with the margin serrate.

b. Leaflets with the margin serrate, usually in less than 3 pairs . . . . .*M. scrobiculata* (HBK) Radlk.

bb. Leaflets with the margin entire, usually in more than 3 pairs . . . . .*M. apetala* (Macfad.) Radlk.

aa. Leaflets with the axils beneath glabrous or barbulate, not foveolate; leaflet margins entire.

c. Leaflets 2 . . . . . .*M. kennedyi* Croat

cc. Leaflets usually 4 or more (2 or 4 pairs).

d. Lower surface of the leaflets with the vein axils barbulate; petiolules and leaf rachis glabrous or inconspicuously tomentose; disc of the flower tomentose; capsules glabrous outside . . . .*M. glaberrina* Radlk.

dd. Lower surface of the leaflets with the axils glabrous; petiolules and leaf rachises with coarse, long, brownish trichomes, disc of the flowers glabrate; capsules densely brown-tomentose outside . . .*M. ingaefolia* Standley

LITERATURE CITED:

Croat, T. B. 1976. Sapindaceae in Woodson & Schery, Flora of Panama. Ann. Missouri Bot. Gard. 63:393-540.

NOTES ON NEW AND NOTEWORTHY PLANTS. CXXXI

Harold N. Moldenke

ERIOCAULON MELANOCEPHALUM f. *LONGIPES* (Griseb.) Mold., stat. nov.
Eriocaulon melanocephalum var. *longipes* Griseb., Cat. Pl. Cub. 226. 1866.

LANTANA PEDUNCULARIS f. *MACROPHYLLA* (Mold.) Mold., stat. nov.
Lantana peduncularis var. *macrophylla* Mold., Phytologia 14: 325. 1967.

LIPPIA ROSMARINIFOLIA f. *LATIFOLIA* (Mold.) Mold., stat. nov.
Lippia rosmarinifolia var. *latifolia* Mold., Phytologia 14: 217. 1967.

PAEPALANTHUS CAPILLACEUS f. *PROLIFERUS* (Gleason) Mold., stat. nov.
Paepalanthus capillaceus var. *proliferus* Gleason, Bull. Torrey Bot. Club 58: 328. 1931.

PAEPALANTHUS PERPLEXANS var. *STEYERMARKII* Mold., var. nov.
Haec varietas a forma typica speciei laminis foliorum junioribus utrinque perspicue longiterque argenteo-villosis recedit.

This variety differs from the typical form of the species in having its upper (younger) leaves conspicuously silvery-villous on both surfaces with long and loose hairs.

The type of the variety was collected by Julian A. Steyermark, Victor Carreño Espinosa, Roy McDiarmid, and Charles Brewer-Carías *(no. 115640)* in dense growth bordering a stream and zajna toward the eastern side of Cumbre del Ptari-tepui, lat. 5° 45' N., 61°45' W., to the north of Mision de Santa Teresita de Kavanayen, at 2360--2420 m. altitude, Bolívar, Venezuela, on February 23, 1978, and is deposited in my personal herbarium. The collectors note "leaves gray-green with gray hairs, heads gray-white with black and gray involucre" and have annotated the holotype as "*Paepalanthus* n. sp. aff. *perplexans* Mold."

SYNGONANTHUS GLANDULOSUS f. *EPAPILLOSUS* (Mold.) Mold., stat. nov.
Syngonanthus glandulosus var. *epapillosus* Mold., Phytologia 26: 177--189. 1973.

VITEX TRIFLORA f. *QUINQUEFOLIOLATA* (Mold.) Mold., stat. nov.
Vitex triflora var. *quinquefoliolata* Mold., Phytologia 1: 104. 1934.

ADDITIONAL NOTES ON THE GENUS *VITEX*. XIV

Harold N. Moldenke

VITEX Tourn.

Additional & emended bibliography: Woodville, Med. Bot. Suppl., ed. 3, 2: pl. 137. 1832; Wight, Icon. Pl. Ind. Orient. 4 (3): 11--12, pl. 1465--1467. 1849; Menzel, Jahrb. Preuss. Geol. Landesanst. 34: 62, pl. 5, fig. 36. 1913; H. Hallier, Meded. Rijks Herb. Leid. 37: 40--54. 1918; S. & G. Mangenot, Bull. Jard. Bot. Brux. 27: 653. 1957; Balle & Hallé, Adansonia, ser. 2, 1: [231] & 265. 1961; H. N. Andrews, U. S. Geol. Surv. Bull. 1300: 224. 1970; Kutuzkina, Paleont. Journ. Acad. Nauk USSR 3: 156--158, fig. 1 & 2. 1970; Palmer & Pitman, Trees South. Afr., ed. 2, 3: 1947 & 1949--1963. 1972; Napp-Zinn, Anat. Blatt. A (1): 410 & 653. 1974; R. Lancaster, Medit. Pl. Gard. 131. 1977; Fournet, Fl. Illustr. Phan. Guad. Mart. 1391--1393, fig. 662. 1978; Troncoso in Burkart. Fl. Ilustr. Entre Rios 5: 230, 231, 290, & 292--294, fig. 138. 1979; Mold., Phytologia 44: 329--361. 1979.

Balle & Hallé (1961) report the mistletoes, *Globimetula braunii* and *Phragmanthera capitata*, as parasitizing two unknown species of *Vitex* in Ivory Coast.

VITEX AGNUS-CASTUS L.

Additional bibliography: Woodville, Med. Bot. Suppl., ed. 3, 2: pl. 137. 1832; Stapf, Ind. Lond. 6: 478. 1931; R. Lancaster, Medit. Pl. Gard. 131. 1977; Fournet, Fl. Illustr. Phan. Guad. Mart. 1392 & 1393. 1978; Mold., Phytologia 44: 330--348. 1979; Troncoso in Burkart, Fl. Ilustr. Entre Rios 5: 292. 1979.

Additional illustrations: Woodville, Med. Bot. Suppl., ed. 3, 2: pl. 137. 1832; R. Lancaster, Medit. Pl. Gard. 131 (in color). 1977.

Fournet (1978) records this species cultivated in Guadeloupe and Martinique.

VITEX ALTISSIMA L. f.

Additional & emended bibliography: Wight, Icon. Pl. Ind.Orient.4 (3): 11, pl. 1466. 1849; H. Hallier, Meded. Rijks Herb. Leid. 37: 44--45. 1918; Mold., Phytologia 44: 348--360. 1979.

Emended illustrations: Wight, Icon. Pl. Ind. Orient. 4 (3): pl. 1466. 1849.

VITEX ALTISSIMA f. juv. *ALATA* (Willd.) Mold.

Additional bibliography: Stapf, Ind. Lond. 6: 478. 1931; Mold., Phytologia 44: 348 & 355--360. 1979.

VITEX AMBONIENSIS Gürke

Additional & emended bibliography: Palmer & Pitman, Trees South. Afr., ed. 2, 1950, 1951, 1955, 1957, & 1962. 1972; Mold., Phytologia 44: 361. 1979.

Emended illustrations: Palmer & Pitman, Trees South. Afr., ed. 2, 1954. 1972.

The *Tanner 3315*, distributed as *V. amboniensis*, seems actually to be *V. amaniensis* Pieper, while *Richardson & Livingstone s.n.* [30 October 1960] is *V. doniana* var. *parvifolia* (Engl.) Mold. and *Watt 17* is *V. mombassae* Vatke.

Additional citations: RHODESIA: *Leveridge s.n.* [Herb. Rhodes. 85922] (Mu). SOUTH AFRICA: Natal: *Ward 2731* (Mu).

VITEX AMBONIENSIS var. *AMANIENSIS* Pieper

Additional & emended bibliography: Pieper, Engl. Bot. Jahrb. Beibl. 141: 69. 1928; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 403. 1938; Mold., Phytologia 8: 29. 1961; Mold., Fifth Summ. 1: 238 (1971) and 2: 923. 1971.

VITEX ANDONGENSIS J. G. Baker

Additional synonymy: *Vitex andongensis* Baker & Hiern ex Mold., Fifth Summ. 2: 713, in syn. 1971.

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 317 & 329--330. 1900; Mold., Phytologia 15: 89. 1967; Mold., Fifth Summ. 1: 245 (1971) and 2: 713 & 923. 1971.

Baker (1900) cites only the type collection, *Welwitsch 5696*, from Angola, in the herbarium of the British Museum, London.

Additional citations: ANGOLA: Loanda: *Welwitsch 5696* [F. G. Mey. photo 2994] (Gz--photo of type, N--photo of type).

VITEX ANGOLENSIS Gürke

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 316 & 325. 1900; Good & Exell, Journ. Bot. 68: Suppl. 144. 1930; Mold., Phytologia 15: 227. 1967; Mold., Fifth Summ. 1: 245 (1971) and 2: 923. 1971.

Baker (1900) cites only the type collection, *Welwitsch 5758*, from Angola, deposited in the herbarium of the British Museum, London.

Good & Exell (1930) have encountered the species in "shrub-grown thickets and on decayed ant-hills", citing their *nos. 2263 & 2264* and listing the local vernacular name, "muvomba".

Additional citations: ANGOLA: Huila: *Welwitsch 5758* [G. F. Mey. photo 2992] (Gz--photo of type, N--photo of type).

VITEX APPUNI Mold.

Synonymy: *Vitex appunii* Mold. apud López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 94. 1975.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 48. 1948; Mold., Phytologia 15: 227. 1967; Mold., Fifth Summ. 1: 128, 131, & 179 (1971) and 2: 923. 1971; López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 94--95. 1975; López-Palacios, Fl. Venez. Verb. 582--585 & 654, fig. 136. 1977.

Illustrations: López-Palacios, Fl. Venez. Verb. [584], fig. 136. 1977.

Recent collectors refer to this species as a tree 5 m. tall, the flowers very abundant and showy, attracting large quantities of insects, and have found it in flower in April. The corollas are said to have been "blue-purple" on *Aristeguieta 6083*. The vernacular names, "guarataro" and "totumillo", have been recorded for it. López-Palacios (1975) says that it "Es un arbolito bajo, hasta de unos 8 m., que sólo se he registrado en las sabanas secas del Edo. Guárico [Venezuela]. Como el tipo proviene de la Guyana Británica, es posible que se encuentre en el amolio espacio existente entre el Guárico y Roraima." In his 1977 work he cites from Guárico: *Aristeguieta 4257 & 5027, Aristeguieta & Tamayo 5071,* and *Aristeguieta & Zabala 7025,* all in the Caracas herbarium.

Material of this species has been misidentified and distributed in some herbaria as *V. capitata* Vahl and *V. orinocensis* H.B.K.

Additional citations: VENEZUELA: Guárico: *Aristeguieta 6083* (N).

VITEX AUREA Mold.

Additional bibliography: Mold., Phytologia 15: 227. 1967; Mold., Fifth Summ. 1: 262 (1971) and 2: 923. 1971.

Croat describes this species as a tree, 5 m. tall, with green fruit in January, and found it in cultivation at 1200 m. altitude.

Additional citations: CULTIVATED: Madagascar: *Croat 28777* (N).

VITEX AXILLARIS Wall.

Synonymy: *Vitex ? axillaris* Wall., Numer. List [48], no. 1760, hyponym. 1829.

Additional bibliography: Wall., Numer. List [48], no. 1760. 1829; C. B. Clarke in Hook. f., Fl. Brit. India 4: 588. 1885; Mold., Phytologia 15: 228. 1967; Mold., Fifth Summ. 1: 284 (1971) and 2: 923. 1971; Mold., Phytologia 23: 423. 1972.

According to Clarke (1885) the Wallich collection on which this name is based is not represented in the Wallich Herbarium at Kew. Jackson in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1213 (1895) was the first to remove the question-mark placed after the generic name by Wallich. Nothing else is known to me of this taxon and until the Wallich type is located, it is not possible to dispose of the binomial satisfactorily.

VITEX BAKERI B. L. Robinson, Proc. Am. Acad. Sci. 51: 531. 1916.

Synonymy: *Vitex diversifolia* J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 323. 1900 [not *V. diversifolia* Kurz, 1870].

Bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 316 & 323. 1900; B. L. Robinson, Proc. Am. Acad. Sci. 51: 531. 1916; Lely, Useful trees N. Nigeria 116. 1925; Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 275 & 276. 1936; Dalz., Useful Pl. W. Afr. 457. 1937; H. N. & A. L. Mold., Pl. Life 2: 49. 1948; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 576. 1941; Worsdell, Ind. Lond. Suppl. 2: 500. 1941; Kerharo & Bouquet, Pl. Méd. Tox. Côte Iv. 234. 1950; Mold., Phytologia 6: 133. 1958; Kershaw, Journ.

Ecol. Brit. 56: 473. 1968; Mold., Fifth Summ. 2: 713 & 727. 1971; Mold., Phytologia 34: 261. 1975.

Illustrations: Lely, Useful Trees N. Nigeria 116. 1925.

This taxon has sometimes in the past been regarded as being conspecific with *V. simplicifolia* Oliv.., but it differs markedly from at least the type collection of that species. Baker (1900) describes it as "A small tree; branchlets densely clothed with short whitish pubescence. Leaves 3-foliolate or simple, subcoriaceous, green and obscurely pubescent above when mature, densely matted beneath when young and less distinctly so when mature; leaflets obovate-cuneate or when solitary suborbicular, entire; end leaflet shortly stalked, 4--5 in. long, more than half as broad; main petiole 2--3 in. long. Cymes axillary, long-peduncled; branchlets densely villous; pedicels very short. Calyx campanulate, 1/8 in. long, densely villous; teeth minute. Corolla small, very hairy outside. Fruit globose, the size of a small cherry or plum, with a calyx 1/2 in. diam." He based it on *Barter 1096* from Nigeria and *1644* from the Niger Republic. Hutchinson & Dalziel (1936) describe it as "A small tree, densely pale-pubescent, with small hairy flowers 1/4 in. long, greenish with blue-purple corolla-lobes, in peduncled axillary cymes, and violet-black plum-like fruit," citing *Barter 1096* & *1644, Dalziel 176, Dent Young 206, Kitson 689, Lely P.197,* and *Vogel 97*,reporting it common on savannas, flowering from January to May. They give its overall distribution as French Sudan, Gold Coast, and Nigeria. Dalziel (1937) records it from French Sudan, Gold Coast, Togo, and Nigeria, noting that "The fruits are violet-black, cupped like an acorn, with thin edible pulp and a large 3--4-seeded stone. The twigs are used in N. Nigeria as tooth-sticks". He records the local vernacular names, "buji", "bummehi", "bummeji", "bummere", "dinyar biri", "'dunyar biri", "idjoli", "kuru", "nambalerri", and "panyero buda". Kershaw (1968) reports that in Nigeria it grows in association with *Combretum binderianum* and *Crossopteryx febrifuga* in the limestone areas.

Kerharo & Bouquet (1950) tell us that this "Petit arbre assez fréquent dans les formations de savanes de Côte d'Ivoire et de la Haute-Volta........est utilisé en médecine indigène contre les maladies de peau (décocté d'écorce en lotion) et comme odontalgique". They list the following common names: "ara", "awon", "awondolo", "dinehiar beurhi", "koto kiama", "kotoni", "m'bli", and "m'bliassoua".

Citations: SUDAN: Bahr-el-Ghazal: *Schweinfurth 1519* (N--cotype, N--photo of cotype, S--cotype, Z--photo of cotype). NIGERIA: Northern: *Chaloner, Elliott, & Molsla s.n.* [Dec. 1965] (Ln--245526).

VITEX BALBI Chiov.

Additional bibliography: Dale & Greenway, Kenya Trees Shrubs 592 & 593. 1961; Mold., Phytologia 15: 228. 1967; Gillett, Numb. Check-list Trees Kenya 47. 1970; Mold., Fifth Summ. 1: 241 (1971) and 2: 923. 1971.

Dale & Greenway (1961) cite *Balbo 55, 78,& 861* from "East and west Mt. Kenya" and describe this little-known species as follows: "Tree. Leaves 5-foliolate with a stout petiole to 5 in. long, cylindrical and densely tomentose; leaflets sessile or subsessile, the terminal leaflet shortly petiolulate, coriaceous, obovate, the terminal to 5 in. long and to 2 in. wide, the laterals to 2 in. long and to 1 in. wide, apex rounded or obtuse and cuspidate, margin entire or minutely and irregularly undulate subcrenulate, lamina sparsely scabrid puberulous above, pubescent villose below, copiously on the nerves and veins. Flowers in axillary panicles with peduncles to 3 1/2 in. long, pedicels 1/10 in. long densely tomentose; corolla tube curved, 1/6 in. long, lobes 5, entire; ovary globose and hairy. Drupe obovate, 2/3 in. long, speckled with black".

These same authors provide a very useful key to the Kenyan species of this genus as recognized by them. It is well worth repeating here:

1. Panicles terminal, sometimes from upper leaf-axils as well.
  2. Leaflets 3--5, markedly discolorous, 1--3 leaflets stalked...*V. negundo*.
  2a. Leaflets 3, not discolorous.
    3. Leaflets glandular-puberulous on the veins beneath........ *V. lamiana*.
    3a. Leaflets usually scabrid and more or less rugose above and densely to sparsely pubescent beneath.*V. strickeri*.

1a. Inflorescences all axillary.
  4. Leaflets glabrous, usually 5, sometimes up to 7, all distinctly stalked.
    5. Leaflets membranous, elliptic or lanceolate-obovate, acute or cuspidate; cymes lax, with a very long peduncle...... *V. carvalhi*.
    5a.Leaflets leathery, obovate-cuneate, slightly apiculate, rounded, or emarginate; cymes dense, peduncle to 3 in. long...*V. doniana*.
  4a. Leaflets more or less pubescent or tomentose, at least beneath.
    6. Ovary glabrous, with sessile glands or sometimes with a few scattered hairs; leaflets 5.
      7. Leaflets sessile or subsessile, the terminal one with a petiolule up to 1/4 in. long.................*V. balbi*.
      7a.Leaflets distinctly petiolulate.
        8. Leaflets oblong to narrowly elliptic, base acute, apex shortly acuminate, scabrous above; a savanna tree..................................*V. fischeri*.
        8a. Leaflets oblong-elliptic, base rounded or subacute, sometimes oblique, apex shortly acuminate, pubescent above; a high forest timber tree........*V. keniensis*.
    6a. Ovary densely clothed with more or less erect hairs, glands often present but more or less concealed by hairs; leaflets 3--7, normally 5.
      9. Leaflets sessile or subsessile, pubescent above.

10. Bracts lanceolate or oblanceolate; leaflets 3--5, obovate-elliptic or oblong-elliptic....*V. mombassae.*
10a. Bracts linear; leaflets 5, obovate.........*V. payos.*
9a. Leaflets petiolulate, glabrous above.
11. Leaflets 3--5, usually 3, elliptic-lanceolate or oblong, apex acute or acuminate..........*V. tangensis.*
11a. Leaflets 5--7, usually 5, oblanceolate-elliptic to oblong-lanceolate, apex acute........*V. amboniensis*

VITEX BARBATA Planch.

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 316 & 323. 1900; Roberty, Pet. Fl. Ouest-Afr. 178. 1954; Gledhill, Check List Flow. Pl. Sierra Leone 30. 1962; Mold., Phytologia 16: 496. 1968; Mold., Fifth Summ. 1: 210, 215, 217, 218, 220, & 226 (1971) and 2: 714 & 923. 1971.

Hutchinson & Dalziel (1936) list this species from French Sudan, Sénégal, Gambia, French Guinea, Sierra Leone, and Gold Coast, citing *Chevalier 496, 510 bis, 511, 12460, 12467,* & *12990, Dalziel 8061, Heudelot 30, Ingram s.n., Kitson 835,* and *Scott Elliot 4881* & *5189.*

Material of *V. barbata* has been misidentified and distributed in some herbaria as *V. pachyphylla* J. G. Baker.

Additional citations: GABON: *Krukoff 119* (N).

VITEX BEFOTAKENSIS Mold.

Additional bibliography: Mold., Phytologia 15: 228. 1967; Mold., Fifth Summ. 1: 262 (1971) and 2: 923. 1971.

VITEX BENTHAMIANA Domin

Additional synonymy: *Vitex trifolia* γ *parviflora* Benth. ex K. Schum. & Hollr., Fl. Kaiser Wilh.-land 121--122. 1889.

Additional bibliography: K. Schum. & Hollr., Fl. Kaiser Wilm.-land 121--122. 1889; F. M. Bailey, Compreh. Cat. Queensl. Pl. 386. 1913; Wangerin, Justs Bot. Jahresber. 56 (1): 668. 1936; Fedde & Schust., Justs Bot. Jahresber. 56 (2): 286. 1937; H. N. & A. L. Mold., Pl. Life 2: 50. 1948; Mold., Phytologia 15: 228. 1967; Mold., Fifth Summ. 1: 349 (1971) and 2: 729, 730, & 923. 1971.

Perry describes this plant as an erect shrub, 8 feet tall, with pink corollas, and found it growing in creekbeds with *Eucalyptus camalduensis,* flowering in May.

Additional citations: AUSTRALIA: Queensland: *R. A. Perry 1061* (Ai, W--2156492, Z--photo).

VITEX BENUENSIS Engl.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 59 (2): 417. 1939; Mold., Phytologia 15: 228. 1978; Mold., Fifth Summ. 1: 224 (1971) and 2: 923. 1971.

VITEX BEQUAERTI DeWild.

Synonymy: *Vitex bequaertii* DeWild. apud Fedde & Schust., Justs Bot. Jahresber. 42: 252. 1920.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 42: 252. 1920; H. N. & A. L. Mold., Pl. Life 2: 50. 1948; Mold., Phytologia 15: 228. 1967; Mold., Fifth Summ. 1: 231 (1971) and 2: 923. 1971.

VITEX BERAVIENSIS Vatke

Additional bibliography: Wangerin, Justs Bot. Jahresber. 53 (2): 644. 1925; Mold., Phytologia 16: 496 (1968) and 17: 17, 22, & 23. 1968; Mold., Fifth Summ. 1: 262 (1971) and 2: 713, 714, 718, & 923. 1971.

Additional citations: MADAGASCAR: *Hildebrandt 3085a* (Mu--1532-cotype).

VITEX BERAVIENSIS var. *ACUMINATA* Mold.

Emended synonymy: *Vitex arborea* Brēon ex Mold., Phytologia 5: 213, in syn. 1955 [not *V. arborea* Brown, 1806, nor Desf., 1847, nor Fischer, 1829, nor Roxb., 1814].

Additional bibliography: Mold., Phytologia 15: 91 (1967) and 17: 17, 22, & 23. 1968; Mold., Fifth Summ. 1: 262 (1971) and 2: 713, 714, 718, & 923. 1971.

It should be noted here that the *V. arborea* accredited to Brown in the synonymy above belongs in the synonymy of *V. heptaphylla* A. L. Juss., that ascribed to Desfontaines and to Fischer is *V. negundo* f. *albiflora* Mold., while that credited to Roxburgh is *V. pinnata* L.

VITEX BERAVIENSIS f. *PILOSA* Mold.

Additional bibliography: Mold., Phytologia 16: 496. 1968; Mold., Fifth Summ. 1: 262 (1971) and 2: 714 & 923. 1971.

VITEX BERAVIENSIS f. *VILLOSA* Mold.

Additional bibliography: Mold., Phytologia 16: 496. 1968; Mold., Fifth Summ. 1: 262 (1971) and 2: 714 & 923. 1971.

VITEX BETSILIENSIS Humbert

Additional bibliography: Mold., Phytologia 16: 496. 1968; Mold., Fifth Summ. 1: 262, 263, & 373 (1971) and 2: 714 & 923. 1971.

VITEX BETSILIENSIS ssp. *BARORUM* Humbert

Synonymy· *Vitex barorum* Bernardi ex Mold., Fifth Summ. 2: 714, in syn. 1971. *Vitex barorum* Humbert ex Capuron, Adansonia, ser. 2, 12: 52. 1972.

Additional bibliography: Mold., Phytologia 15: 91. 1967; Mold., Fifth Summ. 1: 263 & 373 (1971) and 2: 714 & 923. 1971; Capuron, Adansonia, ser. 2, 12: 52. 1972.

Bernardi describes this plant as a large shrub or small tree, the leaves very coriaceous, ferrugineous-tomentose beneath, and found it growing at 1100--1200 m. altitude, fruiting in November.

Additional citations: MADAGASCAR: *Bernardi 11228* (Ac, N).

VITEX BOGALENSIS Wernham

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber.

42: 252. 1920; Mold., Phytologia 15: 228. 1967; Mold., Fifth Summ. 1: 224 (1971) and 2: 923. 1971.

It should be noted here that the Missouri Botanical Garden photograph A.856, cited below, consists not only of a picture of *Vitex bogalensis,* but also one of *Phyllanthus kaesneri* Hutchins.

Additional citations: CAMEROONS: *Talbot 1046* [Mo. Bot. Gard. photo A.856, in part] (N--photo of type, W--photo of type).

VITEX BOJERI Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 501. 1858; Wangerin, Justs Bot. Jahresber. 56 (1): 668. 1936; H. N. & A. L. Mold., Pl. Life 2: 50. 1948; Mold., Phytologia 16: 496. 1968; Mold., Fifth Summ. 1: 263 & 426 (1971) and 2: 714, 717, & 923. 1971.

Additional citations: MADAGASCAR: *Bojer s.n.* [Be-zon-zong] (Mu--625--isotype).

VITEX BOJERI var. *SUBORBICULARIS* Mold.

Additional bibliography: Mold., Phytologia 15: 92. 1967; Mold., Fifth Summ. 1: 263 (1971) and 2: 923. 1971.

VITEX BRACTEATA S. Elliot

Additional bibliography: Mold., Phytologia 15: 229. 1967; Mold., Fifth Summ. 1: 263 (1971) and 2: 923. 1971.

Bernardi describes this species as an erect shrub or small tree, the branches dark-green, the leaves "hispid" [this is not true!], coriaceous, "like those of a *Petrea*", the flowers borne on long slender pedicels, the corollas wine-red, and encountered it in sandy woods, flowering in November.

Additional citations: MADAGASCAR: *Bernardi 11505* (Ac).

VITEX BREVILABIATA Ducke

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1076. 1932; Mold., Phytologia 15: 229. 1967; Mold., Fifth Summ. 1: 179 (1971) and 2: 923. 1971.

VITEX BREVIPETIOLATA Mold.

Additional bibliography: Mold., Phytologia 15: 229. 1967; Mold., Fifth Summ. 1: 179 (1971) and 2: 923. 1971.

VITEX BUCHANANII J. G. Baker

Additional synonymy: *Vitex buchanani* "Bak. ex Guerke" apud Richards & Morony, Check List Fl. Mbala 239. 1969.

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 315 & 319. 1900; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 402. 1938; H. N. & A. L. Mold., Pl. Life 2: 51. 1948; Mold., Phytologia 15: 229. 1967; Richards & Morony, Check List Pl. Mbala 239. 1969; Mold., Fifth Summ. 1: 238, 246, 250, & 252 (1971) and 2: 714, 726, & 923. 1971.

Recent collectors describe this plant as a "herbaceous plant", small shrub, or tree, 4--6 m. tall, forming thickets, the young twigs hairy, the leaflets 3--5, slightly rough above, hairy beneath, the petioles hairy, the flowers borne in lateral panicles on old wood, and have found it growing in coastal sandy grassland-bushland, in woodland on steep banks above cliffs, in thickets on sand dunes, and among rocks in sandy soil, at altitudes from sealevel to 1300 m., flowering in February. Schlieben found it "abundant between boulders". The corollas are said to have been "pale-green, with [a] dark mark on [the] upper petal" on *Richards 19024*. *Buchanan 318* in the United States National Herbarium is marked "*V. buchanani* Baker, n. sp.", but actually is not one of the collections on which Baker based the taxon.

Richards & Morony (1969) cite *Richards 4484, 10928, 18988,* and *19204* from Tanzania, *no. 18988* being from Crocodile Island.

The *B. J. Harris 6180,* distributed as *V. buchananii,* actually is *V. mossambicensis* Gürke, while *Ludanga DSM.225, Schlieben 6008,* and *Wingfield, Kabuye, & Vollesen 3468* are *V. schliebeni* Mold.

Additional citations: TANZANIA: Tanga: *Harris & Tadros BJH. 5586* (Z); *Schlieben 1614* (Mu). ZAMBIA: *Mrs. H. M. Richards 19024* (N). MALAWI: *J. Buchanan 318* (W--74078).

VITEX BUCHANANII var. *QUADRANGULA* (Gürke) Pieper

Additional synonymy: *Vitex buchanani* var. *quadrangula* (Gürke) Pieper, Engl. Bot. Jahrb. Beibl. 141: 54. 1928.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 57 (2): 402. 1938; Mold., Phytologia 15: 229. 1967; Mold., Fifth Summ. 1: 238 & 250 (1971) and 2: 714, 726, & 923. 1971.

VITEX BUCHNERI Gürke

Additional & emended bibliography: Gürke, Engl. Bot. Jahrb. 18: 166. 1894; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 317 & 331. 1900; H. N. & A. L. Mold., Pl. Life 2: 52. 1948; Mold., Phytologia 15: 229. 1967; Mold., Fifth Summ. 1: 231 & 245 (1971) and 2: 923. 1971.

Material of this species has been misidentified and distributed in some herbaria as *V. camporum* Buettn.

Additional citations: ZAIRE: *Liben 1926* (E--2168606).

VITEX BUDDINGII Mold.

Additional bibliography: Mold., Phytologia 15: 229. 1967; Mold., Fifth Summ. 1: 328 (1971) and 2: 923. 1971.

Additional citations: GREATER SUNDA ISLANDS: Borneo: *Budding 227* [Boschbouwproefst. bb.27010] (N--isotype).

VITEX BULUSANENSIS Elm.

Additional bibliography: Mold., Phytologia 8: 29--30. 1961; Mold., Fifth Summ. 1: 318 (1971) and 2: 923. 1971.

Additional citations: PHILIPPINE ISLANDS: Luzon: *Elmer 17004* (Mi--isotype).

VITEX BUNGUENSIS Mold., Phytologia 35: 419. 1977.

Bibliography: Mold., Biol. Abstr. 64: 2438. 1977; Mold., Phytologia 35: 419 (1977), 36: 36 (1977), and 44: 354. 1979.

Collectors describe this plant as a tree, 30--50 feet tall, aromatic, gnarled, with brown-lined bark, or as a "trailer with woody stems", the leaves digitate, fragrant, entire or sometimes all coarsely dentate [=juvenile?]. They have encountered it in anthill thickets and at the edge of thickets, at 150 m. altitude, flowering in January.. The corollas are said to have been "purple/white" on *Rodgers MRC.164*. The vernacular name, "mpujwa", is recorded for the species. *Flock 363* exhibits all coarsely dentate leaflets, but Wingfield later visited the locality where it was collected and found all the leaves entire-margined; he concludes that perhaps the toothed ones represent a juvenile state. Most of the material cited below was originally misidentified and distributed as the south Indian and Sri Lankan *Vitex altissima* L. f.

The specific epithet adopted by me for this species was chosen because of the locality where the type collection was gathered as given on its accompanying label when sent to me. Unfortunately, this was published before the following comments from Robert Wingfield of the University of Dar-es-Salaam were received by me: "Since this plant is not confined to the Bungu area, and since there are 3 other 'Bungu' sites in the Tanzanian gazetteer, whereas this Bungu is not yet on any map or gazetteer, may I suggest you choose some other name? E.g. as a possibility, *'zanjensis'*, from zanj the old Arab name for the Kenya-Tanzania coastal region and in Zanzibar & *Zinjanthropus* - or something still less obscure."

Citations: TANZANIA: Tanga: *Flock 362* (Tz); *Minjas & Raya DSM. 1908* (Z--type); *Rodgers MRC.164* (Tz), *s.n.* (Tz).

VITEX BURMENSIS Mold.

Additional bibliography: Mold., Phytologia 15: 93. 1967; Mold., Fifth Summ. 1: 284 (1971) and 2: 923. 1971.

VITEX CAESPITOSA Exell in Good & Exell, Journ. Bot. 69, Suppl. 2: 145--146. 1931.

Additional & emended bibliography: Good & Exell, Journ. Bot. 69, Suppl. 2: 145--146. 1931; Mold., Phytologia 15: 230. 1967; Mold., Fifth Summ. 1: 245 (1971) and 2: 923. 1971.

This species is based on *Gossweiler 3302* deposited in the herbarium of the British Museum in London, re-determined as "*V. doniana* Sweet?" The original description reads as follows: "A caespitose undershrub with annual shoots. Leaves glossy on both faces, coriaceous, translucent. Flowers whitish-violet. Leaflets up to 12 x 4.5 cm., the outer ones smaller; petioles up to 7 cm. long; inflorescences 4--4.5 cm. long; pedicels usually about 0.5 mm. long; bracteoles 3--4 mm. long; calyx 3 mm. long, measuring to the end of the calyx-teeth, slightly zygomorphic; corolla 7 mm. long, the upper lip measuring about 2 mm.; stamens 3--3.5 mm. long; ovary 1.5 mm. in diam. with style attaining 4--5 mm. in length; fruit up to 10 x 6 mm. This species seems nearest to *V.*

puberula Baker, also from Angola, but can be distinguished by having three leaflets instead of five, by the opposite leaves, and by the abruptly acuminate leaflets."

Citations: ANGOLA: Luanda: *Gossweiler 3302* [Mo. Bot. Gard. photo A.857] (N--photo of type, W--photo of type).

VITEX CALOTHYRSA Sandw.

Additional synonymy: *Vitex callothyrsa* López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 97, sphalm. 1975.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 58 (2): 330. 1938; Mold., Phytologia 15: 230. 1967; Mold., Fifth Summ. 1: 128, 133, & 179 (1971) and 2: 725, 767, & 923. 1971; López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 95 & 97, [fig. 18]. 1975; Mold., Phytologia 31: 412. 1975; López-Palacios, Fl. Venez. Verb. 579, 581, 585--588, & 654, fig. 137. 1977.

Illustrations: López-Palacios, Revist. Fac. Farm. Univ. Andes 15: [fig. 18]. 1975; López-Palacios, Fl. Venez. Verb. [586], fig. 137. 1977.

López-Palacios (1975) says: "Aunque el Dr. Moldenke cita *V. calothyrsa* como de Bolívar y del Territorio Amazonas.....nunca he visto ejemplares de Bolívar; todas las colecciones que yo he examinado, inclusive el tipo, *Spruce 3356*, provienen del Territorio Amazonas. Es, pues, un error la ubricación del Río Pacimoni en Bolívar.......; también debe advertirse el lapsus de la cita de *William 14993* como del Brasil....que procede de la isla de Trapichote, en el Delta del Ventuari, Alto Orinoco, Territorio Amazonas (Ven.), pero a lo mejor esta ejemplar es *V. compressa*." In his 1977 work he cites from Amazonas, Venezuela: *Maguire, Wurdack, & Bunting 37402, 37403, & 37413, Spruce 3356, Vareschi 7779,* and *Wurdack & Adderley 42328*.

Additional & emended citations: VENEZUELA: Amazonas: *Spruce 3356* [Macbride photos 17564, 30185, & 34229] (B--isotype, Bm--isotype, Br--isotype, Cb--isotype, Cb--isotype, Ed--isotype, F--663043--photo of isotype, F--876591--photo of isotype, F--923106--photo of isotype, F--976277--photo of isotype, K--type, K--isotype, Kr--photo of isotype, Kr--photo of isotype, Kr--photo of isotype, Lu--isotype, N--isotype, N--photo of isotype, N--photo of isotype, N--photo of isotype, P--isotype, V--isotype, X--isotype, W--photo of isotype); *Ll. Williams 14993* in part (Ve--12874). GUYANA: *R. Schomburgk s.n.* [British Guiana] (Ut--3253678).

VITEX CANESCENS Kurz

Additional synonymy: *Vitex heterophylla* f. *tomentosa* Jenkins, in herb.

Additional & emended bibliography: Kurz, Forest Fl. Brit. Burma 2: 269, 270, & 612. 1877; Gamble, Man. Indian Timb., ed. 1, 296 & 522. 1881; C. B. Clarke in Hook. f., Fl. Brit. India 4: 586. 1885; Brandis, Indian Trees, imp. 1, 504. 1906; Kanjilal, Das, Kanjilal, & De, Fl. Assam 3: 479, 481--482, & 561. 1939; Biswas, Indian Forest Rec., ser. 2, Bot. 3: 42. 1941; Mold., Phytologia 16: 496--

497. 1968; Sawyer & Cherms., Nat. Hist. Bull. Siam Soc. 23: 126. 1969; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Brandis, Indian Trees, imp. 2, 504. 1971; Mold., Fifth Summ. 1: 279, 284, 290, 293, 298, 303, & 373 (1971) and 2: 714 & 923. 1971; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974.

Recent collectors describe this plant as a shrub or deciduous tree, 4--12 m. tall ["200--250 feet tall" according to King's collector], the trunk 7--30 cm. in diameter at breast height, often buttressed, the bark rough and furrowed, fawn-gray, the wood cream or cream-gray, hard, the blaze "tan over tan", the leaves light glossy-green above, paler beneath, the flowers with a slight odor, usually produced before the leaves, the buds yellow-green with a brown hue, the calyx light-green, and the fruit light-green with a red-brown tinge. They have encountered it in mixed bamboo/deciduous forests, sandy open forests, rocky deciduous forests, stunted pyric swamp forests, and "in the open sun in scrub with occasional trees to 15 m. tall along with *Bauhinia* and *Lantana*", at altitudes of 6--1330 m., flowering in January and from March to June, fruiting in March and June to October.

The corollas are said to have been "light-tan or buff" on *Squires 814,* "cream" on *Maxwell 75-48,* "white" on *King's Collector s.n.,* and "lobes with purple veins and dots" according to Kanjilal & al. (1939). The leaves are used as cattle fodder in Assam. Vernacular names recorded for the species are "arekdal", "borkengthing", "ching moi", "dieng-sartudkhar", "mathokhrai", "panchpati", "phung-arong", "teta", and "than-thang".

Maxwell 72-109 has the leaves exceptionally hairy. A bark specimen accompanies *Squires 814*. *King 5493* serves as a voucher for a wood collection. The inflorescence is very dense on *Squires 814,* but very loose on *Jenkins s.n.* and *King's Collector s.n.* The new leaves are said to unfold in April in Thailand. Sawyer & Chermsirivathana (1969) report "phytocenoses 1,3,4; 330--710 m." in this species.

Clarke (1885) cites *Griffith 6066* and *Masters s.n.* from Assam, *McLelland s.n.* & *Kurz s.n.* from Pegu and Ava in Upper Burma. He comments that "*Vitex canescens*, Wall. Cat. 1757, is not in Wallich's Herbarium; Kurz does not state whether he intended or guessed his own *V. canescens* to be the same as Wallich's or no."

Material of *V. canescens* has been misidentified and distributed in some herbaria as *V. pubescens* Vahl.

Additional citations: INDIA: Assam: *Jenkins s.n.* [Assam] (Mu--691, Mu--1133, Pd); *King's Collector s.n.* [April 1893] (Mu--3801). THAILAND: *R. M. King 5493* (W--2435951); *Maxwell 72-60* (Ac), *72-109* (Ac), *75-303* (Ac). INDOCHINA: Annam: *Squires 814* (Mu). Cambodia: *Pierre 648* (W--2602822). NEW GUINEA: Papua: *Schodde 2755* (Ba). CULTIVATED: Florida: *Gillis 8682* (Go, Z).

VITEX CAPITATA Vahl

Additional & emended synonymy: *Vitex bignonioides* Humb. & Bonpl. apud Steud., Nom. Bot. Phan., ed. 1, 888. 1821. *Vitex bignonioides* Kunth apud Spreng. in L., Syst. Veg., ed. 16, 2: 757. 1825. *Petrea* *bignonioides* H.B.K. apud López-Palacios, Fl. Venez. Verb. 589, in syn. 1977. *Vitex wicttrockiana* [Moldenke] apud López-Palacios, Fl. Venez. Verb. 654, in syn. 1977.

Additional & emended bibliography: Pers., Sp. Pl. 3: 361. 1819; Steud., Nom. Bot. Phan., ed. 1, 888. 1821; Sweet, Hort. Brit., ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 551. 1832; Sweet, Hort. Brit., ed. 3, 551. 1839; D. Dietr., Syn. Pl. 3: 612. 1843; Schau., Linnaea 20: 484. 1847; Schau. in A. DC., Prodr. 11: 689. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 501. 1858; Pittier, Contrib. U. S. Nat. Herb. 20: 483 & 487. 1922; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 607. 1927; H. N. & A. L. Mold., Pl. Life 2: 89. 1948; J. A. Steyerm., Act. Bot. Venez. 1: 254. 1966; Mold., Phytologia 16: 497. 1968; Mold., Résumé Suppl. 16: 3, 13, & 29. 1968; Dennis, Kew Bull. Addit. Ser. 3: 177 & 289. 1970; Lasser, Act. Bot. Venez. 4: 48. 1970; Mold., Fifth Summ. 1: 112, 120, 128, 133, 179, & 373 (1971) and 2: 549, 714, 715, 731, & 923. 1971; Barrios & Briceño, Mem. II Congres. Venez. Bot. 155, 170, 173, 177, & 179. 1974; Howes, Dict. Useful Pl. 96. 1974; Mold., Phytologia 28: 452 (1974) and 31: 383. 1975; López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 95--96. 1975; López-Palacios, Fl. Venez. Verb. 581, 589--594, 626, & 654, fig. 138. 1977.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [590], fig. 138. 1977.

Recent collectors describe this species as an unarmed shrub or small tree, 1.5--25 m. tall, the trunk erect, simple, cylindric, 12--30 cm. in diameter; leaves decussate-opposite, 3--5 digitately foliolate, mostly 5-foliolate, calyx dark-green, filaments deep-blue to amethyst, anthers dark-purple, fruit at first green, later red or purple, more or less spherical, 1 or 2 produced per cyme, the old fruit brown. They have found it growing on granite cliffs, in sandy disturbed soil of mata de cipó, in dry scrub, and in small patches of woods on savannas, at 50--900 m. altitude, flowering from March to June and in November, in fruit from March to July. Veillon notes: "apamate blanco-canalete". The corollas are said to have been "blue" on *Curran 1797, Gentry & al. 11148,* and *Murça Pires & al. 14336,* "violet" on *Fosberg 45241,* "light-red" on *Mori & al. 11070,* "bright-purple" on *Collector undetermined 15* and *Senaratna 193,* "azul-arroxeado" on *Murça Pires & al. 14387*, "azul a ametístina, con pelos blancos en la base del lóbula inferior" on *Ruiz-Terán & al. 10858,* and "petals and stamens purple" on *Prance & al. 11225.* Murça Pires and his associates say: "árvore pequena, comu às vezas"; Mori and his associates call it "common" and describe the "frutos pretos".

Sweet (1830) and Loudon (1832) both assert that *V. capitata* was introduced into cultivation in England in 1822 from Trinidad, while *V. bignonioides* was introduced in 1826 from Caracas, Venezuela. Pittier (1922) also keeps the two taxa distinct, keying them out as follows:

1. Leaflets sessile or almost so; corolla-tube only twice as long as the calyx; Venezuela....................*V. bignonioides*.

1a. Leaflets distinctly petiolulate; corolla-tube much longer than the calyx.

2. Corolla woolly in the throat; calyx distinctly but shortly repand-dentate; Trinidad & Venezuela..........*V. capitata.*

2a. Corolla almost glabrous in the throat; calyx hardly denticulate; Guyana..........................*V. schomburgkiana.*

Vernacular names recently reported for *V. capitata* include "acietuno", "calisaya morada", "escolilla", "five leaf fiddle wood", "flor azul", "guaratarö", "headed-flowered chaste-tree", "mariquita", "piedrero", "piqueguaro", "trumpet-flow'd chaste-tree", and "trumpet-flowered chaste-tree".

Dennis (1970) reports the following fungi as parasitizing this species: *Phyllachora taruma* Speg. and *Uredo viticis* Juel, both in Trinidad.

López-Palacios (1975) notes that "En lo que respecta a las localidades citadas por el Dr. Moldenke.....hay que anotar lo siguiente: El Edo. Zamora ya no figura en la actual nomenclatura de la división territorial; hoy corresponde al Edo. Barinas. Además de los Estado allí citados colecciones antiguas y recientes atestiguan su existencia en los de Anzoátegui (*Pittier 14884*); Portuguesa [*Tamayo s.n.* (VEN.34114]; Sucre (*Steyermark & otros 107814* y *Aristeguieta 5555*). *Lasser 225,* acreditada erróneamente por Moldenke para Monagas (Phytologia 5: 264) [It is not so accredited there!], procede de Santa Bárbara de Barinas. *Williams 12696* es un ejemplar muy pobre (2 hojas y un inflorescencia en VEN. y apenas 3 folíolos sueltos en NY.); me dan fuertas dudas de que sea *V. staheli* por sus cimas divericadas, el tamaño de los folíolos, y el excepcional porte del árbol (18 m.), ya que las citas de los restantes ejemplares colectados en Venezuela no pasan do los 11 m. En P he visto un *Chaffanjon M.11* 'borde de l'Orenoque', con una cedula anexa que dice 'Mariquita-Calysaya morada'. Parece que con ella se quiere indicar nombres vulgares." López-Palacios (1977) cites the following collections from Venezuela: Amazonas: *Chaffanjon 11, Spruce 3746, Vareschi s.n.* Anzoátegui: *Aristeguieta & Agostini 5555, Pittier 14884.* Apure: *Badillo 1372, Smith V.1460, Trujillo 2120, Vélez 2688.* Aragua: *Bonpland 741, Ll. Williams 10188.* Barinas: *Lasser 225, López-Palacios 3145, Smith V.1526, Veillon 87.* Bolívar: *Aristeguieta 5283, 5842, Cardona 2872, Grosourdy Cat. 13 s.n., Little 15961, Pittier 12849, Ruiz-Terán, Carabot, & Morales 10560, 10858, Steyermark 86791, 94269; Ll. Williams 11642, 12046, 12696, 12849.* Carabobo: *Fernández-Yépes F.679, Saer 868.* Delta Amacuro: *Little 15950.* Guarico: *Aristeguieta 4183, 4187, 6083, Burkart 16206.* Lara: *Pittier 11756.* Monagas: *Aristeguieta 1729, F. D. Smith 230, Steyermark 61777, Wurdack & Monachino 39451.* Portuguesa: *Tamayo s.n.* Sucre: *Steyermark & al. 107840.*

Material of this species has been misidentified and distributed in some herbaria as *V. montevidensis* Cham., *V. schaueriana* Mold., and *V. trifoliolata* L. f. On the other hand, the *Little, Ortega U., Samaniego V., & Vivar C. 548,* distributed as *V. capitata,* actually is *V. moronensis* Mold., while *Prance, Forero, Pena, & Ramos 4623* is *V. schomburgkiana* Schau. and *Aristeguieta 6083* seems better placed as representing *V. appuni* Mold. The *Williams 12696*, cited by me as *V. capitata* in a previous publication, seems better regarded as *V. stahelii* Mold. as pointed out by López-Palacios.

Additional & emended citations: COLOMBIA: Bolívar: *Romero-Castañeda 1636* (N). VENEZUELA: Amazonas: *Curran 868* (N), *1797* (N). Anzoátegui: *Aristeguieta & Agostini 5555* (N). Barinas: *Gentry, Morillo, & Morillo 11148* (W--2786426); *Lasser 225* (Ca--734623, N, Ve--12850); *López-Palacios 3145* (Ld, N); *Veillon 87* (W--2654202). Bolívar: *Aristeguieta 5842* (N); *Gentry & Berry 14725* (N), *15103* (N); *Ruiz-Terán, Carabot, & Morales 10858* (Ac); *Ruiz-Terán, Carabot, Morales, & Jahn 10560* (Tu); *Ruiz-Terán & López-Palacios 11658* (Mi). Delta Amacuro: *Curran 1810* (N). Monagas: *F. R. Fosberg 45241* (Ld). BRAZIL: Amazônas: *Murça Pires, Cavalcante, Magnago, & Silva 14387* (Ld). Bahia: *Mori, Mattos Silva, Kallunki, & Santos 9925* (Ld); *Mori, Mattos Silva, Santos, Kallunki, & Pennington 9441* (Ld); *Mori, Santos, & Thompson 11070* (Ld, N). Minas Gerais: *Glaziou 14160* (B, Br, Cb, Cp, K, N, N--photo, P, P, P, W--1112492, Z--photo). Roraima: *Murça Pires, Cavalcante, Magnago, & Silva 14336* (Ld); *Murça Pires, Leite, & Lima s.n.* [Herb. IPEAN 14610 (79)] (Ld); *Prance, Forero, Pena, & Ramos 4623* (S); *Prance, Steward, Ramos, & Monteiro 11225* (Ld, N); *Ruiz-Terán & López-Palacios 11034* (Ld). CULTIVATED: Sri Lanka: *Collector undetermined 15* [125/46] (Pd, Pd, Pd); *Moldenke, Moldenke, & Jayasuriya 28144* (Ac, Ld, Pd, W--2764413); *Senaratna 193* (Pd).

VITEX CARBUNCULORUM Smith & Ramas

Additional bibliography: Mold., Phytologia 15: 230. 1967; Mold., Fifth Summ. 1: 284 & 298 (1971) and 2: 923. 1971.

VITEX CARVALHI Gürke

Additional & emended bibliography: Gürke in Engl., Pflanzenw. Ost-Afr. C: 339. 1895; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 316 & 326. 1900; H. N. & A. L. Mold., Pl. Life 2: 53. 1948; Dale & Greenway, Kenya Trees Shrubs 592 & 593. 1961; Mold., Phytologia 15: 230. 1967; Gillett, Numb. Check-list Trees Kenya 47. 1970; Mold., Fifth Summ. 1: 241 & 252 (1971) and 2: 923. 1971.

Baker (1900) cites only the type collection, *Carvalho s.n.*, from Mozambique. Dale & Greenway (1961) cite *Tiede 23* from Kenya.

VITEX CAULIFLORA Mold.

Additional bibliography: Mold., Phytologia 15: 230. 1967; Mold., Fifth Summ. 1: 263 (1971) and 2: 923. 1971.

VITEX CAULIFLORA var. *LONGIFOLIA* Mold.

Additional bibliography: Mold., Phytologia 15: 95. 1967; Mold., Fifth Summ. 1: 263 (1971) and 2: 923. 1971.

VITEX CAULIFLORA var. *VILLOSISSIMA* Mold.

Additional bibliography: Mold., Phytologia 15: 95. 1967; Mold., Fifth Summ. 1: 263 (1971) and 2: 923. 1971.

VITEX CESTROIDES J. G. Baker

Additional bibliography: Mold., Phytologia 16: 497. 1968; Mold., Fifth Summ. 1: 263 (1971) and 2: 715 & 923. 1971.

VITEX CHARIENSIS A. Chev.

Additional bibliography: Mold., Phytologia 15: 230. 1967; Mold., Fifth Summ. 1: 227 (1971) and 2: 923. 1971.

VITEX CHARIENSIS var. *LATIFOLIA* A. Chev.

Additional bibliography: Mold., Phytologia 15: 95. 1967; Mold., Fifth Summ. 1: 227 (1971) and 2: 923. 1971.

VITEX CHRYSLERIANA Mold.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 53. 1948; Mold., Phytologia 15: 230--231. 1967; Mold., Fifth Summ. 1: 179 (1971) and 2: 923. 1971.

VITEX CHRYSOCARPA Planch.

Additional & emended bibliography: Hook. f. & Benth. in Hook., Niger Fl. 486. 1849; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 316 & 325. 1900; Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 275 & 276. 1936; Dalz., Useful Pl. W. Trop. Afr. 456. 1937; H. N. & A. L. Mold., Pl. Life 2: 90. 1948; Roberty, Pet. Fl. Ouest-Afr. 178. 1954; Huber in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 446 & 448. 1963; Mold., Phytologia 16: 497 (1968) and 17: 27. 1968; Mold., Fifth Summ. 1: 210, 215, 217, 219, 221, 222, 231, & 246 (1971) and 2: 715, 731, & 923. 1971; Mold., Phytologia 23: 420. 1972; Gray & DeZeeuw, IAWA Bull. 1974 (2): 25, fig. 2. 1974.

Illustrations: Gray & DeZeeuw, IAWA Bull. 1974 (2): fig. 2. 1974.

Hooker & Bentham (1849) list this species as "*Vitex (Chrysomallum) chrysocarpa*" and cite *Vogel s.n.* from Nigeria. Dalziel (1937) records the vernacular names, "balamagnian", "bu-kudu-nẽ", "insuo-koto", and "kuru", noting that in Togo the wood of this plant is used to make fishing gear.

Additional citations: ZAIRE: *Toussaint 534* (E--2168607).

VITEX CHRYSOMALLUM Steud.

Additional bibliography: D. Dietr., Syn. Pl. 3: 612. 1843; Buek, Gen. Spec. Syn. Candoll. 3: 501. 1858; H. N. & A. L. Mold., Pl. Life 2: 72. 1948; Mold., Phytologia 16: 497--498. 1968; Mold., Fifth Summ. 1: 263 & 426 (1971) and 2: 713, 715, 716, 722, & 924. 1971.

VITEX CHRYSOMALLUM var. *LONGICALYX* Mold.

Additional bibliography: Mold., Phytologia 15: 96. 1967; Mold., Fifth Summ. 1: 263 (1971) and 2: 924. 1971.

VITEX CHRYSOMALLUM var. *TOMENTELLA* Mold.

Additional bibliography: Mold., Phytologia 15: 96. 1967; Mold., Fifth Summ. 1: 263 (1971) and 2: 924. 1971.

VITEX CILIATA Pierre

Additional & emended bibliography: Pellegrin, Mem. Soc. Linn. Normand. 26 [ser. 2, 1 (3); Fl. Mayombe 2]: 49--50, pl. 2. 1928; Saint Aubin, For. Gabon [194] & 206. 1963; Mold., Phytologia 15: 231. 1967; Mold., Fifth Summ. 1: 226 & 227 (1971) and 2: 7;5 & 924. 1971.

Additional & emended illustrations: Pellegrin, Mem. Soc. Linn. Normand. 26 [ser. 2, 1 (3); Fl. Mayomb. 2]: pl. 2. 1928; Saint Aubin, For. Gabon opp. [194]. 1963.

Saint Aubin (1963) records the vernacular names, "angona", "evino", and "nto", for this species but all also applied to *V. pachyphylla* J. G. Baker. *Vitex ciliata* seems to be based on *Le Testu 1701* from Gabon, although Pellegrin (1928) also cites *Klaine 3257* from the same country.

VITEX CILIO-FOLIOLATA A. Chev.

Additional bibliography: Mold., Phytologia 15: 231. 1967; Mold., Fifth Summ. 1: 220 (1971) and 2: 924. 1971.

VITEX CLEMENTIS Britton & P. Wils.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 85. 1948; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 317 & 318. 1957; Mold., Phytologia 15: 231. 1967; Mold., Fifth Summ. 1: 98 (1971) and 2: 924. 1971; Alain in León & Alain, Fl. Cuba, imp. 2, 2: 317 & 318. 1974.

VITEX COCHINCHINENSIS Dop

Additional bibliography: Wangerin, Justs Bot. Jahresber. 56 (1): 669. 1936; Fedde & Schust., Justs Bot. Jahresber. 56 (2): 286. 1937; Mold., Phytologia 15: 231. 1967; Mold., Fifth Summ. 1: 303 (1971) and 2: 924. 1971.

VITEX COFASSUS Reinw.

Additional & emended synonymy: *Cofassus* Rumpf, Herb. Amboin. 3: 28--30, pl. 14, fig. B. 1743. *Cofassus alba* Rumpf, Herb. Amboin. 3: 28. 1743. *Cofassus femina* Rumpf, Herb. Amboin. 3: 28. 1743. *Cofassus mollis* Rumpf, Herb. Amboin. 3: 28. 1743. *Cofassus pallida* Rumpf, Herb. Amboin. 3: 28. 1743. *Vitex punctata* Schau. in A. DC., Prodr. 11: 687. 1847 [not *V. punctata* Merr., 1918]. *Vitex cofassus typica* H. J. Lam apud Worsdell, Ind. Lond. Suppl. 2: 500. 1941. *Vitex cofassi* Hall. f. ex Mold., Fifth Summ. 2: 715, in syn. 1971. *Vitex cofassus* "Reinw. ex Bl." apud Foreman, Div. Bot. Dept. For. N. Guin. Bot. Bull. 5: 63. 1972. *Vitex cafassus* Reinw., in herb.

Additional & emended bibliography: Rumpf, Herb. Amboin. 3: 28--30, pl. 14, fig. B. 1743; Moon, Cat. Indig. Exot. Pl. Ceyl. 1: 46. 1824; Blume, Bijdr. Fl. Ned. Ind. 14: 813. 1826; D. Dietr., Syn. Pl. 3: 611. 1843; Buek, Gen. Spec. Syn. Candoll. 3: 502. 1858; Thwaites & Hook. f., Enum. Pl. Zeyl. 244. 1861; Hassk., Neuen Schl.

48. 1866; Heyne, Nutt. Pl. Nederl. Ind., ed. 1, 112--113. 1917; H. Hallier, Meded. Rijks Herb. Leid. 37: 47--48, 51, & 85. 1918; Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 48. 1921; Fedde & Schust, Justs Bot. Jahresber. 47 (2): 246. 1927; Fedde, Justs Bot. Jahresber. 47 (2): 423. 1929; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 576. 1941; Van Royen, Nova Guinea, ser. 2, 10: 240. 1960; Mold., Phytologia 16: 498. 1968; Mold., Résumé Suppl. 17: 6. 1968; Uphof, Dict. Econ. Pl., ed. 2, 545. 1968; Begemann, Lex. Nutzh. 4: 2470--2471 (1969) and 5: 2631. 1969; Worthley & Schott, Life Sci. 8: 225--238. 1969; Farnsworth, Pharmacog. Titles 5 (8): xvii & item 8792 (1970) and 5, Cumul. Gen. Ind. 1971; Mold., Fifth Summ. 1: 319, 320, 328, 331, 333, 337, 339, 340, 373, & 468 (1971) and 2: 715, 716, 722, 726, 788, & 924. 1971; Versteegh, Meded. Landbouwhogesch. Wagen. 71-19: 10 & 62. 1971; Foreman, Div. Bot. Dept. For. N. Guin. Bot. Bull. 5: 14, 63, 178, & [179]. 1972; Hartley, Dunstone, Fitzg., Johns, & Lamberton, Lloydia 36: 294. 1973; Mold. in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 131 & 148. 1973; Farnsworth, Pharmacog. Titles 9 (1): xxviii. 1974; Mold., Phytologia 28: 452 & 465 (1974) and 34: 267. 1976; Fundter & Wisse, Meded. Landbouwhogsch. Wagen. 77 (9): 205--209. 1977.

Additional illustrations: Foreman, Div. Bot. Dept. For. N. Guin. Bot. Bull. 5: [179]. 1972; Fundter & Wisse, Meded. Landbouwhogsch. Wagen. 77 (9): 208 & 209. 1977.

Recent collectors describe this species as a large, tall, canopy tree, 8--37 m. tall, freely branched, sometimes branching 0.5 m. from the base, at other times with a bole 3--5.5 m. high, crooked, very much grooved and flanged; trunk often very gnarled and irregular, 25--75 cm. in diameter at breast height, with a girth to 3 m., with or without buttresses, the buttresses (if present) thick, equal, to 4 m. high and 2.5 m. long; outer bark pale-gray, gray, gray-brown, or pale brownish-gray to brown, light-brown, or yellowish-brown, often banded, sometimes "cream-powdery", close, soft, rather smooth or rough, very fibrous, scaly or "stringy-flakey", about 1/4 inch thick, peeling off in large, thin, fibery flakes or shredding into thin papery scales, the under bark brown, the inner bark, white, yellow, or yellow-straw, with conspicuous rings of fibers; crown light-green, sparse, spreading; branches heavy; wood hard, white or straw-color, without odor or exudate, the sapwood yellow or pale-yellow, the heartwood gray- or dark-brown, sharply defined; lenticels large, numerous; slash wood hard, light-brown or yellow; slash bark hard, "fawn-colored with flecks"; blaze pale-brown or "4-layered: orange-white, yellow, white with orange channels, and yellow"; buds green, covered with short hairs; leaves light yellowish-green, sometimes reddish-margined, or else dark- or mid-green and glossy or rather dark dull-green above, paler or light-green and dull beneath; inflorescences terminal, paniculate, their branches green; flowers scented or scentless; corolla-throat hairy; fruit oval or irregularly globular, about 8 mm. long and 7--10 mm. wide, shiny, at first light- or dull-green to gray-green or even yellowish-white, blue or black to reddish-purple when ripe, fleshy, shiny.

Collectors have found this species growing in open fields, on the sides of beaches, and in swamp margins on flat plains, in rainforests and lowland rainforests on clayey soil, in burned-over secondary forests, in valley bottoms, coastal forests and well-drained primary forests, in forests on sandy loam soil, alluvial rainforests, and along open roadsides on volcanic clay soil with *Morinda, Thelypteris,* and *Scleria,* as well as in "alluvial freshwater-tidal forest ecotones" and "ridge forests on shallow soil over conglomerate rock", from sealevel to 550 m. altitude, flowering from February to July, as well as October to December, fruiting in February, April to July, September, and October. Kajewski refers to it as "common in rainforests" and Walker & White report it "common in lowland rainforests".

The corollas are said to have been "white" on *Herb. Brit. Sol. Isls. Prot. 6697 & 6830* "whitish-blue on *Kuswata & Soepadmo 111,* "blue" on *Herb. Brit. Sol. Isls. Prot. 5967,* "lilac-blue" on *Gillis 10995,* "purplish-blue on *Fryar 3347,* "mauve-blue" on *Schodde & Craven 4497,* "blue and purple" on *Robinson 302,* "purple" on *Canfield 567, Collector undetermined 343,* and *Sutrisno 35,* "mauve" on *Croft & Lelean LAE.65427, Floyd 6633,* and *Walker & White 20,* "violet" on *Brass 21950,* "lavender" on *Brass 21909,*and "yellow" on *Herb. Brit. Sol. Isls. Prot. 6785.*

Vernacular names reported for this species include "afas", "ahsang", "anoano", "a'sang", "bai-ah", "bitum", "fata", "father", "gofasa", "gofassa", "gupasa", "kofasa", "namavue", "New Guinea teak", "ridohokko", "sassuwar", and "vitex". A wood sample accompanies *Schodde & Craven 4497. Robinson 302* is said to represent the *Cofassus femina* of Rumpf's (1743) plate 14 B, which exhibits both 1- and 3-foliolate leaves. The type of the species itself is probably a Rumpf collection from Amboina.

Kajewski notes that the "exceptionally strong timber [is] used by natives [in the Solomon Islands] for making large wooden bowls and platters for feasts, pounding food in [a] manner similar to mortar". Wood anatomy characters are given in detail by Fundter & Wisse (1977) who cite *NGBW nos. 809, 843, 1335, 9436, & 10074* from New Guinea. Foreman (1972) cites *NGF.577, 2862, 16422, 19690, 45643, 45748, & 48608, Kajewski 1033 & 1843, Rechinger 3748, Schodde & Craven 3651, 4004, & 4119, Wat. 6-B,* and *Wat. Yale 29,* all from Bougainville island.

Heyne (1917) gives detailed notes on the uses of this species in Indonesia and differentiates the characteristics of the three forms of the species noted by Rumpf (1743). For *Cofassus alba* he lists the vernacular name, "gofasa perampoean", for *Cofassus mas* "gofasa batoe", and for *C. femina* "gofasa gaba-gaba". From Ceram he lists also the local names, "gofasa tikar" and "gofasa mĕrah". Hallier (1918) records the name, "adjie bitie" from Celebes, "matatakum" from New Guinea, and "gafussu", "govasa-batu-baum", and "govasa-gaba-baum" from the Molucca Islands. He cites *Heyne 2821* from Celebes, *Elbert 2732* from Buton, *DeVriese & Teijsmann 5 & 6, Forsten s.n.,* and *Reinwardt 1465* from the Moluccas, and

Weinland 155 from New Guinea. Lam (1919) cites *Boerlage 503* and *Robinson 302* from Amboina, *Hulstijn 404* from Sula Besi, and *Hulstijn 414* from Mangoli. Uphof (1968) gives the range of the species as "Malay Archipelago, Celebes, Moluccas etc." and notes that its wood is "durable, resistant to sea-water and moist soil; used for building vessels." Begemann (1969) describes the wood characters in detail, gives the distribution as "Neu-Guinea und den Salomon-Inseln, aber auch in Malaysia, dem Sarawak und in Indonesien heimisch", and notes that "Das Holz wirt generell zu den gleichen Zwecken wie Teak.....verwandt, speziel aber im Boots- und Schiffbau, als Bau- und Konstruktionholz mit einer mittleren Beansprechung, zum Innenausbau, als Fussboden und Perkett, für Möbel, Leitungsmaste und Schwellen....Die Liefermöglichkeiten sind beschränkt. Der Hauptabnehmer dieses Holzes ist nach wie vor Australien."

Hartley and his associates cite their *nos. 9631b* & *10154*. Versteegh (1971) reports that the slash of this wood turns dark-green on exposure and the living bark yellow, and that in the English and Indonesian trade the wood goes by the name of "gofassa".

Foreman (1972) gives detailed descriptions of the tree, its bark, leaves, flowers, fruits, and wood (density 44 lbs. per cubic foot). He affirms that "The timber is strong, hard, durable and does not warp after cutting. It is used in boat building and has been used for panelling. The poor form restricts its attractiveness to saw millers. It is used much for carvings and drums..... The wood is very similar to that of *Viticipremna novaepommeranae (Vitex quinata)* which has been cut extensively on New Britain, but that species has a much better form than *Vitex cofassus."* He gives its distribution as "Moluccas, Micronesia, New Guinea, throughout the Solomon Islands and Bismark Archipelago." The Gillis collection, cited below, was gathered from cultivated material in Florida, grown from the seed of *Fairchild 319* from Maripa island in the Moluccas.

It should be pointed out here that Foreman (1972) is in error in synonymizing *Viticipremna novae-pommeraniae* (Warb.) H. J. Lam with *Vitex quinata* (Lour.) F. N. Will.

It is also worth noting here that according to Merrill (1917) *Cofassus mas* Rumpf is in part *Vitex cofassus* and in part *V. parviflora* A. L. Juss. Actually, on p. 28 Rumpf says: "Post Metrosideri species hoc celebre tignum suum obtinet locum, cujus tres nobis obvenere species: Prima *mas* seu *rubra*; Secundo *alba,* seu *pallida*: Tertio *mollis,* quae *femina* esse putatur, quae omnes parum forma, modoque crescendi differunt, excepto lignorum colore." On his pl. 14 fig. A and B are drawn as attached to each other -- "A", above, is trifoliolate and probably represents *V. parviflora,* while "B", below, is unifoliolate and probably represents *V. cofassus*. As to the names he cites, it seems that *Cofassus mas* and *C. rubra* probably represent "A" or *V. parviflora,* while *C. alba, C. pallida, C. mollis,* and *C. femina* probably represent "B" or *V. cofassus*. "A" is drawn with flowers, "B" with fruit. "A" is marked "folia maris" on the plate and "B" is marked "femina".

The Blume (1826) reference cited in the bibliography above is often mistakenly cited as "8: 3", "9: 813", or "1825"; that of Moon (1824) is sometimes cited as "1821"; that of Thwaites & Hooker (1861) as "246" or "1839"; and that of Foreman (1972) by the misleading title-page date of "1971".

Additional citations: PALAU ISLANDS: Aimiriik: *Kanehira 1977* (W--1656936). Koror: *Canfield 567* (W--2835869, W--2835970). Palau: *Hosokawa 7051* (W--2036330). MOLUCCA ISLANDS: Amboina: *C. B. Robinson 302* (W--654620). Ceram: *Kuswata & Soepadmo 111* (N). Halmahera: *Herb. Neth. Ind. For. Serv. bb.23772* (N), *bb. 23773* (N). Ternate: *Herb. Neth. Ind. For. Serv. bb.23185* (N). AROE ISLANDS: Kobroor: *Herb. Neth. Ind. For. Serv. bb.25296* (N). NEW GUINEA: Papua: *Brass 21909* (W--2603087), *21950* (W--2603093). Territory New Guinea: *Fryar 3347* (N, W--2211051); *Schodde & Craven 4497* (Ac); *Weinland 155* (Mu--3963); *Womersley 2913* (N), *3313* (W--2211054). BISMARK ARCHIPELAGO: New Britain: *Floyd 6633* (W--2603222); *Frodin NGF.26866* (Mu); *Henty & Lelean NGF.49499* (Mu); *Womersley & Kazakoff NGF.7082* (W--2603189). New Ireland: *Croft & Lelean LAE.65427* (Mu). SOLOMON ISLANDS: Guadalcanal: *Walker & White B.S.I.P.20* (W--2157870, W--2157871). Malaita: *Kajewski 2381* (W--1752235). New Georgia: *Maenu'u s.n.* [Herb. Brit. Sol. Isls. Prot. 5967] (W--2578788). Ulawa: *Teona s.n.* [Herb. Brit. Sol. Isls. Prot. 6269] (W--2578324). Ysabel: *Beer collectors s.n.* [Herb. Brit. Sol. Isls. Prot. 6830] (W--2578424), *s.n.* [Herb. Brit. Sol. Isls. Prot. 6697] (W--2578661), *s.n.* [Herb. Brit. Sol. Isls. Prot. 6785] (W--2578460), *s.n.* [Herb. Brit. Sol. Isls. Prot. 7778] (W--2578379). CULTIVATED: Florida: *Gillis 10995* [Pl. Introd. 139401 M.10573] (Ld). India: *Herb. Hort. Bot. Calcut. s.n.* (Pd). Java: *Sutrisno 35* [Herb. Hort. Bogor. XIII.J.87] (N). Sri Lanka: *Collector undetermined 343* (Pd), *s.n.* (Pd).

VITEX COFASSUS f. *ANOMALA* Mold.

Additional bibliography: Mold., Phytologia 15: 98. 1967; Mold., Fifth Summ. 1: 328, 333, & 373 (1971) and 2: 924. 1971.

VITEX COFASSUS var. *PUBERULA* H. J. Lam

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 47 (2): 246 (1927) and 60 (2): 576. 1941; Mold., Phytologia 15: 98. 1967; Mold., Fifth Summ. 1: 334, 338, & 340 (1971) and 2: 715 & 924. 1971.

VITEX COLUMBIENSIS Pittier

Emended synonymy: *Vitex colombiensis* Pittier apud A. W. Hill, Ind. Kew. Suppl. 7: 252. 1929.

Additional & emended bibliography: Pittier, Contrib. U. S. Nat. Herb. 20: 483--485. 1922; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1076. 1932; Record & Mell, Timbers Trop. Am. 525--527. 1924; Mold., Phytologia 15: 232. 1967; Mold., Fifth Summ. 1: 120 (1971) and 2: 778 & 924. 1971.

López-Palacios, in a personal communication, lists the following vernacular names for this species: "Totumillo costeño según Duque-Jaramillo; Aceotuno en Bolívar, y en la región de Urabá posiblemente sea a esta especie a la que se denomina Truntago (-negro; -blanco; tená), Jorge Ignacio del Valle, o. c.: 275".

VITEX COMPRESSA Turcz.

Additional & emended bibliography: Pittier, Contrib. U. S. Nat. Herb. 20: 483 & 485. 1922; Pittier, Man. Pl. Usual. Venez. 94 & 451. 1926; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 607. 1927; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1076. 1932; Pittier, Supl. Pl. Usual. Venez. 55. 1939; H. N. & A. L. Mold., Pl. Life 2: 81. 1948; Macbr., Field Mus. Publ. Bot. 13 (5): 692 & 693. 1960; Mold., Phytologia 16: 498. 1968; J. A. Steyerm., Act. Bot. Venez. 3: 83. 1968; Uphof, Dict. Econ. Pl., ed. 2, 122, 255, & 545. 1968; Mold., Fifth Summ. 1: 111, 112, 120, 128, 131, 133, 134, 144, 179, 373, & 470 (1971) and 2: 714, 727, 730, & 924. 1971; López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 95--97. 1975; Mold., Phytologia 34: 259. 1976; Soukup, Biota 11: 20. 1976; López-Palacios, Fl. Venez. Verb. 579, 581, 595--601, 639, 648, & 654, fig. 139. 1977; R. F. Sm., Act. Bot. Venez. 13: 186, 208, & 240. 1978.

Illustrations: López-Palacios, Fl. Venez. Verb. [596], fig. 139. 1977; R. F. Sm., Act. Bot. Venez. 13: 240. 1978.

Recent collectors describe this species as a small or tall tree, 2.5--30 m. tall, erect, unarmed, leafy, the trunk 8--30 cm. in diameter at breast height, the leaves firmly membranous, rich-green above, "concha arenosa en textura", the lower petal 3-lobed, the filaments white, pilose, the anthers deep-purple or black, the line of dehiscence cream-color, and the fruit green [immature?], fleshy, depressed at the apex, bland. They have found the plant growing in periodically inundated forests (varzea), primary forests in the warm zone, on stream banks, on savanna-covered slopes with dry thickets, and between rocks on sand of river banks, at altitudes of 10--300 m., flowering in February, April, June, and August, in fruit in April and from June to September.

The corollas are said to have been "rose" on *Cavalcante 2482* and *Murça Pires & al. 14414*, "purple" on *Blanco 998*, "light-purple, the throat light yellowish-green" on *Ruiz-Terán & López-Palacios 11701*, "pale-blue, the lower lip dark-blue with a yellow spot" on *Lanjouw & Lindeman 2028*, and "lateral lobes light-blue, central lobe dark-purple with a yellow spot inside" on *Mori & al. 8137*. Macbride (1960) says that *V. compressa* "Becomes a stout tree to 30 meters tall, the straight trunk to a meter in diameter; flowers blue to purple, fragrant". He lists it from Peru with a question, adding that it is found naturally "To Colombia, Trinidad and Brazil".

Vernacular names reported for the species include "aceituno", "guaratare", "guarataro", "guateloro", "hakiaballi", "kalebashout", "pachaca", "totumillo", "totumillo blanco", "totumillo sarnito", and "totumo". Uphof (1968) refers a "Guiana Chaste Tree" to *Vitex divaricata* Sw., but it seems more probable that this name belongs to *V. compressa*. Smith (1978) lists *V. compressa* from Lara, Venezuela.

López-Palacios (1977) cites the following collections from Venezuela: Amazonas: *Ll. Williams 14993*. Anzoátegui: *Pittier 15069 & 15118*. Aragua: *Montaldo 3076, 3403, & 3425; Stauden 17; Trujillo 3413; Ll. Williams 10257*. Barinas: *Marceno-Berti & Lezama 219*. Bolivar: *Aristeguieta 5315 & 5844; Bernardi 7400; Little 17596 & 17618; Steyermark 86381, 86621, 86722, 86916, 94217, 94239, & 94269*. Carabobo:*Karsten s.n.; Steyermark & Carreño 106876*. Falcón: *Blanco 925 & 998; Ruiz-Terán 467 & 701; Steyermark & Manará 110731*. Guárico: *Aristeguieta & Agostini 6407; Ruiz-Terán & López-Palacios 11701*. Lara: *Badillo 409; Smith V.1753; Steyermark 56822*. Miranda: *Steyermark & Steyermark 110042*. Monagas: *Aristeguieta & Vera 7524*. Portuguesa: *Trujillo 3901*. Sucre: *Steyermark & Manará 107898*. Trujillo: *Curran 761; Pittier 10848; Trujillo & Bunting 2819*. Yaracuy: *Bernardi 6955; Madriz 38*. Zulia: *Aristeguieta & al. 6846; Delascio & Benkosky 3084; Tejera E.117; Trujillo 4242*.

Additional & emended citations: COLOMBIA: Caquetá: *Romero-Castañeda 4094* (N). Guajira: *Trujillo 4242* (Ut--333344b). Magdalena: *Romero-Castañeda 1057* (W--2104673), *9051* (N); *H. H. Smith 2107* (Ld). VENEZUELA: Aragua: *Vogl 814* (Mu). Bolívar: *Aristeguieta 5844* (N); *J. A. Steyermark 94217* (N, W--2438641). Falcón: *Aristeguieta, Blanco, & Carrillo 6846* (N); *C. A. Blanco 925* (N, W--2777220, N), *998* (N); *Steyermark & Manará 110731* (N). Guárico: *Ruiz-Terán & López-Palacios 11701* (Ld). Miranda: *Steyermark & Steyermark 110042* (N); *Trujillo 2819* (Ld). Zulia: *Aristeguieta, Blanco, & Carrillo 6846* (Ac); *Budowski 2* (Ld, N). GUYANA: *D. H. Davis 726* (N). GUYANAN ISLANDS: Thomas: *Mori, Bilten, Persaud, Boyan, Roberts, Jugernauth, & Dwarka 8137* (Ld, N). SURINAM: *Lanjouw & Lindeman 2028* (W--2796107); *Lindeman 5443* (Ld, W--2640856); *J. P. Schulz 7709* (N). BRAZIL: Pará: *Cavalcante 2482* (Ld, N); *Murça Pires & Leite 14845* (Ld). Roraima: *Murça Pirex, Cavalcante, Magnago & Silva 14414* (Ld).

VITEX CONGENSIS A. Chev.

Additional bibliography: Mold., Phytologia 15: 232. 1967; Mold., Fifth Summ. 1: 219 & 231 (1971) and 2: 776 & 924. 1971.

VITEX CONGESTA Oliv.

Additional bibliography: Mold., Phytologia 15: 232. 1967; Mold., Fifth Summ. 1: 263 & 468 (1971) and 2: 648 & 924. 1971.

VITEX CONGOLENSIS DeWild. & Th.-Dur.

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 316 & 325. 1900; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 402. 1938; H. N. & A. L. Mold., Pl. Life 2: 61. 1948; Mold., Phytologia 16: 498. 1968; Mold., Fifth Summ. 1: 224, 231, & 245 (1971) and 2: 710, 717, 718, 776, & 924. 1971.

Recent collectors describe this species as a small tree, 40--50 feet tall, or as a shrub, 3--4 m. tall, the trunk 20--70 cm. in diameter, and have encountered it on sandy plains, along rivers, and on savannas with *Hymenocordia acida*, at 470 m. altitude, flowering in March, fruiting in November. A vernacular name reported for it is "kpar-seh".

Baker (1900) cites *Schweinfurth 3442* from Zaire as the type of what he called *V. aesculifolia* J. G. Baker and notes that "*Vitex congolensis*..........is not separable from *V. ferruginea*, Schumach. & Thonn., by the description. It was collected by Dewèvre at Bokakata in the northern part of the Congo Free State [Zaire]".

Material of *V. congolensis* has been misidentified and distributed in some herbaria as *V. rufa* A. Chev. and *V. thonneri* DeWild.

Additional citations: LIBERIA: *G. P. Cooper 355* (W—1378523). ZAIRE: *Carlier 286* (Mu); *Louis 3509* (N), *13889* (W--2091110); *Luyten 29* (Mu).

VITEX CONGOLENSIS var. *GILLETII* (Gürke) Pieper

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 57 (2): 402. 1938; H. N. & A. L. Mold., Pl. Life 2: 61. 1948; Mold., Phytologia 15: 232. 1967; Mold., Fifth Summ. 1: 231 (1971) and 2: 717 & 924. 1971.

VITEX COOPERI Standl.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 57 (2): 404. 1938; H. N. & A. L. Mold., Pl. Life 2: 54. 1948; Kribs, Comm. For. Woods, ed. 2, 161--162, fig. 474 (1959) and ed. 3, 161--162, fig. 474. 1968; Mold., Phytologia 16: 498. 1968; Mold., Résumé Suppl. 16: 4. 1968; Whitmore & Hartshorn, Lit. Rev. Com. Trop. Trees 95. 1969; Gibson, Fieldiana Bot. 24 (9): 234--235. 1970; Farnsworth, Pharmacog. Titles 6 (9): xii & title 15746. 1971; Mold., Fifth Summ. 1: 81, 84, 86, 89, & 91 (1971) and 2: 924. 1971; Saez R. & Nassar C., Revist. Biol. Trop. 18: 137. 1971; Farnsworth, Pharmacog. Titles 6, Cum. Gen. Ind. [122]. 1973; Mold. in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 131, 134--135, & 148. 1973; Janos in Sanders & al., Endomycor. 437--446. 1975; Molina R., Ceiba 19: 96. 1975; Anon., Forest. Abstr. 37: 555 (1976) and 37 (10): 9. 1976; Croat, Fl. Barro Colorado 40 & 732. 1978.

Illustrations: Kribs, Comm. For. Woods, ed. 2, fig. 474 (1959) and ed. 3, fig. 474. 1968.

Recent collectors describe this species as a tree, 30--80 feet tall, the trunk 12--30 inches in diameter, fluted at the base, the flowers fragrant, and have found it growing from sealevel to 50 m. altitude, flowering from June to August. The corollas are said to have been "blue" on *Woodson & Schery 937* and "lavender" on *Allen 5294*.

Whitmore & Hartshorn (1969) report *V. cooperi* from "lowland forests from Guatemala to Panama". Croat (1978) tells us that on Barro Colorado Island, Panama, it flowers and fruits "in the wet season". He gives its overall distribution as "Guatemala to Panama; sea level to 600 m. In Panama, known from tropical moist forest in the Canal Zone and Darién and from premontane wet forest in

Chiriqui (Progreso); reportedly fairly common on the Atlantic watershed around Gatun Lake (*Fisher 1*) and no doubt more widespread and common than collections indicate." Gibson (1970) reports it from damp thickets in Izabal, Guatemala, as well as the Atlantic coast of Honduras, Nicaragua, Costa Rica, and Panama. She notes that "This has been confused with *V. floridula* Duchass. & Walp. of Panama, which has larger flowers and short-pedunculate cymes. It more closely resembles the West Indian *V. divaricata* Sw. which has slightly larger flowers and glabrate pedicels and calyxes." She distinguishes the Guatemalan species as follows:

"Leaflets 3; calyx cupuliform, subtruncate, remotely and minutely denticulate...............................*V. cooperi*.
 Leaflets 5 (rarely 7); calyx campanulate, lobate or dentate.
  Leaflets glabrous beneath or nearly so; calyx with triangular-oblong to linear, often reflexed lobes 1.5--2.5 mm. long.......................................*V. kuylenii*.
  Leaflets tomentulose and velutinous beneath; calyx with acute teeth 0.5--1 mm. long........................*V. gaumeri*.

Janos (1975) calls *V. cooperi* "rare" in northeastern Costa Rica. He has found that inoculations of *Endomycorrhiza* into the roots of this species significantly improve growth and the ability to survive attack by native insects "owing to the more vigorous growth of their axillary buds."

Vernacular and common names reported are "cua-ja", "cuajada", "raja bien", "rajate bient", and "yellow manwood".

Additional citations: COSTA RICA: Puntarenas: *P. H. Allen 5294* (N, Ws). PANAMA: Canal Zone: *Stern & Chambers 159* [Yale wood 51651] (E--1739902). Chiriquí: *Woodson & Schery 937* (W--1209356).

VITEX COURSI Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.13: 570. 1968; Mold., Phytologia 16: 498. 1968; Mold., Fifth Summ. 1: 263 (1971) and 2: 716 & 924. 1971.

VITEX CRENATA A. Chev.

Additional bibliography: Mold., Phytologia 15: 240. 1967; Vergiat, Journ. Agr. Trop. Bot. Appl. 17: 337. 1970; Mold., Fifth Summ. 1: 227 (1971) and 2: 924. 1971.

Vergiat (1970) records the vernacular names, "alya", "bili", and "bili betena", for this species, describing it merely as an "Arbre de savane, à feuilles crénetées vers le summet. Floraison: grappes de fleurs lilas. Fructification: grappes de trois à quatre fruits noir violacé, de la grosseur d'une cerise, comestibles." He asserts that "La décoction des feuilles est bue contre la dysenterie. La décoction de l'écorce contre la toux, on l'emplois aussi pour laver les pieds enfles. L'eau de macération de l'écorce, aspirée par le nez, excite les sécrétions nasales. Les raclures fraîches des racines pilées avec des graines de...*Amblygonocarpus Schweinfurthii*,servent a confectionner des petits tampons que l'on maintient appliqués sur les dents dont on souffre." He says that an unidentified species of *Vitex* in the same area of what used to be called French Equatorial Africa exhibits the same medicinal properties as *V. crenata*.

VITEX CUSPIDATA Hiern

Additional bibliography: Bouquet, Invent. Pl. Med. Tox. Cong. Braz. 33. 1967; Mold., Phytologia 15: 240. 1967; Mold., Fifth Summ. 1: 231 & 245 (1971) and 2: 924. 1971.

Meyer's photograph of the type collection, cited below, actually shows the holotype of the species preserved in the herbarium of the British Museum, London.

Citations: ANGOLA: Cuanza Norte: *Welwitsch 5665* [F. G. Meyer photo 2991] (Gz--photo of type, N--photo of type).

VITEX CYMOSA Bert.

Additional synonymy: *Vitex cymosa* "Bert. ex Spreng." apud Angely, Fl. Anal. Paran., ed. 1, 580. 1965.

Additional & emended bibliography: D. Dietr., Syn. Pl. 3: 612. 1843; Schau. in A. DC., Prodr. 11: 688. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 501. 1858; Kuntze, Rev. Gen. Pl. 3 (2): 258. 1898; Briq. in Chod. & Hassl., Bull. Herb. Boiss., ser. 2, 4: 1169. 1904; Briq. in Chod. & Hassl., Plant. Hassler. 2: 505. 1904; Peckolt, Bericht. Deutsch. Pharm. Gesell. 14: 481. 1904; Fedde & Schust., Justs Bot. Jahresber. 39 (2): 320. 1913; Pittier, Contrib. U. S. Nat. Herb. 20: 484. 1922; Pittier, Man. Pl. Usual. Venez. 94 & 451. 1926; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 607. 1927; Pittier, Supl. Pl. Usual. Venez. 55. 1939; Chardon, Mycologia 32: 199--200. 1940; Pérez-Arbeláez, Pl. Util. Colomb., ed. 1, 442. 1947; Michalowski, Serv. Tecn. Interam. Coop. Agr. Bol. 174 (1954), 173 (1955), and 189. 1955; Pérez-Arbeláez, Pl. Util. Colomb., ed. 2, 745. 1956; Cuatrecasas, Revist. Acad. Colomb. Cienc. 10: 241. 1958; R. C. Foster, Contrib. Gray Herb. 184: 171. 1958; Macbr., Field Mus. Publ. Bot. 13 (5): 692--695 & 697. 1960; Martínez-Crovetto, Bonplandia 1: 198. 1963; Angely, Fl. Anal. Paran., ed. 1, 580. 1965; Mold., Phytologia 16: 498. 1968; Mold., Résumé Suppl. 16: 4. 1968; A. L. Mold., Phytologia 18: 128. 1969; Mold., Fifth Summ. 1: 91, 128, 179, 184, 188, 203, & 373 (1971) and 2: 531, 715--717, 725, & 924. 1971; Mold., Phytologia 23: 418. 1972; Altschul, Drugs Foods 246. 1973; Mold. in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 131, 136--137, & 148. 1973; Mold., Phytologia 28: 452. 1974; Troncoso, Darwiniana 18: 395 & 412. 1974; Kooiman, Act. Bot. Neerl. 24: 462. 1975; López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 97. 1975; Zimmerm. & Ziegler in Zimmerm. & Milburn, Transp. Pl. 1 [Pirson & Zimmerm., Encycl. Pl. Physiol., ser. 2, 1]: 503. 1975; López-Palacios, Revist. Fac. Farm. Univ. Andes 17: 50--51. 1976; Mold., Phytologia 34: 256. 1976; López-Palacios, Fl. Venez. Verb. 581, 582, 602--606, 649, & 654, fig. 140. 1977.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [603], fig. 140. 1977.

Recent collectors describe this species as a shrub, 2--4 m. tall, or a large tree, 10--23 m. tall [or to "86 m." according to Berg &

al.], the trunk 25--50 cm. in diameter, the stems and/or branches arching, the bark light-colored, finely fissured, the flowers showy, "visitadas por abundantes abejas y abejorros", the calyx dark-blue, and the fruit about 24 mm. long and 14 mm. wide, at first green or greenish, then red or reddish-black, finally maroon, dark red-brown, or black, and fleshy, "vinoso", falling off at the slightest touch when ripe. They have found the plant growing in gallery forests, tropical moist forests, rain forests, primary forests on terra firma, and "disturbed forests with *Prosopis* and *Scheelea*", on floodplains, in degraded cerrado, along quebradas, on streamsides and riverbanks, at lake margins, in small patches of low wet woods, on creek margins, and in both whitewater and blackwater flooded varzea river margins, at altitudes of 16--550 m., in flower from January to March and June to November, in fruit in January, April, and June to August. Anderson reports finding it "emergent from water in dense inundated vegetation of trees and vines or riverine forests"; Prance found it overhanging rivers.

The corollas are said to have been "blue" on *Anderson 10982, McDaniel & al. 2683,* and *Prance & al. 5372, 14144,* & *15080,* "lavender-blue" on *Anderson 10874,* "blue-lilac" on *Fernandez & Jaramillo 7105,* "blue with white center" on *Prance & al. 59124,* "lilac" on *Hatschbach & Scherer 30433,* "violet" on *Schunke 2413,* "purple" on *Campbell & al. 22456,* and "deep-purple" on *Haught 4039.*

Fosberg reports finding the species "occasional". The leaves are extraordinarily large on *Berg & al. P.19703.* Steinbach says: "fruta.....del tamaño de un olivo, a que se parece también alyo en el gusto. Es fruta muy sana". In Colombia Fosberg reports the fruit eaten by the natives, "but [they] are of very flat taste". Schunke asserts that the wood is used for farmhouse construction in Peru. Chardon (1940) reports it attached by the parasitic fungus, *Phyllachora toruma* Speg., the report based on *Müller 166* & *225.*

Peckolt (1904) says of *Vitex cymosa:* "In den Staaten Bahia, Matto Grosso, Minas und Pará [Brazil] vorkommend mit den Tupybenennung Taruma -- Ölfrucht. Urwaldbaum, bis 20 m hoch, mit schöner, dicht belaubter Krone, fünf- bis siebenzähligen, oberseite glänzend grünen, unterzeits weissfilzigen Blättern. Blüten blau. Kugelrunde, weisse, fast transparente saftige Steinfrucht von der Grosse einer Herzkirsche. Ein wohlschmeckendes Waldobst; vom Safte wird mit gleichen Teilen Zucker ein Hustensirup bereitet. Das Dekokt der Rinde wendet man an bei sekundärer Syphilis. Das Holz dient zu Bauten." It is problematic whether this white pleasant-tasting fruit tree of Brazil is conspecific with the black and not especially good-tasting fruit tree passing under this name in other regions.

Vernacular names reported for *V. cymosa* include "aceituna", "aceituna del monte", "aceituno", "cormuñon", "cuajado", "pechiche", "taruma", "tarúma", "tarumã", "tarumão", "veludo", and "zarumá".

Altschul (1973) cites *Steinbach 6428* from Bolivia; Macbride

(1960) cites *Weberbauer 5341* from Lima, Peru, giving the species' overall distribution as "To Colombia, Brazil, Bolivia, Patagonia" -- "Patagonia" obviously an error for "Paraguay". López-Palacios (1977) cites the following collections from Venezuela: Zulia: *Aristeguieta & al. 6763, Karsten s.n., Müller 1114, Pittier 10477* & *10491, Plée 7* & *12, Tamayo 4575*. Zulia or Falcón: *Curran 744*. He comments that "La especie es bastante característica. En Venezuela, que yo sepa, sólo ha sido registrada en los Edos. Zulia y Falcón. La referencia que el Dr. Moldenke.....hace para el Edo. Bolívar parece basarse en alguna mala interpretación, quizás *Cardona 2119*, que es *V. staheli*." He also says: "No he tenido oportunidad de examiner los tipos de *Vitex cymosa* Bert. y *Vitex flavens* HBK., pero el material que se les asigna en los herbarios es tan similar, que hace pensar que con coespecíficos o que el material he sido mal interpretado."

Material of *V. cymosa* has been misidentified and distributed in some herbaria as *Godmania aesculifolia* (H.B.K.) Standl. or as *Bignoniaceae* sp. On the other hand, the *Mexia 6177*, distributed as *V. cymosa*, actually is *V. gigantea* H.B.K., while *Fiebrig 5382* & *5807, Jorgensen 3786*, and *Vattuone & Bianchi L.170* are *V. megapotamica* (Spreng.) Mold., and *Mexia 5251* & *5474* are *V. mexiae* Mold.

Additional citations: PANAMA: Darién: *Duke & Bristan 8244* (E--1864914). COLOMBIA: Caldas: *Fernández-Pérez & Jaramillo Mejía 7105* (N, W--2844805). Guajira: *Saravia T. 2339* (W--2587516). Cundinamarca: *Gentry, Daly, León, & Barbosa 18107* (Ld). Magdalena: *F. R. Fosberg 39401* (Ac); *Haught 4039* (N); *Romero 1029* (W--2104654); *H. H. Smith 1936* (Ld). VENEZUELA: Zulia: *Aristeguieta, Blanco, & Carrillo 6763* (Ac, N); *Budowski 14* (Gz, N); *H. M. Curran 102* (N), *206* (N), *235* (N). PERU: Tumbes: *Schunke Vigo 2413* (N). BRAZIL: Amazônas: *Berg, Bisby, & Monteiro P.19703* (Ld, N); *McDaniel, Fernando, Leonel, & Quintino 2683* (W--2667277); *Prance, Maas, Atchley, Steward, Woolcott, Coelho, Monteiro, Pinheiro, & Ramos 14144* (Ld, N); *Prance, Maas, Woolcott, Coelho, Monteiro, & Ramos 15080* (Ld, N); *Prance, Philcox, Forero, Coelho, Ramos, & Farias 5291* (Ac). Mato Grosso: *Hatschbach & Scherer 30433* (Ld, N, W--2705990); *Prance & Silva 59124* (N); *Prance, Silva, & Murça Pires 59124* [L.S. 120] (N); *Prance & Schaller 26286* (N); *R. P. Richards 6511* (N). Pará: *W. R. Anderson 10874* (Ld, N), *10982* (Ac, N); *Campbell, Ongley, Ramos, Monteiro, & Nelson P.22456* (Ld, N). Paraná: *Hatschbach & Haas 15809* [4317] (Ld, Ld, W—2536540). Rondônia: *Prance, Forero, Wrigley, Ramos, & Farias 6719* (E—2135202); *Prance, Philcox, Forero, Coêlho, Ramos, & Farias 5291* (N), *5372* (Ld. N). BOLIVIA: El Beni: *E. Schmidt 155* (Mu); *Werdermann 2336* (E—999946). PARAGUAY: *Hassler 12307a* (Ws). CULTIVATED: Egypt: *Täckholm & Elsayed s.n.* [1/6/1961] (Gz, Gz).

VITEX DEGENERIANA Mold.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 55. 1948; Mold., Phytologia 15: 241. 1967; Mold., Fifth Summ. 1: 224 (1971) and 2: 924. 1971.

VITEX DENTATA Klotzsch

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 316 & 320--321. 1900; Mold., Phytologia 15: 241. 1967; Mold., Fifth Summ. 1: 252 (1971) and 2: 924. 1971.

VITEX DINKLAGEI Gürke

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 56. 1948; Mold., Phytologia 15: 241. 1967; Mold., Fifth Summ. 1: 224 (1971) and 2: 924. 1971.

VITEX DIVARICATA Sw.

Additional synonymy: *Tanaecium paniculatum* Sieb. apud Buek, Gen. Spec. Syn. Candoll. 3: 469. 1858. *Vitex divaricata* var. *divaricata* [Sw.] apud Alain in León & Alain, Fl. Cuba, imp. 1, 4: 318. 1957. *Vitex divaricata* var. *divaricata* [Alain] ex Mold., Résumé 383, in syn. 1959. *Vitex divaricata* var. *divaricata* Alain ex Mold., Fifth Summ. 2: 716, in syn. 1971. *Vitis divaricata* Mold. ex López-Palacios, Fl. Venez. Verb. 606, in syn. 1977.

Additional & emended bibliography: Raeusch., Nom. Bot., ed. 3, 182. 1797; D. Dietr., Syn. Pl. 3: 611. 1843; Schau. in A. DC., Prodr. 11: 691. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 469 & 501. 1858; Urb., Symb. Antill. 7: 357. 1912; Fedde & Schust., Justs Bot. Jahresber. 40 (2): 336. 1915; Pittier, Contrib. U. S. Nat. Herb. 20: 484. 1922; Pittier, Man. Pl. Usual. Venez. 386 & 451. 1926; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 607. 1927; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 404. 1938; R. W. Br., Compos. Scient. Words 833. 1954; Cocker & Shaw, Journ. Chem. Soc. Lond. 1962: 5194--5197. 1962; Anon., Hortic. Abstr. 34: 151. 1964; Little & Wadsworth, Comm. Trees Puerto Rico [U. S. Dept. Agr. Handb. 249:] 476 & 486--487, fig. 230. 1964; J. A. Steyerm., Act. Bot. Venez. 1 (2): 13 & 17. 1966; D'Arcy, Rhodora 69: 439. 1967; Kariyone, Ann. Ind. Rep. Pl. Chem. 1962: 136. 1967; Mold., Phytologia 16: 498--499. 1968; Mold., Résumé Suppl. 17: 2. 1968; Uphof, Dict. Econ. Pl., ed. 2, 122, 255, & 545. 1968; Dennis, Kew Bull. Addit. Ser. 3: 289. 1970; Gibson, Fieldiana Bot. 24 (9): 234. 1970; Mold., Fifth Summ. 1: 98, 101, 106, 107, 109, 111, 112, 128, 373, & 391 (1971) and 2: 639, 716, 732, & 924. 1971; Mold., Phytologia 23: 416 (1972) and 25: 228. 1973; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 672. 1973; Alain in León & Alain, Fl. Cuba, imp. 2, 2: 317--318. 1974; Howes, Dict. Useful Pl. 96. 1974; Little, Woodbury, & Wadsworth, Trees Puerto Rico Virg. Isls. 2: [U. S. Dept. Agr. Handb. 449] : 854, 990, & 1023. 1974; López-Palacios, Revist. Fac. Farm. Univ. Andes 15: 97--100 (1975) and 17: 50. 1976; L. H. & E. Z. Bailey, Hortus Third 1162. 1976; Laurence & Mohammed, Journ. Agr. Soc. Trin. Tob. 76: 345. 1976; López-Palacios, Fl. Venez. Verb. 581, 582, & 606--610, fig. 141. 1977; Fournet, Fl. Illustr. Phan. Guad. Mart. 1392--1393, fig. 662. 1978.

Additional illustrations: López-Palacios, Fl. Venez. Verb. [607], fig. 141. 1977; Fournet, Fl. Illustr. Phan. Guad. Mart. 1392, fig. 662. 1978.

Recent collectors describe this species as a very handsome tree, 6.5--13 m. tall, the trunk 10--20 cm. in diameter at breast height, the bark light-tan, the lateral leaflets often caducous, thus giving the leaves a 1-foliolate appearance, the flowers fragrant, hairy in the center, the stamens lavender, the immature fruit green or yellow-green, turning brownish, fleshy. They have found it growing in dry or montane forests, at forest edges, in clearings, and along roadsides from near sealevel to 1000 m. altitude, flowering in May and June, fruiting in July and August.

Vernacular names recently reported for *V. divaricata* are "aceituno", "black fiddle wood", "higüerillo", "totumillo", and "white fiddlewood". Uphof (1968) lists "Guiana chaste tree", but this name more probably applies to *V. compressa* Turcz. instead. Raeuschel (1797) makes the remarkable (and completely erroneous) statement that *V. divaricata* is a native of "India orient."

The corollas are said to have been "blue" on *Little 13698* and *Purseglove P.6439,* "violet-blue" on *Proctor 17797,* "purplish-blue" on *Little 13081,* "violet with blue lip" on *Proctor 20929,* and "4 petals pale-lavender, the fifth dark-purple, center white" on *Wagner 560.*

López-Palacios describes the species as an "Arbol ca. 12 m. Hojas por lo general 1-folioladas y cuando 3-folioladas los folíolos laterales pequeños (0.5--5 x 0.2--4 cm.), el folíolo central generalmente obovado o elíptico; cimas divaricadas con 2 brácteas pequeñas; cáliz 5-apiculado; corola lila, el pétalo central un poco más oscuro y ligeramente amarillo y barbelado en la base, el tubo con líneas moradas al interior; 4 estambres didínemos, filamentos arqueados con pequeñisimos pelos glandulares; tecas negras apicifijas, divergentes, con dehiscencia longitudinal; polen blanquecino; estilo bifurcado en el ápice......frecuente también ls parta adyacente del Edo. Mérida, alt. 50 m.; fl. Oct." he also comments that "El Dr. Moldenke cita en sus trabajos 11 *Vitex* para Colombia. Yo he agregado además a *Vitex divaricata* Sw.....*García Barriga & Lozano 18443* (COL), Reyes, Tibú a Petrolea, junio 1--3 de 1968, 50 m., que he colocado aquí por la forma de sus inflorescencias y de sus hojas, y por su vecindad al Lago de Maracaibo, región en donde se he registrado para Venezuela." He also notes (1977) that "Moldenke.....cita para este taxon el Edo. Sucre. Es posible que se atribuyan a esta Estado las dos colecciones paralelas citadas arriba, *Jahn 483* y *Withford 43,* ambas de Puerto La Cruz, del Distrito Federal, no de Sucre, ni tampoco la población homónima del Edo. Anzoátegui." He cites from Venezuela the following collections: Aragua: *Pittier 8628, Ll. Williams 10111* & *11119.* Distrito Federal: *Clemente 784, Jahn 483, Vivas 37, Whitford 43.* Falcón: *Ruiz-Terán 461.* Mérida: *López-Palacios & Bautista 3410, Ruiz-Terán 576* & *2197.* Zulia: *López-Palacios 2999.* Knuth (1927) cites *Pittier 8628* from "Miranda"; he also cites *Jahn 483.* Steyermark (1966) records the species from Sucre.

The Baileys (1976) describe the flowers as "violet or blue" and note that the wood is used for making shingles and the leaves to yield tannin. Cocker & Shaw (1962) report that the heartwood contains esters and their long-chain alcohols and acids in which the

C_{30} compounds predominate. Uphof (1968) adds that the leaves contain 14 percent tannin. Dennis (1970) reports that the tree is host to the parasitic fungus, *Phyllachora taruma* Speg., in Trinidad and "Colombia".

Fournet (1978) regards *V. multiflora* Miq. as a synonym of *V. divaricata* Sw.

The *C. V. Morton 4785,* distributed as *Vitex divaricata,* actually is not verbenaceous.

Additional & emended citations: PUERTO RICO: *R. A. Howard 16646* (S); *Little 13081* (N, W--2633021), *13275* (N, W--2633046), *13698* (N, W--2632845); *Sintenis 2601* (Ac); *Vélez 319* (Lv); *R. J. Wagner 560* (Ws). VIRGIN ISLANDS: Tortola: *Little 16400* (N). LEEWARD ISLANDS: Guadeloupe: *L'Hérminier s.n.* [V-VI 1893] (N). Marie Galante: *Proctor 20929* (Ld, W--26138-5). WINDWARD ISLANDS: St. Lucia: *R. A. Howard 11558* (Ld); *Proctor 17797* (W--2585081). TRINIDAD AND TOBAGO: Trinidad: *Purseglove P.6439* (N). VENEZUELA: Distrito Federal: *Jahn 483* (Ve, Ve, W--1065393). Zulia: *López-Palacios 2999* (Ac, N, Z).

VITEX DIVARICATA var. *CUBENSIS* Urb.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 40 (2): 336 1915; Urb., Arkiv Bot. 21A (17): 110. 1929; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 404. 1938; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 317--318. 1957; Mold., Phytologia 15: 104. 1967; Mold., Fifth Summ. 1: 98 & 373 (1971) and 2: 716 & 924. 1971; León & Alain, Fl. Cuba, imp. 2, 2: 317--318. 1974.

Day encountered this plant growing in potreros. Alain (1974) lists it from "Rocas y sabanas: probable en toda Cuba."

Additional citations: CUBA: Havana: *E. H. Day 481* (N). Province undetermined: *Sagra 504* (P). HISPANIOLA: Dominican Republic: *Marsano s.n.* [April 19, 1962] (Jz).

VITEX DIVERSIFOLIA Kurz, Rep. Veg. Andam. App. A: 45 & 75. 1870 [not *V. diversifolia* J. G. Baker, 1900].

Additional & emended bibliography: Kurz, Rep. Veg. Andam. App. A: 45 & 75. 1870; C. B. Clarke in Hook. f., Fl. Brit. India 4: 585. 1885; Brandis, Indian Trees, imp. 1, 504. 1906; Mold., Phytologia 16: 499. 1968; Brandis, Indian Trees, imp. 2, 504. 1971; Mold., Fifth Summ. 1: 285 (1971) and 2: 924. 1971.

In view of the controversy about the validity of the name herein used for this taxon, it may be worth quoting Clarke (1885) whose description is "leaves simple and 3-foliolate glabrate, leaflets sessile oblong cuneate at both ends entire, panicles terminal fulvous-strigose, bracts ovate prominent, corolla 1/3 in. Andaman Islands; *Kurz*. Branchlets and shoots fulvous-strigose, or subtomentose. Leaflets attaining 5 by 1 3/4 in., above with minute thinly-scattered white glands, beneath finely reticulated, microscopically white-tomentose in the depressions, obscurely puberulous on the midrib; nerves 6--8 pairs; petiole 1 1/2 in. Panicles 2--3 in., upper leaves graduating into bracts; upper bracts 1/4 in. Calyx 1/8 in., campanulate, subtruncate, fulvous-strigose. Corolla fulvous-villous, subtomentose. Drupe not seen." He bases the name on Kurz Andam. Rep. App. A 45 and B 14". Kurz (1870) describes the plant merely as "30 ft. tall, 12 foot bole, 2--2 1/2 ft. girth, Port Blair seashore" and "Steep hill sides along the northern coast of Port Blair from South Point to Flat Shallows, rather frequent." The original for the "B: 14" reference cited by Clarke (1885) has not been located by me -- the name does not occur in the Appendix B following the Appendix A in the 1870 work by Kurz referred to here.

Additional citations: ANDAMAN ISLANDS: South Andaman: *Kurz s. n.* [South Andaman] (Mu--1137--isotype, Z--isotype).

VITEX DJUMAENSIS DeWild.

Additional bibliography: Mold., Phytologia 15: 241. 1967; Mold., Fifth Summ. 1: 231 (1971) and 2: 924. 1971.

VITEX DONIANA Sweet

Additional synonymy: *Vitex umbrosa* H. T. ex Sweet, Hort. Brit., ed. 1, 1: 323. in syn. 1826 [not *V. umbrosa* Sw., 1788]. *Vitex cienkowski* Kotschy & Peyr. apud Palhinha in Ficalho, Pl. Úteis Áfr. Portug. 238. 1947. *Vitex umbrosa* "G. Don ex Sabine" apud Cuf., Senckenb. Biol. 43: 283, in syn. 1962. *Vitex cienkowskii* Kotschy & Perr. apud Uphof, Dict. Econ. Pl., ed. 2, 545, in syn. 1968. *Vitex odoniana* Legris, Trav. Sect. Scient. Techn. Inst. Franç. Pond. 3 (5): 24, sphalm. 1969. *Vitex cuneata* Schum. in herb. *Vitex umbrosa* Sabine, in herb.

Additional & emended bibliography: Sweet, Hort. Brit., ed. 1, 1: 323 (1826) and ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 551. 1832; Schau. in A. DC., Prodr. 11: 694--695. 1847; Hook. f. & Benth. in Hook., Niger Fl. 486--487. 1849; Buek, Gen. Spec. Syn. Candoll. 3: 501. 1858; Schweinfurth, Heart Afr. 1: 221. 1874; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 316, 317, 323, 327, & 328. 1900; Volkens, Notizbl. Bot. Gart. Berlin 5, App. 22 (2): 34--35, fig. 1. 1909; Rein, Tropenpfl. 15: 329 & 382. 1911; Kirtikar & Basu, Indian Med. Pl., ed. 1, 1936. 1918; Sturtev., N. Y. Dept. Agr. Ann. Rep. 2 (2), imp. 1, [Notes Edible Pl.] 598. 1919; Fedde & Schust., Justs Bot. Jahresber. 42: 252. 1920; Good & Exell, Journ. Bot. 68: Suppl. 144. 1930; Irvine, Pl. Gold Coast xlii, xlix, lvii, lxvi, & 436--437. 1930; Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 268 & 275--277, fig. 273. 1936; Wangerin, Justs Bot. Jahresber. 56 (1): 669. 1936; Hansford, Proc. Linn. Soc. Lond. 153: 9. 1941; Palhinha in Ficalho, Pl. Úteis Áfr. Portug. 238. 1947; Hansford & Deight., Mycol. Paper IMI.23: 70. 1948; H. N. & A. L. Mold., Pl. Life 2: 53, 56, & 65. 1948; R. O. Williams, Usef. Ornament. Pl. Zanzib. 18, [20], 351, 484, & 485, fig. 4. 1949; Kerharo & Bouquet, Pl. Méd. Tox. Côte Iv. 233--234. 1950; Snowden, Grass Comm. Mtn. Veg. Uganda 94. 1953; Roberty, Pet. Fl. Ouest-Afr. 178--179. 1954; J. K. Jacks., Journ. Ecol. 44: 349 & 360. 1956; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 317 & 318. 1957; Dale & Greenway, Kenya Trees Shrubs 592--595, fig. 108. 1961; Hansford, Sydowia Ann. Myc., ser. 2, Beih. 2: 690

& 695. 1961; Irvine, Woody Pl. Ghana lxxxii, lxxxviii, & 761--762. 1961; J. D. Chapm., Veg. Mlanje Mtns. 38. 1962; Cuf., Senckenb. Biol. 43: 283 & 329. 1962; S. & G. Manguenot, Rev. Cytol. Biol. Veg. 25: 411--447. 1962; Rougeot, Inst. Franç. Afr. Noire IFAN.14 (4); 1962; F. G. Browne, Bull. Ant. Res. 54: 229--266. 1963; Aubrév., Bois For. Trop. 93: 30. 1964; Langsdale-Br., Osmoston, & Wils., Veg. Uganda 55. 1964; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2278 & 2279. 1966; Amico, Webbia 22: 492, 503, 515, & 523. 1967; Bouquet, Invent. Pl. Méd. Tox. Cong. Brazz. 33. 1967; Kershaw, Veget. Act. Geobot. 15: 244, 251--253, 257, 258, & 261. 1967; Ornduff, Reg. Veg. 50: 86 & 121. 1967; Amico & Bavazzano, Webbia 23: 280 & 302. 1968; Astle, Kirkia 7: 95. 1968; Kershaw, Journ. Ecol. [Brit.] 56: 473, 477, & 482. 1968; Mold., Phytologia 16: 499. 1968; Mold., Résumé Suppl. 16: 8 (1968) and 17: 4. 1968; Uphof, Dict. Econ. Pl., ed. 2, 545. 1968; Begemann, Lex. Nutzh. 4: 2260--2261 (1969) and 5: 2564 & 2631. 1969; Cohic, Ann. Univ. Abidjan (E) 2: 100 & 112. 1969; Bolkhov., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 1, 717. 1969; Hyland, U. S. Dept. Agr. Pl. Invent. 173: 169. 1969; Legris, Trav. Sect. Scient. Techn. Inst. Franç. Pond. 3 (5): 24. 1969; Richard & Morony, Check List Pl. Mbala 239. 1969; Roberts, Commonw. Forest. Inst. Paper 44: 39, 40, 127, & 199. 1969; Drar, Publ. Cairo Univ. Herb. 3: 111. 1970; Gillett, Numb. Check-list Trees Kenya 47. 1970; Latham & Dugerdil, Adansonia, ser. 2, 10: 564. 1970; Gameel, Rev. Zool. Bot. Afr. 84. 1971; Mold., Fifth Summ. 1: 98. 209, 210, 215--222, 224--227, 231, 233, 234, 238, 240, 241, 245, 247, 250, 252, 258, 263, 373, & 376 (1971) and 2: 715, 716, 719, 724, 725, 730, 924, & 968. 1971; Den Outer, Meded. Landsbouwhogs. Wagen. 72-19: 8 & 58--59. 1972; Encke & Buchheim in Zander, Handwörterb. Pfl.-Namen, ed. 10, 525. 1972; Hedrick, Sturtev. Notes Edible Pl., imp. 2, 598. 1972; Lewalle, Bull. Jard. Bot. Nat. Belg. 42 [Trav. Univ. Off. Bujumb. Fac. Sci. C.20]: 25, 76, 88, 89, 91, 98, & [231]. 1972; L. V. Thomas, Notes Afric. 134: 50. 1972; Altschul, Drugs Foods 247. 1973; Greenway, Kirkia 9 (1): 37. 1937; Sowunmi, Grana 13: 184 & [189]. 1973; Bolkh., Grif, Matvej., & Zakhar., Chromos. Num. Flow. Pl., imp. 2, 717. 1974; Alain in León & Alain, Fl. Cuba, imp. 2, 2: 317 & 318. 1974; Mold., Phytologia 28: 442 & 452. 1974; Jaeger & Mold., Phytologia 30: 387, 389, & 402--403. 1975; Lebrun & Stork, Ind. Cart. Répart. Pl. Vasc. Afr. 133. 1977; Paradis & Houngnon, Bull. Mus. Natl. Hist. Nat. Paris, ser. 3, 503 [Bot. 34]: 183. 1977; Wickens, Kew Bull. Addit. Ser. 5: 309, map 152. 1977; Lawton, Journ. Ecol. 66: 183, 188--190, & 193. 1978; Mound & Halsey, Whitefly World 86 & 115. 1978.

Additional illustrations: Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 277, fig. 273. 1936; R. O. Williams, Usef. Ornament. Pl. Zanzib. [20] & 484, fig. 4. 1949; Dale & Greenway, Kenya Trees 594, fig. 108. 1961.

[to be continued]

A new *Disciphania* (Menispermaceae) from French Guiana

R. C. Barneby
New York Botanical Garden

DISCIPHANIA (verosimiliter sect. *Sarcostephana*) UNILATERALIS Barneby, sp. nov., a congeneribus omnibus foliorum unilateraliter secus caulem dispositorum lamina oblongo-elliptica 3--4-plo longiori quam latiori primo intuitu diversa. -- FRENCH GUIANA. Trois Sauts: forêt primaire, région de Zidock ville, 12.I.1975 (fr), *Grenand 653*. -- Holotypus, NY.

A small slender vine of virgin forest, glabrous throughout, the leaves all turned to one side of the weakly scandent canaliculate hornotinous stems; petioles 2--4 cm, twisted at both ends; leaf-blades membranous, when dry dull brownish-olivaceous, in outline oblong-elliptic 13--17 x 4--5 cm, 3--4 times as long as wide, at base broadly cuneate, at apex acuminate (the obtuse acumen 8--10 mm), from base weakly 5-nerved, the stronger (inner) lateral pair of nerves ascending through no more than 1/4 of blade, the midrib giving rise to ± 8 pairs of major secondary nerves, the tertiary reticulation fine and lax, the ultimate areoles much > 1 mm diam; inflorescence ♂ unknown; inflorescence ♀: peduncle ± 6 cm, twisted at both ends; spike ± 20-flowered, the axis in fruit ± 8 cm; flower unknown; drupe grapelike plumply ovoid-ellipsoid ± 15--17 mm, the ripe exocarpic skin chocolate-brown, the mesocarp gelatinously juicy, the endocarp (of sect. *Sarcostephana*) in broad view 15 x 11 mm, its dorsoventral crests ± 1 mm, its 3 latero-marginal wings 2--2.5 mm wide. -- N. V. (Wayapi): *alasiku*.

The genus *Disciphania*, instantly recognized in tribe *Tinosporeae* by its sessile flowers and peculiarly crested endocarp, is most highly developed in upper Amazonia and the Peruvian-Ecuadorian Andes (Barneby, 1970, p. 124--sequ.) and has not been recorded hitherto either from the Guianas or from northeastern Brazil. The discovery of a *Disciphania* on the upper Oiapoque river near 53° W., 2° N. is in itself a notable event and it can cause no surprise that the species is an undescribed one. So far as can be told from the fruiting specimen before me, *D. unilateralis* belongs probably to sect. *Sarcostephana* Barneby, but is unique in that group, as indeed in the whole genus, in its narrowly oblong-elliptic leaves which, by a twist of the petiole, are arranged unilaterally along the slenderly scandent stems.

I am indebted to the Director of Herbier du Centre ORSTOM (CAY) for communicating the type to NY through Dr. B. A. Krukoff.

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Barneby, R. C. 1970. Revision of Neotropical Menispermaceae tribe Tinosporeae. Mem. N. Y. Bot. Gard. 20 (2): 81--158.

A NEW FORM OF HELIANTHUS FROM SOUTH-WEST FLORIDA

Fred W. Oswald

HELIANTHUS TUBEROSUS f. OSWALDIAE Oswald, f. nov.

Haec forma a forma typica speciei differt habente tubera grandes nodis numerosis; nodi plerumque stipitati. Cutis perpallida bruneola, crassa duraque. Tubera fasciculata proxime infra vel prope caules, illa infra rhizomatibus nullis. Tubera nova pullulantia statim juxta plantas adultas. Caules purpureo-rubri pilis rigidis niveis. Folia viridia, lutescentia ad fusca post anthesin, plantae mox effectae incrementa nova foliacea angulo caulium supernorum sub semino-capitulis siccatis, aliquando reflorentes floribus mendosis.

This form differs from the typical form of the species in having tubers large with numerous knobs; the knobs generally stalked. Skin very light tan, thick and tough. Tubers clustered immediately below or near stems, those below lacking rhizomes. New tubers sprouting promptly next to matured plants. Stems purple-red with stiff whitish hairs. Leaves green, turning yellow to brown after the flowering season, soon developing new leafy growths from the angle of the upper stems below the dried seed heads and occasionally reflowering with imperfect blossoms.

In f. nebrascensis Cockerell, and alexandri Cockerell, the skin is thin. In purpurellus Cockerell, the tubers are purple-red. In fusiformis Cockerell, the tubers are occasionally knobbed, but not stalked. In var. multituberculatus Cockerell, the tubers are completely covered with unstalked protuberances. Stems are purple-red but leaves do not become red as in albus Cockerell. Leaves puberulent underneath, not densely soft-hairy as in var. subcanescens Gray.

Fast growing, tall, much-branched and many-flowered plants; the heavy tops often bending the purple-red stalks to earth.

The holotype of this form was collected by the author and his wife on July 4, 1979, 110 feet west of

Magnolia Drive and 300 feet south of Bayshore Road, North Fort Myers, Florida, and is deposited in the Lundell Herbarium at the University of Texas, Austin, Texas.

This tall sunflower is named in honor of Eileen Wolde Oswald, co-discoverer with the author.

BOOK REVIEWS

Alma L. Moldenke

"THE NATURAL HISTORY OF THE LAND OF THE BIBLE" by Azaria Alon, 276 pp., 88 color & 173 b/w photos. Doubleday & Company, Inc., Garden City, N. Y. 11530 & New York, N. Y. 10017. 1978. $12.95.

Welcome to this recent import from Israel originally published there in 1969, with its easy to read print, excellent and attractive illustrations, and quite accurately written text about this mediterranean land, its mountains and deserts, its plants and animals as they appear today and as they probably were in Biblical times.

We wish that the author had used the spelling "sycomore", rather than "sycamore", for what he correctly pictures and describes as *Ficus sycomorus* L. rather than any *Platanus* species. The generic names for the carob, loquat and broom-rape, and the specific names for the styrax and medlar, are misspelled. When identifying the Biblical "rose of Sharon" and "lilies of the field" Alon favors *Pancratium maritimum*, a late summer bloomer, while we Moldenkes choose *Tulipa sharonensis* and/or possibly *T. montana*, both end of winter bloomers as the text infers for this so-called "rose" and *Anemone coronaria* L. for the lilies. These and many other details about Bible plants are provided in our "Plants of the Bible" now obtainable from Ronald Press of John Wiley & Sons. Alon's book makes a delightful and worthwhile souvenir of the land of the Bible.

"AGROMETEOROLOGY" by J. Seemann, Y. I. Chirkov, J. Lomas, and B. Primault, viii & 324 pp., 89 b/w fig., 1 photo, 2 maps, & 56 tab. Springer-Verlag, Heidelberg, D-1000 Berlin 33 & New York, N. Y. 10010. 1979. $53.90.

This book, whose creation was urged by the Commission for Agrometeorology of the World Meteorological Organization, is an introduction to this new field of science to indicate its nature, its economic importance especially in the undeveloped countries, its present-day problems, its potential for instigating academic major departments in the world's colleges, technical agricultural schools and universities, and its prospects for channeling new agrometeorological literature into more readily available sources. "Agriculture interfaces with a complex dynamic system of natural conditions, among which meteorological factors [most important - air, light, heat and moisture] are the most prevalent and the most changeable." Some of the topics well discussed with their illustrative figures, table, models, etc. are: solar radiation and radiation measurement technology, heat transport in the air and heat flux in the soil; climates of pastures, grain crops, trees, greenhouses and improving climate for agricultural purposes, animal husbandry and produce in transport. A useful start.

"EARLY MAN AND THE OCEAN: A Search for the Beginnings of Navigation and Seaborne Civilizations" by Thor Heyerdahl, x & 438 pp., 26 b/w fig., 3 maps & end page color maps. Doubleday & Company, Inc., Garden City, N. Y. 11530 or New York, N. Y. 10017. 1979. $12.95.

The author of "Kon-Tiki". "Aku-Aku", "The Ra Expeditions", etc. has edited these writings and speeches "to form a coherent book.... [that] would give guidance to the many people who have followed the discussions about human migration routes and cultural origins that developed in the wake of the primitive vessels Kon-Tiki and Ra when they, contrary to expert opinion given in advance, managed to traverse the Pacific and the Atlantic oceans." For a series of pages he lists 53 characteristic cultural traits of the pre-European civilizations of Asia Minor, Egypt, Cyprus and Crete that are matched with those in Mexico and Peru at the "receiving end of the Canary Current". This report is interesting and logically presented. Folks and students interested in the seas as early highways, in the nature and spread of cultures with their crops, tools, etc. will find this book fascinating.

"SUCCESSFUL GARDENING WITH PERENNIALS" by Helen Van Pelt Wilson, xix & 289 pp., 14 color & 73 b/w photos, 16 fig., 24 tab. & 1 map. Doubleday & Company, Inc., Garden City, N. Y. 11530 & New York, N. Y. 10017. 1976. $9.95.

This author is well recognized in gardening and landscaping literature and exhibitions. This book measures up well with its feeling for plants, its effective choices along with their handling and the attractive arrangements. Among others, there are chapters on Chrysanthemums - the Final Brilliance, the Ever-Beautiful Peonies, Where Shade Prevails, and there are charts or tables on Perennials fpr Your Small Garden, Control Chart, etc. The writing style is pleasant, the content accurate, and the illustrations well chosen.

"BIOCHEMISTRY AND PHYSIOLOGY OF PLANT HORMONES" by Thomas C. Moore, xii & 274 pp., 164 b/w fig., 13 photos & 9 tab. Springer-Verlag, Heidelberg, D-1000 Berlin 33 & New York, N. Y. 10010. 1979. $22.80.

Thi book is an excellent text or major reference source "for a one-term intermediate-level or advanced course dealing with hormonal regulation of growth and development of seed plants for students majoring in biology, botany and applied botany fields such as agronomy, forestry, and horticulture." For the plant hormones - auxins, gibberlins, cytokinins, abscisic acid and other growth inhibitors, ethylene and the hypothetical florigens - the well printed and well composed text provides: definitions, discovery, chemistry, occurrence, biosynthesis, metabolism, transport, physiological effects and mechanisms of action. The various chapters are helpfully illustrated and provided with key bibliographic references.

"INTERCELLULAR COMMUNICATIONS IN PLANTS: STUDIES ON PLASMODESMATA" edited by B. E. S. Gunning & A. W. Robards. xv & 387 pp., 90 b/w fig., 85 photos & 26 tab. Springer-Verlag, Heidelberg, D-1000 Berlin 33, & New York, N. Y. 10010. 1976. $29.60.

At a conference convened by the Department of Developmental Biology in the Australian National University a series of papers - often with initially reported research - was presented to "about 40 specialists in various disciplines, all with a common interest in intercellular communication in plants." Editorial elimination of duplication and insertions to insure complete coverage of both texts and discussions has produced a monographic study of considerable value. The chapters/papers deal mainly with plasmodesmata in higher plants, algae, viruses, fungi, parasites and their origin and development; physico-chemical assessment of plasmodesmatal transport and cytochemical evidence for ion transport; transport of solutes through the plasmodesmata in *Chara* nodes making it - and others - by definition syncetial, across roots, and to and from phloem; and plasmodesmata in growth and development. The optical microscopes limited students of long ago to seeing *Volvox* cells "holding hands through the chinks in cellulose walls" while today's electron microscopes provide much more details as shown in the many fine illustrations in this book. There are 9 tabular pages measuring the diameter and frequency of plasmodesmata in dozens of plants. "For the future, the main message must be to correlate structure and function by a multi-disciplinary attack on symplastic transport with the same cells and tissues....; further progress will require the improvement of existing techniques and the development of new ones." A fine study.

"CONCEPTS OF SPECIES" edited by C. N. Slobodchikoff. xv & 368 pp., 37 b/w fig., 4 tab., 2 maps. Halsted Press of John Wiley & Sons, Inc., New York, N. Y. 10016. 1976. $27.50.

This collection of 21 papers - usually taken from journals - is topically grouped with the editor's comments and is presented as Volume 3 of the Benchmark Papers in Systematic and Evolutionary Biology. It will surely help "students of systematics and evolutionary biology to expand their understanding of the problems posed by the species question" and to provide easy access to many different species concepts - phenetic, morphological, taxonomic, biological, typological, aggregate, real, evolutionary, etc. - all within the covers of one publication and closing with Stebbins' pertinent and clever fairy tale from "Taxon".

"MEXICAN WILDERNESS & WILDLIFE" by Ben Tinker, xii & 131 pp., 20 b/w draw., 4 maps, & 10 tab. University of Texas Press, London & Austin, P. O. 7819, Texas 78712. 1978. $9.95.

This book is authenticated (not that it is needed) by a Foreword by A. Starker Leopold and it is embellished by excellent natural habitat sketches of the creatures by wildlife artist Doris L. Tischler. The major game and predatory animals are well known to and described by the author from his multiples roles as American cattle rancher in Sonora, hunter and government appointed Game Guardian. The book closes with a guide to big game habitats and wildernesses. It offers interesting, informative and easy reading for folks who like the Sonoran and Baja areas, naturalists, conservationists and hunters - strangely enough!

"PHYSIOLOGY AND BIOCHEMISTRY OF SEEDS in Relation to Germination" Volume I by J. D. Bewley & M. Black, xi & 306 pp., 124 b/w fig. & 4 tab. Springer-Verlag, D-1000 Berlin 33, Heidelberg & New York, N. Y. 10010. 1978. $45.00.

This volume in careful reporting details "the biochemical and physiological phenomena that occur in a germinating seed and the activities that are uniquely related to germination such as food mobilization and early growth of the seedling." The definition of germination used herein "consists of those processes which begin with water uptake and which successfully terminate with the emergence of the radicle or hypocotyl through the seed coverings." Mobilization of food reserves is not strictly a component of germination but it is uniquely associated with the germinating seed. Basic seed structure and the structures of a wide range of different seed types are checked histologically and cytologically for the nutrient, hormone, DNA, RNA, enzyme, and their precursor chemicals stored. How these are mobilized upon the stimulation first of water absorption is best presented in cereals such as barley. A great amount of research in many different laboratories is well integrated here.

The main topic for the proposed Volume II is dormancy. It, too, should prove a worthwhile publication.

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STUDIES IN THE HELIANTHEAE (ASTERACEAE). XXI. ADDITIONS TO ALLOISPERMUM, GALINSOGA, AND TRIDAX.

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A number of new species have been encountered in recent years which belong to various genera in the subtribe Galinsoginae of the Heliantheae. In each of the cases, the traditional generic limits have been a problem, and some tentative solutions are offerred. The three genera in which the new species are placed, are as follows.

Alloispermum

During the initial listing of the species when the genus was resurrected from the synonymy of Calea (Robinson, 1978a), the concepts of the South American species were particularly inadequate. The area seemed to be dominated by a highly variable A. caracasanum with two minor segregates. A single specimen collected by Lehmann in Ecuador and some laxly cymose material collected by Cuatrecasas in Colombia were regarded as only extremes of A. caracasanum, while A. pachense was kept separate. Since that time, one species, A. steyermarkii, with extremely long-pointed involucral bracts, has been described from Venezuela (Robinson, 1978b), two specimens have been seen from a widely disjunct area in southern Peru, the Cuatrecasas collection has been recognized as a first Colombian record of the otherwise Ecuadorian A. sodiroi, and the Lehmann collection from Ecuador has been re-examined and found to be distinct. The concepts of A. lindenii (Sch.Bip. ex Wedd.) H.Robins. and A. steyermarkii H.Robins. remain unchanged, but the studies have indicated the need for the following two new species, new combination and new synonymy.

Alloispermum caracasanum (H.B.K.) H.Robins. is re-interpreted to include C. pachensis Hieron. The latter was originally described for material that lacked ray flowers. Such discoid forms have sometimes been treated as Calea caracasana forma discoidea B.L.Robins. These occur sporadically throughout the range of the species, and they seem best treated at the level of a forma.

There are more significant variations in A. caracasanum. The typical element has five rays in the head and glabrous outer surfaces of the involucral bracts. Specimens with 8 rays in the heads and pubescent outer surfaces of the involucral bracts are rather common in Colombia, but the two characters are not always correlated.

Alloispermum lehmannii H.Robinson, sp. nov.

Plantae subscandentes? mediocriter ramosae. Caules brunnescentes teretes sparse hirsuti, pilis sub nodis densioribus. Folia opposita, petiolis plerumque 1-2 mm longis; laminae lanceolatae ad 5-6 cm longae et 1.0-1.7 cm latae base anguste rotundatae vel breviter obtusae margine subintegrae apice argute acuminatae supra dense scabridulae subtus subdense pilosae fere ad basem trinervatae,nervis secundariis ad marginem subparallelibus. Inflorescentiae laxe corymbosae, ramis 3.5-5.5 cm longis pilosis, pilis erecto-patentibus superioribus densioribus. Capitula ca. 7 mm alta sine radiis ca. 8 mm lata; squamae involucri ca. 20 ca. 3-seriatae subcoriaceae marginaliter rubro-tinctae ovatae vel late oblongae plerumque 3-4 mm longae et 2.0-2.5 mm latae apice rotundatae subscariosae extus glabrae; paleae scariosae suboblongae ca. 3 mm longae apice obtusae. Flores radii ca. 7; corollae albae? ca. 8 mm longae, tubis ca. 2 mm longis dense hispidulis, limbis oblongis ca. 6 mm longis et 4 mm latis apice valde trilobatae extus inferne pilosulis. Achaenia radii ca. 2 mm longa glabra; pappus nullus. Flores disci 25-30; corollae flavae 3.5-4.0 mm longae extus plerumque dense pilosulae, tubis ca. 1.2 mm longis, faucis abrupte campanulatis ca. 1.7 mm longis superne sparse pilosulis, lobis 0.6-0.7 mm longis et latis; thecae antherarum ca. 1.2 mm longae, cellulis endothecialibus in parietibus tranversalibus 3-4-noduliferis; appendices antherarum non glanduliferae. Achaenia disci ca. 2.5 mm longa sparse setifera; squamae pappi ca. 15 subulatae plerumque 3.0-4.8 mm longae. Grana pollinis 30-32 µm in diam.

TYPE: ECUADOR: Tungurahua: Am Tungurahua-Volcan. 2000 m, 30.10.1879. Lehmann 330 (Holotype US). The specimen was determined as Calea integrifolia Hemsl. by Klatt.

Alloispermum lehmannii is most notably distinct by the small disk corollas and short paleae. The single specimen also shows a more flexuous habit and more elongate branches of the inflorescence than is characteristic of the related A. caracasanum. The type locality on the Volcan Tungurahua seems distinctly isolated from the ranges of A. caracasanum and A. sodiroi to the north.

Alloispermum sodiroi (Hieron.) H.Robinson, comb. nov. Calea sodiroi Hieron., Bot. Jahrb. 29: 51. 1900. Sabazia sodiroi (Hieron.) Turner, Wrightia 5 (8): 305. 1976. The species is most obviously distinct from A. caracasanum by the strongly cymose lax inflorescence with the obviously older terminal heads being greatly over-topped by the lateral branches. Dr. Cuatrecasas also informs me that his recent collection of an 8-rayed form from Cundinamarca, Colombia (Cuatrecasas & Jaramillo 28792), is a more herbaceous subscandent plant. In contrast, A. caracasanum is definitely a shrub. The paleae of the latter are also less toothed or lobed.

The transfer of the species from Calea to Sabazia by Turner (1976) raises the question of why this species was singled out from among its relatives such as A. caracasanum, but it also points up the serious problem of generic distinction between Sabazia and Alloispermum. A brief review of the species has not shown me any simple answer with an obvious point of separation, but it has left me with the impression of a rather uniform Alloispermum having larger plants, distinctly branching inflorescences, ray achenes always lacking a pappus while a pappus is normally present on the disk achenes, and endothecial cells with multiple thickenings. Sabazia, as represented by its type, S. humilis (H.B.K.) Cass. (Longpre, 1970), is a smaller herbaceous plant with a strong tendency toward solitary long-pedunculate heads, it has a pappus that is short or lacking, and has mostly single thickenings on the transverse walls of the endothecial cells. Problems arise in such species as Sabazia palmeri (A.Gray) Urbatsch & Turner of Mexico, which has the habit of Alloispermum, but has a distinct pappus on the ray achenes, and in S. trianae (Hieron.) Longpre of Colombia and S. densa Longpre of Costa Rica which have the habit of Sabazia but have the pappus and some other features of Alloispermum. It is not certain that the habit differences represent a single phyletic trend. The pollen sizes show a tendency to be larger in Alloispermum, but they are also larger in the southern species of Sabazia. The species of Sabazia from Mexico that have been examined, including S. palmeri, have small dense papillae on the inner surfaces of the disk corolla lobes. Alloispermum has consistently larger papillae on the lobes and has a uniform pubescence to the outer surfaces of the lobes. Sabazia densa and S. trianae also have larger papillae, though not exactly as in Alloispermum. Sabazia acoma (Blake) Longpre of Colombia has larger papillae, but differs by the lack of hairs on the outer surfaces of the disk corolla lobes.

I am not prepared to see such extremes as Alloispermum and typical Sabazia placed in the same genus. For the present, I have left in Sabazia all those species that lack the precise characters of Alloispermum, having either solitary long-pedunculate heads or a different form of pappus. For others who might favor a broader genus concept, it should be noted that the name Alloispermum has priority over Sabazia.

Alloispermum weberbaueri H.Robinson, sp. nov.

Plantae subscandentes suffruticosae ad 2 m altae mediocriter ramosae. Caules brunnescentes teretes leniter striati sparse hirsuti, pilis superioribus densioribus. Folia opposita, petiolis 3-8 mm longis; laminae lanceolatae 5.0-7.5 cm longae et 1-2 cm latae base obtuse vel acute cuneatae margine integrae vel remote serratae apice anguste acuminatae supra tenuiter pilosae subtus tenuiter pilosae et in nervis dense hirsutae fere ad basem trinervatae, nervis secundariis maxime ascendentibus. Inflorescentiae laxe corymbosae, ramis ultimis plerumque 2-5 cm longis sensim dense pilosulis et interdum stipitato-glanduliferis. Capitula ca. 10 mm alta et sine radiis 8-10 mm lata; squamae involucri ca. 15 ca. 3-seriatae subcoriaceae flavescentes ovatae vel oblongae 3-7 mm longae et 2-3 mm latae apice subacutae subscariosae extus glabrae; paleae scariosae lanceolatae 6-7 mm longae inferne 1.5-2.0 mm latae apice anguste acutae margine in part erosae vel dentatae. Flores radii plerumque 10-12; corollae albae 7-12 mm longae, tubis 2.5-3.0 mm longis dense hispidulis, limbis oblongis 5-9 mm longis et 3-4 mm latis apice distincte trilobatae extus inferne pilosulis. Achaenia radii 2.0-2.3 mm longa glabra; pappus nullus vel raro unisquamellosus. Flores disci ca. 30-45; corollae viridi-flavae ca. 6 mm longae extus plerumque dense pilosulae, tubis 1.7-2.0 mm longis, faucis 3.0-3.5 mm longis superne sparse pilosulis, lobis 0.7-0.9 mm longis et 0.6-0.7 mm latis; thecae antherarum ca. 1.8 mm longae, cellulis endothecialibus in parietibus transversalibus 3-4-noduliferis; appendices antherarum non glanduliferae. Achaenia disci ca. 2.3 mm longa plerumque sparse setifera; squamae pappi plerumque ca. 20 subulatae plerumque ca. 4.5 mm longae raro nullae. Grana pollinis ca. 30-32 µm in diam.

TYPE: PERU: Ayacucho: Prov. Huanta: Choimacota Valley. Alt. 2900-3000 m. Evergreen bush-wood. Climbing shrub. Ray-fls. white, disk-fls. yellow. Feb. 28-Mar. 10, 1926. A.Weberbauer 7581 (Holotype US). PARATYPE: PERU: Ayacucho: Ccarrapa, between Huanta and Río Apurimac; alt. 1200 meters; open hillside. Herb, to 7 ft, with divaricate branches; rays white; florets greenish yellow. May 5, 6, 1929. Killip & A.C.Smith 22422 (US).

Alloispermum weberbaueri is distinct among the South American species by the numerous rays in the heads. The rather lax inflorescence and the more scandent habit further distinguish the species from *A. caracasanum*. The paratype specimen is from the same region as the holotype and is obviously the same species, but it has no pappus on either the ray or disk achenes. The latter condition evidently represents that calvous-achened condition that occurs sporadically in the Asteraceae and which is characteristic of the ray achenes of all species presently placed in *Alloispermum*.

The species range in southern Peru is widely disjunct from other members of the genus. The nearest approach is *A. lehmannii* of central Ecuador.

Galinsoga

The genus has been revised recently by Canne (1977), and has been broadened to include such elements as *Sabazia trifida* Fay and *Tricarpha durangensis* Longpre. The genus is further extended here to include the following related new species from Venezuela.

Galinsoga macrocephala H.Robinson, sp. nov.

Plantae herbaceae annuae? mediocriter ramosae ca. 30 cm altae. Caules purpurascentes teretes leniter striati sparse albo-hirsuti. Folia opposita, petiolis 2-5 mm longis; laminae ovatae plerumque 12-20 mm longae et 3-13 mm latae base obtuse cuneatae et perbreviter acuminatae margine multo serrulatae apice acutae vel breviter acuminatae supra in sicco atro-virides subtus pallidiores utrinque dense pilosae fere ad basem ascendentiter trinervatae. Inflorescentiae diffusae laxe plerumque alterne ramosae pauci-capitatae, ramis 9-27 mm longis hirtellis et stipitato-glanduliferis. Capitula late campanulata ca. 8 mm alta et 7-8 mm lata; squamae involucri ca. 25 flavo-virides subimbricatae membranaceae late oblongae 3-6 mm longae et 2.0-2.5 mm latae apice obtusae vel acutae margine anguste scariosae minute setuliferae extus glabrae 4-6-pallido-maculatae; receptacula conica; paleae interiores minores scariosae facile deciduae. Flores radii ca. 14; corollae rubro-purpurascentes ca. 6 mm longae, tubis 4.5 mm longis dense breviter hispidulis, limbis minute subquadratis ca. 1.5 mm longis et 1 mm latis apice distincte trilobatis. Flores disci ca. 25; corollae flavae 3.5-4.0 longae, tubis angustis 2.0-2.5 mm longis dense breviter hispidulis, faucis late infundibularibus ca. 1 mm longis inferne sparse hispidulis, lobis ca. 0.4 mm longis et 0.3 mm latis extus superne pauce breviter puberulis; thecae antherarum ca. 0.5 mm longae; appendices antherarum anguste ovatae glabrae. Achaenia obovata ca. 2.7 mm longa et 0.7 mm lata glabra; setae pappi numerosae fusiformes perfacile deciduae plerumque 1.0-1.5 mm longae. Grana pollinis 27-30 μm in diam.

TYPE: VENEZUELA: Merida: El Delgadito ad El Portochuelo, 2700 m. 18 XI 1976. A.Charpin, F.Jacquemoud & L.Ruiz-teran 13531 (Holotype US).

The new species has the general habit of Galinsoga, and it keys to that genus in the partial key to the genera of the Galinsoginae by Canne (1978). Also, the short ray flowers are very reminiscent of the ray of G. quadriradiata R.& P., and the anthers are small as in other members of the genus (Powell, 1965). The readily deciduous setiform pappus of the new species differs from the forms traditionally included in the genus, but a similar form is found in one Mexican species, G. formosa Canne (=Sabazia trifida Fay), included in the genus by Canne (1977). The new species remains unique in the genus by the comparatively large size of the heads. The peripheral paleae do not form complexes with the inner involucral bracts as in typical Galinsoga.

The extremely deciduous nature of the pappus setae makes an exact count impossible. A guess would be about 10 per achene, and they are present on both the ray and disk achenes.

Tridax

After careful consideration, the following new species is placed in the genus Tridax.

Tridax moorei H.Robinson sp. nov.

Plantae herbaceae vel inferne lignosae perennes multo ramosae ad 12 cm altae. Caules pallide rubrescentes teretes albo-strigosi. Folia opposita, petiolis ca. 1 mm longis; laminae lineares 6-9 mm longae et ca. 1 mm latae base anguste cuneatae margine integrae apice anguste obtusae supra lucidae sparse strigoso-pilosae subtus anguste subcarnosae plerumque in nervis primariis et marginis strigoso-pilosae, nervis secundariis indistinctis subnullis. Inflorescentiae diffusae in ramis terminales unicapitatae, pedunculis plerumque 1-3 cm longis strigoso-pilosis. Capitula campanulata 7-8 mm alta et 5-6 mm lata; squamae involucri ca. 20 triseriatae subimbricatae membranaceae flavescentes vel in parte rubro-tinctae lanceolatae 2.5-5.5 mm longae plerumque 1.0-1.5 mm latae apice acutae margine subscariosae et laxe fimbriatae extus leniter striati et sparse pilosae; receptacula alte conica; paleae lineares ca. 5 mm longae. Flores radii ca. 8; corollae albae, tubis ca. 2.5 mm longis minute pilosulis, limbis oblongis ca. 5 mm longis et 2 mm latis apice distincte trilobatis. Flores disci ca. 30; corollae albae? ca. 4.5 mm longae, tubis ca. 1 mm longis dense scabridulis, faucis cylindraceis vel anguste infundibularibus ca. 2.5 mm longis extus glabris, lobis triangularibus ca. 0.6 mm longis et 0.45 mm latis extus minute puberulis; thecae antherarum ca. 1.5 mm longae, cellulis endothecialibus in parietibus transversalibus uni-noduliferis; appendices antherarum non glanduliferae; ramis stylorum 1.0-1.3 mm longis. Achaenia ca. 2 mm longa dense setifera; setae pappi in achaeniis radii paucae breves plerumque 0.5 mm longae; setae pappi in achaeniis disci ca. 16 anguste subulatae plerumque 3.5-4.5 mm longae barbellatae vel subplumosae inferne aliquantum alatae. Grana pollinis ca. 30 µm in diam.

TYPE: MEXICO: Hidalgo: Dist. Actopan: Slopes and summit of Cerro de las Canteras, near Puerto de San Pedro, Km. 104 on highway from Pachuca to Actopan, alt. 2500-2700 m. In crevices of cliffs on east face of summit. Flowers white. 12 October 1946. H.E.Moore, Jr. 1487 (Holotype BH).

The Moore specimen has been held for a number of years as an undescribed member of the Galinsoginae because precise generic position was not clear. The barbellate to subplumose pappus setae and the more or less solitary heads might indicate Tridax, but the lack of inner lobes on the ray corollas and the lack of a gland on the anther appendage are unusual for that genus. In the partial key to the genera of the Galinsoginae by Canne (1978) the species falls into Sabazia, but the species does not fit into the concept of the latter genus derived from the present study of the Alloispermum-Sabazia relationship. A position in Tridax ultimately seems best, with the realization that a new genus may eventually need to be established for the species.

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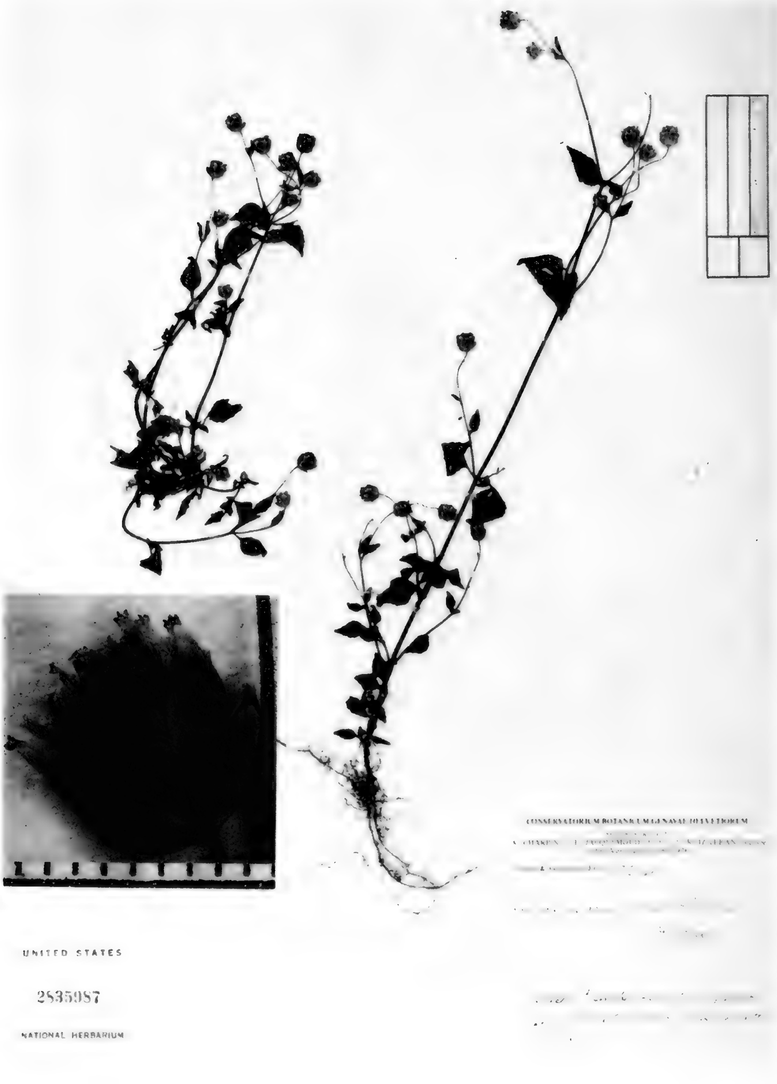
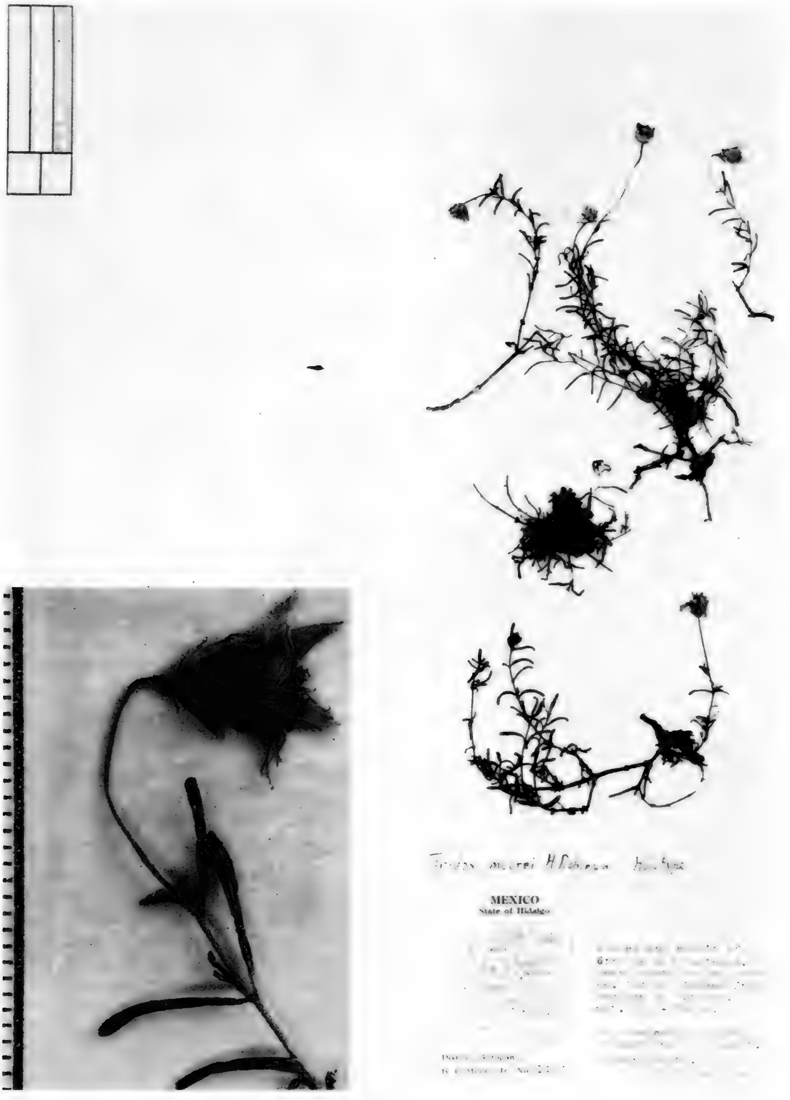
Alloispermum lehmannii H. Robinson, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Alloispermum weberbaueri H. Robinson, Holotype, United States National Herbarium.



Galinsoga macrocephala H. Robinson, Holotype, United States National Herbarium.



Tridax moorei H. Robinson, Holotype, Bailey Hortorium, Cornell University.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XXII.

TWO NEW SPECIES OF *CALEA* FROM BRASIL

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A recent paper describing four species of *Calea* from Brasil (Robinson, 1979), provided results of efforts to identify members of the genus in Bahia and some adjacent parts of Brasil. Since the completion of that paper, two additional new species have been encountered, from Minas Gerais and Bahia, both showing superficial resemblance to *C. rotundifolia* (Less.) Baker. The new species from Minas Gerais proves to have represented in the U.S. National Herbarium by a Belem collection received many years ago under the latter name. Receipt of a second specimen of the Belem collection and the recent collection of similar material by R. M. King in Bahia, has led to the present re-evaluation. The two new species are more closely related to each other than to any other members of the genus, but they are amply distinct, as noted below.

It has also been noted that the nom. nov. proposed in the recent paper was superfluous, the name *Calea marginata* was proposed for the latter homonym, *Calea longifolia* (DC.) Baker, by Blake in 1937 in the Journal of the Washington Academy of Sciences 22: 387.

CALEA BELEMII H. Robinson, sp. nov.

Plantae fruticosae ca. 1 m altae mediocriter ramosae. Caules brunnescentes teretes subangulati perdense hirtelli. Folia opposita, petiolis brevibus 2-4 mm longis; laminae coriaceae orbiculares vel suborbiculares plerumque 2.5-5.0 cm longae et 2.0-4.5 cm latae base late rotundatae margine multo grosse crenato-serratae apice rotundatae vel vix obtusae supra erecte pilosae subscabrae subtus hirtellae vel tenuiter pilosae in nervis et nervulis valde reticulo-prominentes, nervis secundariis subpinnatis, in binis submediis ascendentioribus. Inflorescentiae terminales in ramis dense corymbosis, ramis plerumque oppositis hirtellis, ramis ultimis 0-3 mm longis. Capitula interdum tripliciter sessiliter aggregata cylindrica 14-17 mm alta et 3-4 mm lata; squamae involucri ca. 18 subimbricatae 5-6-seriatae flavo-rufescentes late ovatae vel oblongae 2-10 mm longae et 2-3 mm latae apice breviter obtusae vel rotundatae minute fimbriatae extus plerumque glabrae basilares vis herbaceae et pauce hirtellae: paleae 1-2 bracteiformes ca. 10 mm longae. Flores 5 in capitulo discoidei; corollae flavae ca. 7.5 mm longae extus glabrae, tubis ca. 3 mm longis, faucibus late campanulatis ca. 2 mm longis, lobis oblongo-lanceolatis ca. 2.5 mm longis et 0.8 mm latis; thecae antherarum ca. 2.5 mm longae; appendices antherarum extus glanduliferae. Achaenia 7.0-7.5 mm longa base longe anguste stipitata inferne subcarnosa et glabra ceterum dense setifera, setis leniter flexuosis biseriatis multi-cellularibus; squamellae pappi ca. 15 anguste ellipticae superne subulatae ca. 3 mm longae ad 0.2 mm latae margine erosae extus minute spiculiferae. Grana pollinis plerumque 50-55 µm in diam. valde breviter spinosa.

TYPE: BRASIL: Minas Gerais: Rodovia BR 4, Km 924. Mata Cipó. Planta de 1 m de altura. Capítulo amarelo, invólucro esverdeado. 27.6.1968. *R. P. Belem 3763* (Holotype US).

For the distinctions of the species see the discussion under *C. morii* sp. nov.

CALEA MORII H. Robinson, sp. nov.

Plantae fruticosae 1-2 m altae mediocriter ramosae. Caules brunnescentes subhexagonales perdense hirtelli. Folia opposita, petiolis 2-9 mm longis; laminae late oblongae vel suborbiculares 2.5-6.0 cm longae et 1.6-5.3 cm latae base late rotundatae margine subtiliter serrulatae apice late rotundatae vel obtusae et minute mucronulatae supra hirtellae et sparse glandulo-punctatae subtus dense breviter tomentellae et inter nervulas dense glandulo-punctatae in nervis et nervulis valde reticulo-prominentes. Inflorescentiae terminales in ramis densae corymbosae, ramis plerumque oppositis perdense hirtellis vel subtomentosis. Capitula plerumque tripliciter sessiliter aggregata cylindrica ca. 12-14 mm alta et 3-4 mm lata; squamae involucri subimbricatae ca. 18 ca. 5-seriatae latae ovatae vel oblongae 3-9 mm longae ad 3 mm latae apice obtusae vel breviter acutae margine et extus plerumque in partibus superioribus tomentellae extus sparse glandulo-punctatae, bracteae interiores praeter apicem glabrae, bracteae exteriores ad apicem vix herbaceae; paleae 1-2 bracteiformes ca. 10 mm longae apice breviter acutae glabrae margine plerumque uni-dentatae. Flores 4-5 in capitulo discoidei; corollae flavae ca. 7 mm longae, tubis ca. 2.5-2.8 mm longis extus dense glandulo-punctatis, faucibus distincte campanulatis ca. 2 mm longis extus glabris, lobis oblongo-lanceolatis ca. 2.5 mm longis et 0.8 mm latis superne dense glandulo-punctatis; thecae antherarum ca. 3 mm longae; appendices antherarum extus glanduliferae. Achaenia 5.5-6.0 mm longa base breviter stipitata inferne carnosa et subglabra ceterum dense setifera et glandulo-punctata, setis leniter flexuosis biseriatis multi-cellularibus; squamellae pappi ca. 13 anguste oblongae superne breviter subulatae vel subtruncatae ca. 3 mm longae extus minute spiculiferae. Grana pollinis plerumque 50-60 µm in diam. valde breviter spinosa.

TYPE: BRASIL: Bahia: Município de Rio de Contas. Base de Pico das Almas, a 18 km ao NW de Rio de Contas. Elev. 1300 m. Common shrubs 1-1½ meters tall, flowers yellow. July 22, 1979. *R. M. King, S. Mori, T. S. Santos & J. Hage 8097* (Holotype RB, isotypes CEPEC, US). PARATYPES: BRASIL: Bahia: Município de Rio de Contas. Base de Pico das Almas, a 18 km ao NW de Rio de Contas. Elev. 1300 m. Shrub one meter tall, flowers yellow. July 24, 1979. *R. M. King, S. Mori, T. S. Santos & J. Hage 8121* (CEPEC, US); Município de Mucugê, a 3 km ao S de Mucugê. Na estrada que vai par Jussiape. Elev. ca. 1000 m. Shrub 2 meters tall, flowers yellow. July 26, 1979. *R. M. King, S. Mori, T. S. Santos & J. Hage 8161* (CEPEC, US).

Both *C. belemii* and *C. morii* can be distinguished readily from *C. rotundifolia* by the lack of ray flowers and by the lack of the more herbaceous-tipped lower involcral bracts. In both of the new species, the outermost flowers of the heads sometimes lack anthers, but the corollas are in no way asymmetric. The only previously described discoid member of the species complex is *C. lantanoides* Gardn. which has 6-8 flowers in the head, and has longer linear-lanceolate pappus setae that reach more than 3/4 the length of the corolla.

In comparison of the two new species, *Calea belemii* differs from *C. morii* initially by the more rounded, more serrate, less pubescent leaves, and by the mostly glabrous involucral bracts. In details of the florets, *C. belemii* has the corollas glabrous, the achenes narrow with a long-stipitate base, and the pappus squamae narrowly elliptical with subulate tips. In *C. morii*, the tube and lobes of the corolla are densely glandular-punctate on the outer surface, the achenes are broad with stout bases, and the pappus squamae are more oblong with generally blunt or retuse tips. Also, the throat of the corolla is generally shorter and more abruptly expanded at the base in *C. belemii*.

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

Calea morii H. Robinson, Holotype, Jardim Botânico, Rio de Janeiro.

Calea enlargements of heads: Top. *C. belemii*. Bottom. *C. morii*.

TWO NEW GENERA OF VERNONIEAE (ASTERACEAE) FROM BRASIL

HETEROCYPSELA AND *PSEUDOSTIFFTIA*

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Brasil is a major center of diversity for the Vernonieae, and of the 70 genera listed by Jones (1977) in his review of the tribe, 27 occur in that country. Many of the genera are endemic to Brasil, including all of the typical element of the subtribe Lychnophorinae. Additional undescribed genera are to be expected, from both re-evaluation of previously described species, and from the discovery of totally undescribed entities. Two genera of the latter type are described here, *Heterocypsela* from the State of Minas Gerais and *Pseudostifftia* from Bahia, the former distinguished by the markedly dimorphic achenes in the head, and the latter showing an incrassate style form unlike those in any other members of the Vernonieae.

HETEROCYPSELA ANDERSONII H. Robinson, genus et sp. nov.

Plantae herbaceae perennes 1.5 m altae. Caules fulvescentes teretes striati glandulo-punctati et evanescentiter appresse piliferi, pilis T-formibus sessilibus, internodis ad 7 cm longis. Folia alterna membranacea inferiora base petioliformia superiora subsessilia, petiolis ad 5 mm longis; laminae inferiores oblanceolatae plerumque ca. 18 cm longae et ca. 6 cm latae base anguste cuneatae attenuatae margine superne sensim argute serrulatae apice subabrupte argute acuminatae; laminae superiores lanceolatae vel oblongo-lanceolatae plerumque 7-14 cm longae et 2-4 cm latae base subrotundatae vel obtusae margine argute serrulatae apice leniter argute acuminatae supra sparse evanescentiter appresse piliferae subtus dense glandulo-punctatae et densius appresse piliferae, pilis T-formibus, nervis secundariis utrinque 8-10 ca. 45^{o} ascendentibus, nervulis indistinctis. Inflorescentiae valde cymosae, ramis secundariis ad 14 cm longis, ramis ultimis 5-30 mm longis dense canescentiter piliferis. Capitula late campanulata ca. 15 mm alta et 12-15 mm lata; squamae involucri 70 subimbricatae ca. 6-seriatae 3-8 mm longae, exteriores lineares vel filiformes laxe patentes, ceterum base ovatae vel oblongo-lanceolatae ad 1.8 mm latae apice distincte caudato-acuminatae in acuminis 1.5-3.5 mm longae margine dense breviter fimbriatae vel superne minute scabridulae extus scabridulae inferne callose albo-striatae in medio viridi-vittatae albo-marginatae superne interdum rubotinctae; receptacula plana glabra. Flores ca. 60-70 in capitulo. Corollae disciformes purpureae anguste infundibulares ca. 9 mm longae, tubis 3.5-4.5 mm longis base sensim angustis inferne glabris superne dense hirtellis, faucibus ca. 2 mm longis inferne hirtellis superne sensim scabridulis, lobis recurvatis linearibus ca. 3 mm longis et 0.4 mm latis extus scabridulis apice perdense scabridulis; filamenta in parte inferiore tenua in parte superiore distincta ca. 0.2 mm longa; thecae antherarum ca. 2.7 mm longae; appendices antherarum anguste ovatae ca. 0.5 mm longae et 0.3 mm latae apice subobtusae abaxialiter et in connectivis sparse minute glanduliferae; basi stylorum distincte parve noduliferi; styli superne in scapis et ramis dense longe scabridulae, ramis filiformibus ca. 2 mm longis. Achaenia biformia; achaenia exteriora obcompressa triangularis ca. 3 mm longa et 2 mm lata glabra laevia in marginis lateralibus distincte alata; cellulis superficialibus achaeniorum subquadratis 12-25 µm in diam. in partibus collenchymatis crystalliferis; pappus multisetosus perfacile deciduus, setae plerumque ca. 4 mm longae setae breviores ad 0.7 mm longae; achaenia interiora prismatica immatura ad 2 mm longa setifera; setae pappi aliquantum persistentes ca. 40 plerumque ca. 5 mm longae base tenues supra basem latiores, seriebus exteriores nullis. Grana pollinis 40-50 µm in diam. valde lophorata, cristis altis minute multo spinuliferis, spinis majoribus nullis (reticulation mostly the *V. cognata*-type of Stix, 1960, with polar areole, variations involve a wall partially separating the area of the pore from the upper and lower extensions of the colpar areole, and the polar areole sometimes being 5-sided rather than 6-sided.

TYPE: BRASIL: Minas Gerais: 15 km by road W. of Januária on road to Serra das Araras; elev. 575-650 m; hill of raw jagged limestone and tall forest at its base. Herb 1.5 m tall, with perennial base; flowers purple; limestone. 20 April 1973. *William R. Anderson, P. A. Fryxell, S. R. Hill, R. Reis dos Santos & R. Souza 9223* (Holotype UB, isotype US).

Heterocypsela is named after the strikingly dimorphic achenes of the head, the most extreme example of such dimorphism seen in the tribe. Two other genera of the tribe have some achene dimorphism, *Lychnophoropsis* Sch. Bip. and *Pithecoseris* Mart. in DC., both from Brasil and both members of the subtribe Lychnophorinae, having clustered heads and only 3-15 flowers in each head. In these genera the outer achenes differ only in being glabrous and in having a somewhat differentiated pappus. The pappus elements of the inner achenes are usually more persistent and sometimes broader. As such, the two Brasilian genera do not seem closely related to the new genus.

Heterocypsela is evidently more closely related to the fleshy herbaceous *Dipterocypsela* Blake of Colombia. Both genera have numerous flowers in the head and both have the outer achenes obcompressed with wings on the lateral margins that extend upward as short teeth beside the pappus. In *Dipterocypsela* the comparatively immature condition of the inner flowers in the Type leaves the question of dimorphism uncertain, but at least some achenes inside the outer series seem to be as winged and glabrous as those of the outer series. The most basic distinction between *Heterocypsela* and *Dipterocypsela* is the actinomorphic corolla of the former, the latter genus being one of the notable examples of asymmetric corollas in the Vernonieae. *Dipterocypsela* also has the heads sessile on well-developed serially-cymose inflorescence branches, and in spite of the general similarity to *Heterocypsela*, it seems likely that the two genera have arisen from different though related elements within the large genus *Vernonia*.

The specimen of the new genus was originally put aside because of the distinctive appearance of the long-pedunculate heads and the long-attenuate involucral bracts. The species has a superficial resemblance to *Vernonia subulata* Baker, but the latter is an annual with dense spreading oxylepidous involucral bracts that are evenly tapering from their base.

PSEUDOSTIFFTIA KINGII H. Robinson, genus et sp. nov.

Plantae erectae fruticosae vel subarborescentes ad 2 m altae mediocriter ramosae. Caules teretes striati appresse fulvo-puberuli vel sublepidoti. Folia alterna, petiolis ca. 5 mm longis base subabrupte latioribus; laminae coriaceae distincte obovatae vel cuneiformes plerumque 4.5-8.5 cm longae et 2.5-7.0 cm latae base distincte cuneatae margine integrae apice truncatae vel leniter retusae supra et subtus appresse puberulae vel sub-lepidotae, nervis primariis percurrentibus vel submucronatis, nervis secundariis pinnatis utrinque ca. 8 ca. 45^{o} ascendentibus, nervis et nervulis utrinque prominulis. Inflorescentiae copiose thyrsoideo-paniculatae in ramis dense corymbosae, bracteis superioribus subulatis ca. 1.5 mm longis, ramis ultimis plerumque 1-3 mm longis sublepidotis. Capitula anguste campanulata vel cylindrica uniflora, involucro ca. 7 mm alto et 2.5-3.0 mm lato; squamae involucri ca. 18 subimbricatae ca. 5-seriatae valde inaequilongae ovatae vel lineari-lanceolatae 1.5-6.0 longae et 1.0-1.7 mm latae superne rubrescentes margine dense fimbriatae apice breviter acutae extus leniter distincte uni-costatae sub-evanescentiter sublepidotae; squamae interiores facile deciduae; receptacula glabra. Flores 1 in capitulo; corollae disciformes purpureae subcarnosae anguste infundibulares 12-13 mm longae, tubis 6-7 mm longis cylindraceis glabris, faucibus indistinctis ca. 1.5 mm longis extus glandulo-punctatis, lobis leniter vel distincte incurvatis lanceolatis 4.0-4.5 mm longis et 1.2-1.5 mm latis extus dense glandulo-punctatis; filamenta in parte inferiore tenua in parte superiore vix discriminentia ca. 0.4-0.5 mm longa; thecae antherarum ca. 4 mm longae, cellulis endo-thecialibus elongatis in parietibus transversalibus 1-3-noduliferis; appendices antherarum lanceolatae ca. 1 mm longae et 0.4 mm latae glabrae margine involutae apice subacutae; base stylorum valde noduliferi, nodis abruptis ca. 1 mm latis et 0.4 mm altis; styli superne incrassati dense scabridi, ramis stylorum lanceolatis ca. 2 mm longis. Achaenia prismatica ad 4.5 mm longa

10-costata dense breviter villosa glandulifera, setis distaliter plerumque uniseriatis base plerumque biseriatis; carpopodia breviter annuliformia ca. 0.6 mm lata et 0.1 mm alta, cellulis subquadratis ca. 5-seriatis; setae pappi ca. 100 plerumque uniformes capilliformes plerumque ca. 8 mm longae aliquantum persistentes superne vix latiores extus leniter complanatae, setae exteriores paucae breviores. Grana pollinis 60-70 µm in diam. subregulariter spinosa.

TYPE: BRASIL: Bahia: Munićipio de Mucugê. Estrada que liga Mucugê. 17 km de Mucugê. Campo rupestre. Elev. ca. 1100 meters. Small tree 2 meters tall, flowers purple, most past anthesis. July 27, 1979. *R. M. King, S. A. Mori, T. S. dos Santos & J. Hage 8179* (Holotype RB, isotypes CEPEC, US). PARATYPES: BRASIL: Bahia: Munićipio de Rio de Contas, a 10 km ao NW de Rio de Contas. Elev. 1000 meters. Subshrub branching from base, flowers white?, mostly in pappus. July 21, 1979. *R. M. King, S. A. Mori, T. S. dos Santos & J. Hage 8084* (CEPEC, US); Pico das Almas. a 18 kms. NW de Rio de Contas. Elev. 1600-1850 meters. Shrub 1½ meters tall, flowers white. July 24, 1979. *R. M. King et al. 8145* (CEPEC, US); Serra do Sincorá. By Rio Cumbuca, about 3 km. N of Mucugê on the Andarai road. On conglomerate sandstone rock with partly burnt-over vegetation among rocks by river and neighboring hillside. Alt. ca. 850 m. Approx 41° 23'W, 13° 00'S. Shrub 2 m high. Leaves mid-green with rusty tomentum. Flowers mauve. Feb. 5, 1974. *R. M. Harley, S. A. Renvoize, C. M. Erskine, C. A. Brighton & R. Pinheiro 16024* (K).

The genus is named after the general resemblance to the Mutisian genus *Stifftia* of eastern Brasil, especially *S. uniflora* Ducke. The new genus is clearly not Mutisian, however, having a short transparent anther appendage, having spherical spinose pollen with a single layer of distally branched baculae, and having some prominent glandular-punctations, all being characters indicative of the Vernonieae and rare or lacking in the Mutisieae.

Still, the new genus is not readily placed in the Vernonieae. The resemblance to various members of *Vernonia* subgenus *Critoniopsis* appears to be misleading. There are deciduous inner involucral bracts and single-flowered heads in members of the latter subgenus in the Andes and in the equivalent Mexican subgroup *Eremosis*. These characters are similarly combined in the new genus, but *Pseudostifftia* lacks the sharply differentiated outer pappus series and the irregularly crested *Lychnophora*-Type pollen that occurs in those subgroups of *Vernonia*. It is the style of *Pseudostifftia* that presents the most striking differences, having a broadened upper portion bearing only short scabridulae and broad tapering branches. This contrasts with the long hairs and slender branches typical of other Vernonieae. The style is more like various members of the Mutisieae and Cynareae, though the scabrosity does not terminate below in a pronounced rim. The size of the style has allowed some dissection, and the cells of the mesophyll seem to contain some unusually elastic and viscid substance. In section, the stigmatoid tissue forms a pale strongly differentiated central cylinder that is particularly evident in the broader upper part of the shaft. The fleshiness seen in the style is reflected in the thick wall of the corolla which remains with lobes somewhat incurved after flowering. The filaments are also rather fleshy, and the anther collar is scarcely differentiated. The endothecial cells are unusually elongate compared to other members of the tribe, with thickenings restricted to the upper and lower ends.

The pappus has a few shorter outer setae, but there is no sharply demarcated outer series. Such a pappus is most closely approached in the Vernonieae in the genus *Eremanthus*. The pollen of the new genus also approaches the type seen in *Eremanthus* and *Lychnophora*, but the surface is not at all lophorate and has almost no groupings of spines. Actually, the spines are more prominent than those observed in the typical *Lychnophora*-Type. In addition to other differences, the habit of the new genus, with its rather open thrysoid-panicle, in no way resembles the inflorescences in members of the subtribe *Lychnophorinae*.

The new genus, in spite of some superficial resemblance to some species of *Vernonia*, seems to represent an extremely isolated element in the tribe. The style form may reflect the relationship that is already recognized between the Vernonieae and such tribes as the Cynareae and Mutisieae, but it is not of the exact form seen in the latter tribes, while its thickness is the primary difference from other Vernonieae. It is believed that the incrassated styles in the various tribes reflect a similar genetic potential within the subfamily, but that they do not reflect a direct relationship between *Pseudostifftia* and the other tribes.

The single species of the genus is individually distinctive in the cuneate shape of the leaves, having tips that are usually broadly truncate to slightly retuse. The very immature Harley collection has somewhat more rounded leaf-tips, but it is evidently the same species. The collection data on two of the series of specimens indicates the flowers are white, but in these plants all the corollas had apparently fallen.

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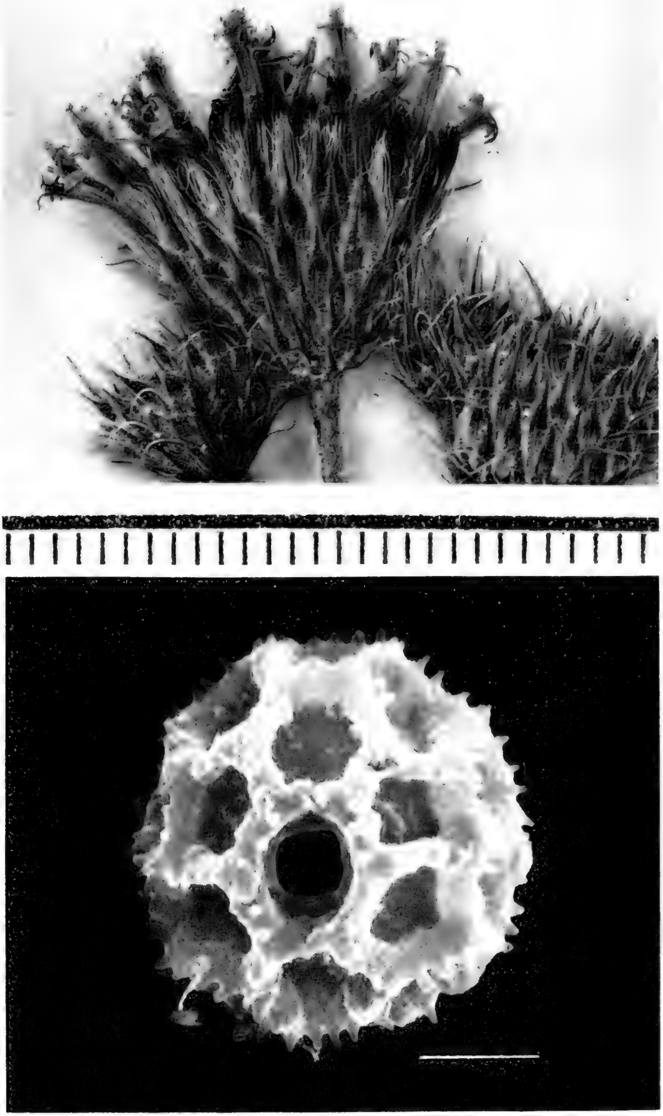
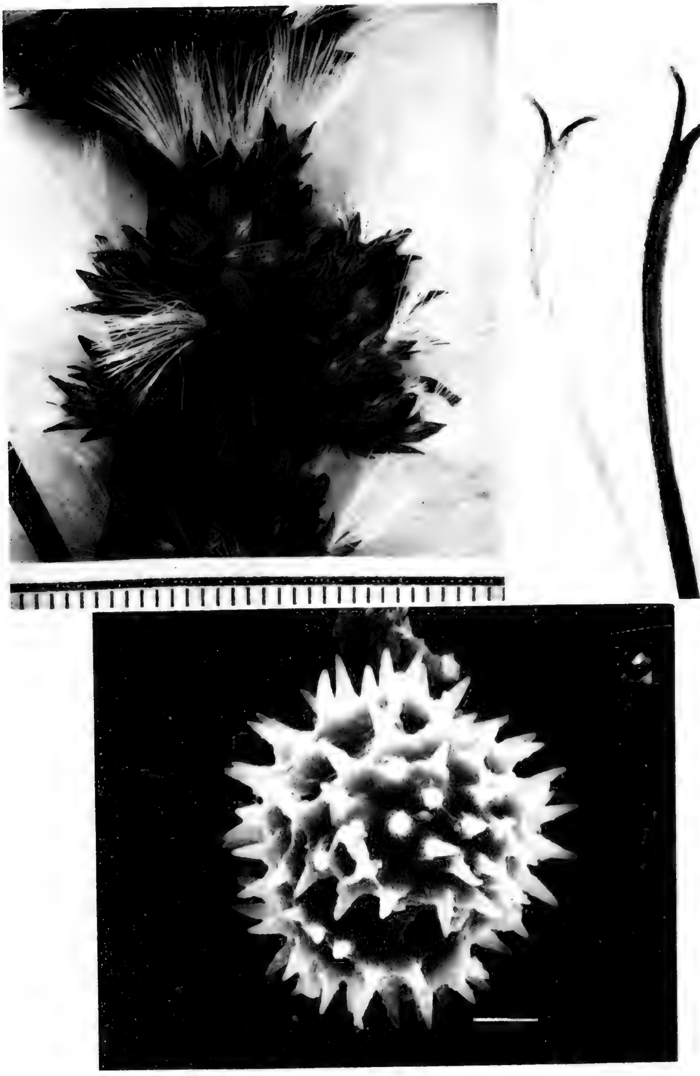
Stix, E. 1960. Pollenmorphologische Untersuchungen an Compositen. Grana Palynol. 2 (2): 41-104.

Heterocypsela andersonii H. Robinson, Holotype, Herbário Universidade de Brasília. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.



Heterocypsela andersonii H. Robinson. Top. Enlargement of heads. Bottom. Pollen grain with pole at top, line equals 10 µm.

Pseudostifftia kingii H. Robinson, Holotype, Jardim Botânico, Rio de Janeiro.



Pseudostifftia kingii H. Robinson. Top left. Enlargement of heads. Top right. Styles. Bottom. Pollen grain, line equals 10 µm.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXVII.

A NEW GENUS, *MORITHAMNUS*.

R. M. King[1], H. Robinson[1] & G. M. Barroso[2]

The multiflowered members of the Eupatorieae having spirally inserted leaves, have their greatest concentration in the State of Bahia, Brasil. The genera *Agrianthus*, *Arrojadocharis*, *Bahianthus*, *Lasiolaena* and *Stylotrichum* all occur in that region. Material has now been seen of another member of this group from Bahia which is named here as a new genus, *Morithamnus*.

The new genus is immediately recognizable in the field by its coarse leaves and candelabra-form branching. Closer examination shows a pappus of reduced short setae that immediately would exclude the genus from the broad concept of *Eupatorium*. The plant is extremely viscid, the inflorescence shows ascending subfasciated branching with decurrent ridges, and the receptacle is not conical, all characters shared with the apparent closest relative, *Bahianthus*. The new genus is most obviously different from the latter by the larger and more succulent stems and leaves, the strictly eximbricate involucral bracts with firm slender tips, the great size of the heads with over 100 flowers, the setae on the ribes near the apex of the achene, and the short pappus with setae of more regular width.

The resin ducts of *Morithamnus* furnish some interesting comparisons with those of other related genera. The new genus has distinct ducts both above and below many of the veins in the leaves. In *Agrianthus*, there are large ducts in the leaves, perhaps the largest in the tribe, but they are in one series. In *Bahianthus*, the leaves have only resiniferous pockets which are not linked into ducts. In the corollas of the new genus, the double ducts appear again, paired along each vein of the corolla throat. In the other genera of the relationship, including *Agrianthus*, *Arrojadocharis*, *Bahianthus*, and *Lasiolaena*, the ducts along the veins of the corolla throat are single.

The genus is named in honor of Dr. Scott A. Mori, Curator of the Herbarium at CEPEC in Itabuna, Bahia, who has greatly aided in the collection of this and many other Asteraceae during recent field work by the senior author.

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ZC-20-6B Brasil. Bolsista do CNPq.

MORITHAMNUS CRASSUS R. M. King, H. Robinson & G. M. Barroso, genus et sp. novum Asteracearum (Eupatorieae).

Plantae suffruticosae vel subarborescentes 1-2 m altae mediocriter candelabriformiter ramosae viscosae. Caules incrassati carnosi teretes subtiliter late striati glabri et glandulo-punctati interdum in aspectu minute lepidoti. Folia dense spiraliter inserta, petiolis ad ca. 2.5 cm longis distaliter indistincte demarcatis; laminae carnosae obovatae plerumque 8-15 cm longae et 2.5-4.5 cm latae base argute cuneatae in petiolis superioribus decurrentes margine integrae apice obtusae et anguste apiculatae supra et subtus glabrae dense glandulo-punctatae, nervis secundariis aliquantum irregularibus subpinnatis valde ascendentibus. Inflorescentiae abrupte terminales interdum superatae ab innovatione lateralis, ramis elongatis corymbose depositis ascendentibus, ramis ultimis 4-55 mm longis saepe extra-axillaribus, bracteis subinvolucralibus plerumque remotis linearibus ca. 7 mm longis. Capitula hemisphaerica ca. 9 mm altae et 12-14 mm lata; squamae involucri ca. 35 eximbricatae duplo-seriatae herbaceae lineares vel anguste lanceolatae ca. 7 mm longae extus dense glandulo-punctatae viscosae interiores persistentes margine scariosae et in sicco reflexae; receptacula plana vel leniter convexa glabra. Flores ca. 100 in capitulo; corollae lavandulae ca. 5 mm longae extus plerumque glabrae, tubis angustioribus ca. 1 mm longis, faucibus late cylindraceis ca. 3.5 mm longis, ductis resiniferis in nervis binis valde distinctis, lobis ovato-oblongis ca. 0.8 mm longis et 0.7 mm latis intus brevibus extus superne glanduliferis et minute cristiferis; filamenta glabra in partibus superioribus 0.20-0.25 mm longa crassa, cellulis oblongis vel linearibus in parietibus valde annulate ornatis; thecae antherarum lavandulae ca. 2 mm longae, cellulis endothecialibus quadratis vel brevioribus; appendices antherarum oblongo-ovatae ca. 0.3 mm longae et latae; basi stylorum glabri non noduliferi, rami stylorum filiformes dense papillosi. Achaenia ca. 3 mm longa 5-costata base breviter constricta plerumque glabra superne in costis dense setifera; carpopodia breviter cylindrica ca. 0.1 mm longa et 0.4 mm lata, cellulis ca. 5-seriatis quadratis ca. 25 µm latis, parietibus non incrassatis non noduliferis; setae pappi uniseriatae 20-25 irregulares breves plerumque 0.5-1.0 mm longae subsquamelliformes margine sub-barbellatae extus planae, cellulis apicalibus argute acutis. Grana pollinis 27-30 µm in diametro breviter spinosa.

TYPE: BRASIL: Bahia: Município de Mucugê. Estrada que liga Mucugê com Andarai a 11 kms. Elevation ca. 1150 meters. Small tree 1-2 meters tall, leaves very sticky, flowers pink. July 27, 1979. *R.M.King, S.A.Mori, T.S.dos Santos & J.L.Hage 8166* (Holotype RB; isotypes CEPEC, US). PARATYPES: BRASIL: Bahia: Município de Mucugê. 22 km S of Andarai on road to Mucugê. Open area of peaty marsh. Wetter areas predominantly sedge, grasses and other monocots, on white sand and peat, with some small shrubs with scattered rocky bluffs with scrub and small trees.

Approx. 41° 20' W, 12° 57' S. Alt. ca. 1000 m. Sub-shrub 1.5 m. Leaves rather fleshy, viscid. 16 February 1977. *R.M.Harley, S.J. Mayo, R.M.Storr, T.S.Santos & R.S.Pinheiro 18728* (K, US received as *Senecio* sp.); Bahia: Serra do Andarai, sobre pedros. *Dimitri Sucri 10865* (RB, US).

Acknowledgement

We would like to thank the following people for their help in the project. Dr. Dourimar Nunes de Moura, Superintendent for International Cooperation, Conselho Nacional de Desenvolvemento Cientifico e Tecnologico (CNPq) Brasilia, Dr. Paulo Alvim, Director of Research, and Dr. Scott A. Mori, Curator of the Herbarium, both of the Centro de Pesquisas do Cacau (CEPEC), Itabuna.

Morithamnus crassus R. M. King, H. Robinson & G. M. Barroso, Holotype, Jardim Botânico. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXVIII.

ADDITIONS TO *EITENIA* AND *LOMATOZOMA*.

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Recent studies of Brazilian material have encountered some previously undescribed species belonging to two of the small genera of the subtribe *Praxelinae*, both genera being endemic to Brazil. The new species of *Eitenia* represents a second for that genus, and provides further insight into the limits of variation to be expected. The new species of *Lomatozoma* brings the total for that genus to four, and a key is provided for that genus, which until recently was considered monotypic. The occurence of asymmetry in corollas of both genera is notable, not having been present in previously described members of *Lomatozoma*. This characteristic, which is unusual in the tribe Eupatorieae, has n w been noted in three genera of the subtribe *Praxelinae: Eitenia, Lomatozoma* and *Praxeliopsis*.

The genus, *Eitenia*, judged on the basis of two species, is closest to the genus, *Eupatoriopsis*, with which it shares the elongate receptacle and the broad obcompressed mostly two-ribbed achenes. The leaves also are similar in the trinerved condition originating at the bases of the short petioles, a feature less evident in most other members of the *Praxelinae*. The original description of *Eitenia* (King & Robinson, 1974) emphasized the asymmetric corollas of the peripheral flowers and the long pappus setae as distinctions from *Eupatoriopsis*, both characters still being valid. More subtle differences include the more cylindrical throats of the corollas, the narrower anther thecae, the longer papillae inside the throat of the corolla, especially along the veins, and the less cylindrical receptacle. Re-examination of the isotype of *Eupatoriopsis* has shown another major distinction in the involucre of the latter, the bracts are thinner and more persistent, mostly spreading rather than falling to allow release of the achenes. In the latter feature, *Eupatoriopsis* has partially reverted from the characteristic form of involucre in the subtribe *Praxelinae*.

EITENIA POLYSETA R. M. King & H. Robinson, sp. nov.

Plantae herbaceae annuae? erectae ca. 30 cm altae pauce vel non ramosae. Caules pallide rubrescentes teretes striati dense hirsuti. Folia opposita, petiolis 1-2 mm longis; laminae 1.5-2.5 cm longae et 0.7-1.5 cm latae base breviter acutae margine argute 2-4-serratae vel lobatae apice argute acutae supra sparse pilosae subtus subcarnosae distincte glandulo-punctatae plerumque in nervis pilosae plerumque a caulibus valde ascendentiter trinervatae, nervis subtus prominentibus. Inflorescentiae diffusae inferne opposite ramosae, ramis ultimis 2-4 cm longis glabris vel subglabris. Capitula cylindrica vel anguste campanulata ca. 8 mm alta et 4 mm lata base pauce glandulo-punctatae; squamae involucri 22-25 valde inaequales appressae omnino facile deciduae lanceolatae 2-7 mm longae ad 1.3 mm latae margine anguste scariosae apice caudato-attenuatae extus trinervatae glabrae. Flores ca. 50 in capitulo; corollae albae in floribus exterioribus asymmetricae in lobis exterioribus ca. 1.5 mm longae, tubis ca. 1 mm longis glabris, faucibus intus papillosis, papillis in nervis aliquantum longioribus, lobis plerumque ca. 0.6 mm longis et 0.45 mm latis intus dense longe apiculate papillosis extus sparse puberulis superne pauce glandulo-punctatis; thecae antherarum ca. 0.7 mm longae; appendices antherarum anguste oblongae ca. 0.2 mm longae et 0.12 mm latae; appendices stylorum angustae, papillis non patentibus. Achaenia obcompressa plerumque bicostata raro tricostata ca. 2.3 mm longa superne ca. 1.0 mm lata in costis marginalibus ubique longe setifera caeterum sparse breviter setifera; setae pappi ca. 20 longiores plerumque 3.5 mm longae, setae tenuiores breviores interdum alterna interspersae. Grana pollinis defectiva 18-23 µm in diam.

TYPE: BRASIL: Goiás: Serra dos Pirineus. ca. 10 km (straight line) NE of Corumbá de Goiás; elev. 1050 m; woods and rocky cerrado at base of waterfall on Rio Corumbá. Herb in open sand near stream; flowers white. 15 May 1973. *Anderson 10354* (Holotype UB). PARATYPE: BRASIL: Distrito Federal: Universidade de Brasília, disturbed cerrado. Elev. 975 m. 6 May 1966. *H.S. Irwin, J.W.Grear, R. Souza & R.Reis dos Santos 15645* (US).

The new species differs from *E. praxeloides* by the more densely hirsute stems, the more acute bases of the leaves, the sharp tips of the leaf lobes, the predominantly opposite branching in the inflorescence, the basal involucral bracts being generally larger and less numerous, the inner involucral bracts having longer tapering attenuate tips, the corollas being whitish rather than violet, and the setae of the pappus being more numerous. The pappus of the new species has up to 20 setae, of which 10 or more are thick as in *E. praxeloides*. The remaining interspersed setae are shorter and very slender. The papillae along the veins inside the throat of the corolla are not as long as in *E. praxeloides*, being scarcely differentiated from the papillae of the intervening surface.

Both species of *Eitenia* occur in the Goiás area, but the new species is from in and near the Federal District. *Eitenia praxeloides* is from the Município of Paraíso do Norte de Goiás, 500 km to the north of the Federal District.

Both specimens of the new species have defective pollen and the anthers are quite small. Correlated with, and perhaps partly because of the lack or near lack of pollen, the long papillae of the style appendages mostly remain appressed. In *E. praxeloides*, pollen is present and not deformed, the papillae of the style are spreading, and the corollas are distinctly pigmented, all indicating maintainence of active pollination mechanisms and a normal sexual reproduction.

The genus *Lomatozoma* was recognized for over a century on the basis of the dissected leaves and the short pappus of the original species, *L. artemisiifolium*. The paleaceous receptacle was also noted. Recent additions to the genus (King & Robinson, 1975, 1978) have shown that the leaves are not always dissected and that the receptacles are usually not paleaceous. The genus has continued to be distinguished, however, on the basis of the minute carpopodium, the non-conical receptacle, and the short capillary pappus. The trichomes have been given little notice previously, but recent studies show that they are the most unique features of the genus. There are two types, both glandular. The undersurfaces of the leaves in all four species bear glandular dots of unusually large size. The other type of gland in the genus is best developed in *L. artemisiifolium* where the stems and leaves are covered with long-stipitate glands which are uniseriate. The other species have comparatively minute glands on the stems, various surfaces of the leaves, and on the involucral bracts which, on microscopic examination, also prove with few exceptions to be uniseriate. As the exceptions suggest, these glands are related to the biseriate glands found elsewhere in the family. No other example of uniseriate hairs with glandular tips is presently recorded for the Asteraceae.

LOMATOZOMA INAEQUALE R. M. King & H. Robinson, sp. nov.

Plantae herbaceae perennes ca. 40 cm altae multo ramosae. Caules brunnescentes teretes striati perminute stipitato-glanduliferi inferne glabrescentes pallide corticati. Folia opposita, petioles plerumque 2-6 mm longis; laminae ovatae plerumque 9-14 mm longae et 5-14 mm latae base truncatae vel breviter obtusae margine utrinque 1-3-lobatae inter lobos inferiora profundius divisae apice breviter obtusae supra perminute stipitato-glanduliferae subtus pallidiores dense glandulo-punctatae, glandulis magnis globosis. Inflorescentiae diffusae laxe cymosae, ramis tenuibus plerumque 1-5 cm longis perminute stipitato-glanduliferae. Capitula cylindrica ca. 6 mm alta et 2.5-3.0 mm lata; squamae involucri ca. 25 imbricatae omnino deciduae valde inaequales ovatae vel anguste oblongae 1.5-5.0 mm longae et ca. 1.0 mm latae superne margine et extus perminute stipitato-glanduliferae apice acutae vel breviter acuminatae; receptacula superne convexa. Flores 15-20 in capitulo; corollae lavandulae ca. 4 mm longae juveniter superne leniter incurvatae, tubis ca. 0.5 mm longis extus glabris, faucibus 2.5 mm longis intus in partibus interioribus valdius papillosis, lobis inaequalibus interioribus 0.6-0.7 mm longis exterioribus ca. 0.9 mm longis intus perpapillosis extus sparse puberulis; thecae antherarum ca. 1 mm longae; appendices antherarum ovatae ca. 0.25 mm longae et 0.12-0.15 mm latae apice interdum subacutae. Achaenia ca. 2.2 mm longa plerumque in costis lateralibus setifera superne densius et longius setifera base dense spiculifera; setae pappi ca. 15 valde inaequales 0.4-2.0 mm longae patentiter marginaliter scabridulae extus papillosae, cellulis apicalibus argute acutis. Grana pollinis ca. 20 µm in diam.

TYPE: BRASIL: Mato Grosso: Top and eastern slope of mountain ca. 9 km NE of Barra do Garças; elev. 500-700 m; sandstone and sandy soil with cerrado. Herb in crevices in sandstone; heads pale blue, turning pink in press. 6 May 1973. *Anderson 9826* (Holotype UB, isotype US).

Lomatozoma inaequale is closely related to *L. huntii*, also from Mato Grosso. Both species have shortly acute involucral bracts with minute glands on the outer surface. The latter species is most obviously distinct in the more deeply lobed and often tripartite leaves. The new species is unique in the genus in the partially zygomorphic nature of the corollas. The corollas have the outer lobes larger and the inside surface of the throat nearest the center of the head is more strongly papillose.

The four species of *Lomatozoma* can be distinguished by the following key.

1. Stems and leaves densely pubescent with long gland-tipped hairs; involucral bracts narrowly acute; paleae present . . . . *L. artemisiifolium*

1. Stems and leaves with only minute or sessile glands; involucral bracts with short-acute or rounded tips; paleae absent 2

2. Involucral bracts with mostly rounded or obtuse tips, minute glands restricted to the margin; heads with 25-27 flowers . . . . *L. andersonii*

2. Involucral bracts with mostly short-acute to apiculate tips, with minute glands on margins and upper outside surface; heads with 10-20 flowers 3

3. Leaves shallowly lobed; heads with 15-20 flowers; corollas zygomorphic, with longer outer lobes, tip of corolla incurved in bud . . . . *L. inaequale*

3. Lower leaves tripartite or deeply lobes; heads with ca. 10 flowers; corollas symmetrical . . . . *L. huntii*

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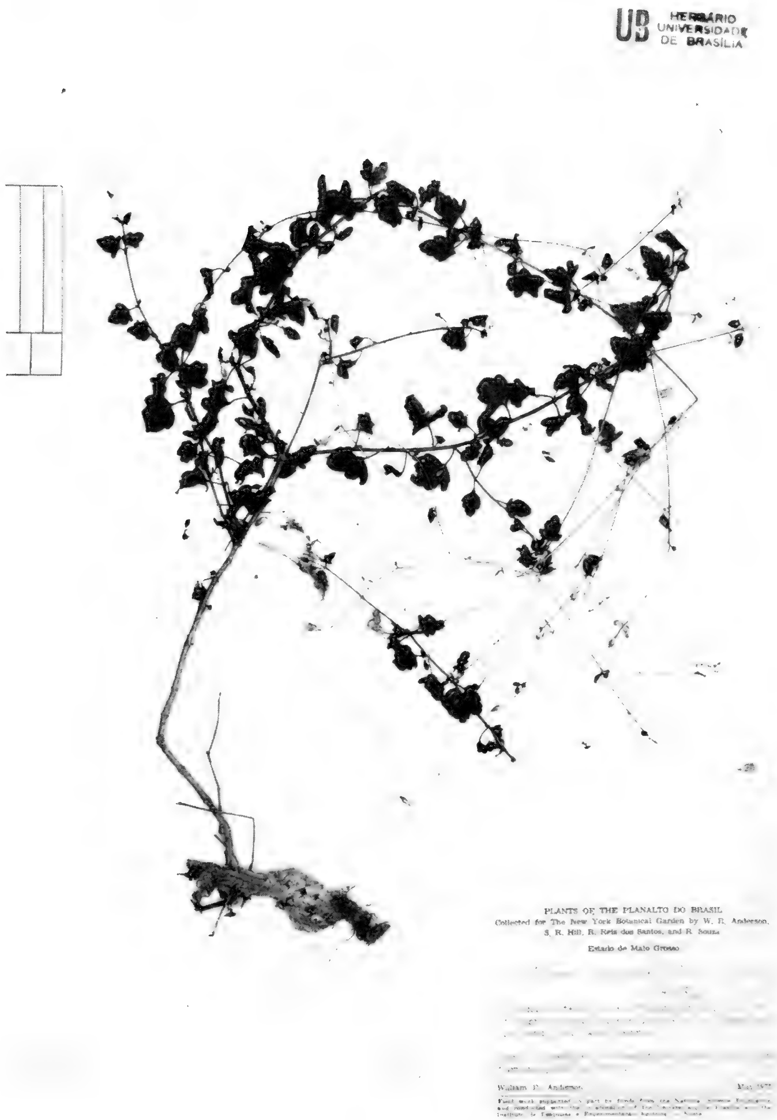
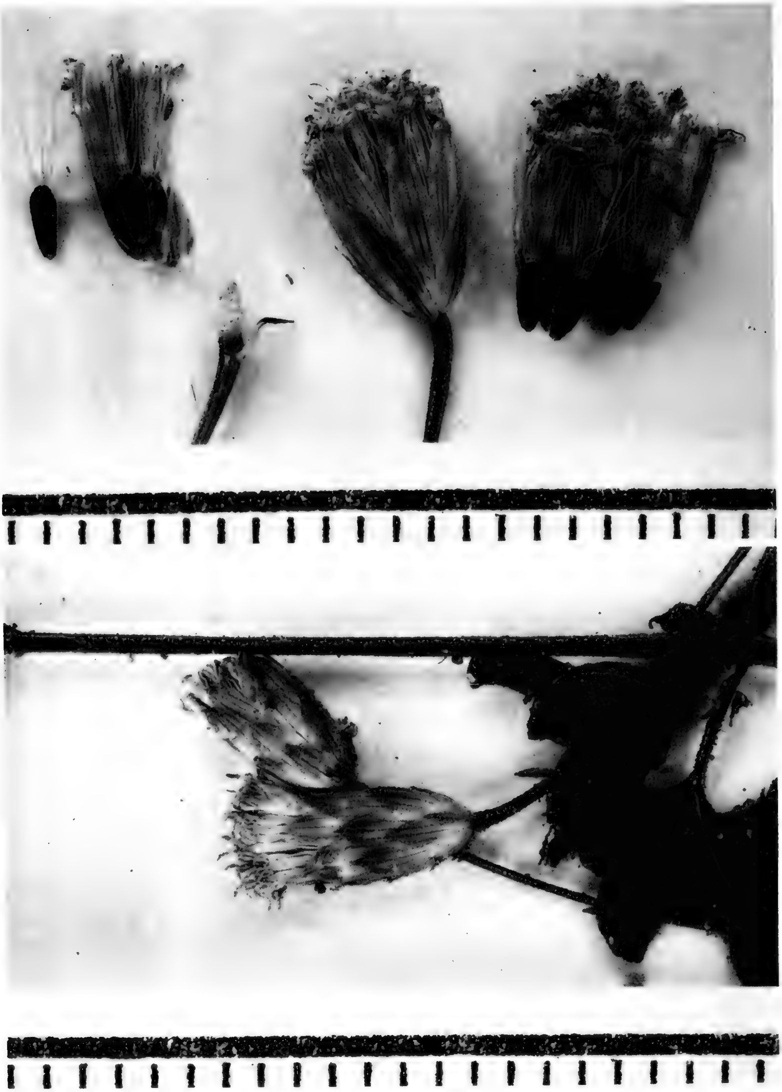
Eitenia polyseta R. M. King & H. Robinson, Holotype, Herbário Universidade de Brasília. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.



Lomatozoma inaequale R. M. King & H. Robinson, Holotype, Herbário Universidade de Brasília.



Enlargements of heads: Top. *Eitenia polyseta*. Bottom. *Lomatozoma inaequale*.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXXIV.

A NEW SPECIES OF *ARROJADOCHARIS*.

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The genus *Arrojadocharis* was first described by Mattfeld (1923) under the name *Arrojadoa*, to include a single species from Bahia having linear spirally-inserted leaves, long peduncles, a reduced pappus, and a short anther appendage. The genus was placed in the subtribe *Ageratinae* as that subtribe was broadly defined at that time. Close relatives of the genus were not obvious, and Robinson and King (1977), in their review of the tribe Eupatorieae, placed *Arrojadocharis* in the *Piqueria* Group with other genera such as *Ageratum* or *Phania*, having a reduced pappus or anther appendage. The position was unsatisfactory because the *Piqueria* Group is primarily Central American and Andean with only a few unique elements in Brasil. Also, the Group is opposite-leaved, with a few possible exceptions. Recent collections from Bahia include material of a new species that seems to resolve the question of the relationship of *Arrojadocharis*.

The new species is similar to *Arrojadocharis praxeloides* Mattf. in the linear, ascending, spirally-inserted leaves with a fine spreading whitish pubescence, and the eximbricate involucre, but it differs notably in lack of long peduncles in the inflorescence and the presence of a well-developed pappus. The species would have been placed technically in the broad concept of *Eupatorium* and would seem an unlikely addition to *Arrojadocharis*. Nevertheless, the most important set of characters given by Mattfeld for his genus invlove the extremely high-conical receptacle with paleae on the lower part. The new species has receptacles and paleae of the same form. The defective pappus of the Mattfeld species seems better interpreted as a reduction of the type found among various of the Gyptoid genera, including *Agrianthus*, *Morithamnus* and *Stylotrichum*. In *A. praxeloides*, some of the specimens have no pappus, but those plants with a pappus have short setae that are in no way squamiform.

The new species differs from *A. praxeloides* by a few additional minor characters such as the pubescence of the corolla, but the difference in pubescence of the stems and leaves is of particular interest. The fine whitish hairs of both species look similar superficially, but those of *A. praxeloides* have gland tips while those of the new species are non-glandular. Problems arise when it is noticed that the non-glandular hairs of the new species have the cells uniseriate and they are thus not directly equivalent to the similar sized hairs of the Mattfeld species. Closer examination shows numerous shorter slender uniseriate hairs among the gland-tipped hairs of *A. praxeloides*, and there are a few minute gland-tipped hairs scattered among the non-glandular hairs of the new species. The actual difference proves to be in the relative prominence of the two differing hair types.

The new species is named after T. S. dos Santos, on the staff of the Herbarium at CEPEC in Itabuna, Bahia.

ARROJADOCHARIS SANTOSII R. M. King and H. Robinson, sp. nov.

Plantae herbaceae annuae vel breviter perennes ad 40 cm altae ascendentiter interdum suffasciculate ramosae in caulis foliis et bracteis involucri dense albo-hirtellae. Caules teretes striati persparse glandulo-punctatae. Folia spiraliter inserta sessilia linearia plerumque 10-15 mm long ad 1.3 mm lata margine integra dense pilose fimbriata apice anguste acuta supra sparse pilosa et glandulo-punctata subtus dense hirtella, nervis parallelis utrinque prominulis. Inflorescentiae in ramis terminales uni-capitatae vel pauci-capitatae, pedunculis 2-5 mm longis dense pilosulis. Capitula late campanulata 7-8 mm alta et ca. 8-10 mm lata; squamae involucri ca. 20 eximbricatae 2-3-seriatae subaequales lineares plerumque 5-6 mm longae et ad 1 mm latae superne purpurascentes apice anguste acutae vel vix acuminatae margine et extus dense pilosulis; receptacula peralte conica; paleae inter flores exteriores praesentes bracteiformes sed angustiores et plerumque glabrae. Flores ca. 50 in capitulo; corollae intense lavandulae ca. 4.5 mm longae anguste infundibulares extus sparse breviter glanduliferae, tubis ca. 1.2 mm longis indistinctis, lobis ca. 0.8 mm longis et 0.6-0.7 mm latis utrinque mamillosis vel papillis; thecae antherarum ca. 1.4 mm longae; appendices antherarum breviter rotundatae ca. 0.15 mm longae et 0.25 mm latae. Achaenia ca. 2.5 mm longa sparse minute glandulifera et plerumque in costis subdense setifera; setae pappi ca. 25 plerumque 2.5-4.0 mm longae extus minute spiculiferae margine dense fimbriatae. Grana pollinis ca. 23 µm in diam.

TYPE: BRASIL: Bahia: Município de Rio de Contas. Pico das Almas, a 18 kms NW de Rio de Contas. Elev. 1600-1850 m. flowers dark pink. 24 July 1979. *R.M.King*, *S.Mori*, *T.S. dos Santos & J.Hage 8143* (Holotype RB, isotypes CEPEC, US).

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Arrojadocharis santosii R. M. King & H. Robinson, Holotype, Jardim Botânico, Rio de Janeiro. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXXV.

ADDITIONS TO THE GENUS *LASIOLAENA*

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Recent efforts in the study of the Eupatorieae of eastern and central Brasil would indicate that a great number of undescribed taxa remain in these inadequately collected areas. The genus *Lasiolaena* of Bahia is a particularly good example, where the few known collections almost all represent new species, and none of the previously known species has been recollected. It is a symptom of the most preliminary stage of plant exploration.

The first member of the genus *Lasiolaena* was recognized as *Eupatorium blanchetii* Sch.Bip. ex Baker in the Flora Brasiliensis (1876). Almost a hundred years later, King and Robinson (1972) established the genus *Lasiolaena* for *E. blanchetii* and for a second previously undescribed species. A recent trip to Bahia by the senior author has now resulted in the collection of two more undescribed species. We provide here a review of the four presently known species of the genus.

Lasiolaena is most readily recognized by the spirally arranged obovate tomentose leaf-blades occurring with heads containing numerous pink or lavender flowers. The involucres are slightly subimbricate, and the receptacles are distinctly conical with at least some hairs. The style branches are usually distinctly broadened and flattened at the tips, as in the genera *Agrianthus* and *Arrojadocharis* which are apparently closely related. There are no hairs on the shaft of the style and no stipitate-glandular hairs on the corolla as in *Stylotrichum*, but the latter is also probably closely related. The pappus setae are almost subulate or awn-like in aspect with the lateral margins forming a narrow wing below. The genus *Bahianthus* superficially seems like a glabrous variant of *Lasiolaena*, but the former differs in numerous significant details that indicate more remote relationship, the inflorescence is subfasciculate in its branching pattern, the receptacle is plane or only slightly conical, the style branches are scarcely broadened or flattened distally, the achenes are glabrous, and the pappus setae are more irregular in width without the narrowly winged bases.

Key to the species of *Lasiolaena*

1. Leaves mostly ca. 6 mm wide, short-acute; undersurface thinly covered with flaccid thin-walled hairs which are concentrated between the nerves, darker color and glandular dots of nerves evident; anther appendages with entire margin *L. santosii*

1. Leaves mostly 7-10 mm wide, obtuse; undersurface densely covered with slender contorted wiry hairs which completely cover the nerves, glandular dots of leaves obscure or lacking; anther appendages minutely crenulate distally . 2

2. Heads each on a distinct peduncle; achenes sparsely pubescent; apical cells of some pappus setae with rounded tips *L. duartei*

2. Heads usually in pairs or in small clusters terminating branches of the inflorescence; achenes densely pubescent; apical cells of pappus setae with acute tips 3

3. Mature achenes ca. 2 mm long, bearing numerous setae on lateral surfaces; corollas with slender hairs near tips of lobes *L. blanchetii*

3. Mature achenes ca. 3 mm long, densely covered with glands on lateral surfaces, without evident non-glandular setae; corollas without slender hairs on lobes *L. morii*

LASIOLAENA MORII R. M. King and H. Robinson, sp. nov.

Plantae fruticosae 1.0-1.5 m altae ascendentiter ramosae. Caules obscure angulati superne dense tomentosi. Folia spiraliter inserta, petiolis 6-7 mm longis leniter demarcatis; laminae late obovatae 17-25 mm longae et 10-15 mm latae base anguste acuminatae margine superne pauce serrulatae apice breviter obtusae vel rotundatae supra evanescentiter tomentellae non glandulo-punctatae subtus dense albo-tomentosae, nervis secundarius paucis valde ascendentibus. Inflorescentiae in ramis terminales dense corymbosae, ramis brevibus dense tomentosis. Capitula 2-4 sessilia in binis vel glomerulis congesta ca. 9 mm alta et 7 mm lata; squamae involucri 20-25 leniter subimbricatae 2-3-seriatae lanceolatae vel anguste lanceolatae 4-7 mm longae ad 1.5 mm latae superne purpurascentes apice breviter anguste acuminatae extus dense hyaline glandulo-punctatae et albo-tomentosae; receptacula distincte conica hirsuta. Flores 12-18 in capitulo; corollae lavandulae vel violaceae ca. 5 mm longae in faucibus et lobis sparse glandulo-punctatae, tubis ca. 1.7 mm longis, lobis ca. 0.8 mm longis et 0.6 mm latis; thecae antherarum ca. 1.7 mm longae; appendices antherarum maturae oblongae ca. 0.5 mm longae et 0.35 mm latae deciduae margine distaliter leniter crenulatae. Achaenia ca. 3 mm longa dense breviter glandulifera, setis non glanduliferis raris vel nullis; setae pappi 35-40 plerumque 3.0-4.5 mm longae, cellulis apicalibus argute acutis non deformibus. Grana pollinis ca. 25 μm in diam.

TYPE: BRASIL: Bahia: Município de Rio de Contas. Pico das Almas, a 18 kms ao NW de Rio de Contas. Elev. 1600-1850 m. flowers pink. 22 July 1979. *R.M.King, S.Mori, T.S.dos Santos & J.Hage 8110* (Holotype RB; isotypes CEPEC, US). PARATYPES: BRASIL: Bahia: Município de Mucugê, a 3 km ao S de Mucugê. Na estrada que vai par Jussiape. Elev. ca. 1000 m. Uncommon shrubs 1½ meters tall, flowers lavender. *R.M.King, S.Mori, T.S.dos Santos & J.Hage 8157* (CEPEC, US); Município de Mucugê. Estrada que liga Mucugê cam Andarai a 11 kms de primeiro. Elev. 1150 m. Shrub one meter tall, flowers pink, mostly in bud. 27 July 1979. *R.M.King, S.Mori, T.S.dos Santos & J.Hage 8171* (CEPEC, US).

The species is most distinctive in the larger size of the flower parts and the densely glanduliferous achenes which lack setae. The number of flowers in the head is less than any other species of the genus, but the number of setae in the pappus is greater. The apical cells of the pappus setae are unmodified, while those of the longer setae in *L. blanchetii* are congested and obtuse. In *L. duartei* the longer pappus setae have apical cells that are often enlarged with rounded ends. The number of flowers in the heads of the new species are not quite as variable as the cited span of numbers implies. The type and *King 8171* tend to have 18 flowers in the head while *King 8157* tends to have 12.

The anther appendages of the type specimen have proved so fragile that none could be prepared intact. Inspection of the less mature paratypes showed their appendages were not fragile but were shorter. Under the compound microscope a zone of tissue is seen that may represent an area of persisting intercalary growth at the base of the appendage which may add to the length of the appendage as the flower matures. Ultimately, at full maturity, the zone appears to wither allowing the appendage to dehisce. Such fragile appendages have not been noticed in other species of the Asteraceae.

LASIOLAENA SANTOSII R. M. King and H. Robinson, sp. nov.

Plantae fruticosae ad 1 m altae ascendentiter interdum fasciculate ramosae. Caules leniter angulati et striati dense flaccide tomentosi. Folia spiraliter inserta, petiolis ca. 7 mm longis leniter demarcatis; laminae anguste obovatae ca. 15-20 mm longae et 5-6 mm latae base anguste acuminatae margine superne multo minute serrulatae apice breviter acutae supra glandulo-punctatae et dense minute puberulae subtus plerumque in areolis flaccide tomentosae in nervis et nervulis glandulo-punctatis, nervis secundariis numerosis valde ascendentibus, anastomosis densis. Inflorescentiae in ramis terminales pauci-capitatae subumbellatae, ramis ca. 10-15 mm longis dense tomentellis. Capitula in ramis solitaria late campanulata ca. 6 mm alta et plerumque 6-8 mm lata; squamae involucri 30-40 leniter subimbricatae 2-3-seriatae lineari-lanceolatae 3-5 mm longae ad 1 mm latae superne purpurascentes apice anguste acutae herbaceae extus glandulo-punctatae et flaccide tomentellae; receptacula distincte conica sparse puberula. Flores 45-65 in capitulo; corollae lavandulae ca. 4 mm longae in faucibus et lobis sparse glandulo-punctatae, tubis ca. 1.3 mm longis, lobis 0.8-0.9 mm longis et 0.5 mm latis; thecae antherarum ca. 1 mm longae; appendices antherarum quadratae ca. 0.25 mm longae et latae margine integrae. Achaenia ca. 2 mm longa dense breviter setifera et glandulifera; setae pappi 25-27 plerumque 2.5-3.5 mm longae superne saepe purpurascentes, cellulis apicalibus argute acutis non deformibus. Grana pollinis ca. 23 µm in diam.

TYPE: BRASIL: Bahia: Município de Rio de Contas. Pico das Almas, a 18 kms NW de Rio de Contas. Elev. 1600-1850 m. Shrub one meter tall, flowers pink. 24 July 1979. *R.M.King, S.Mori, T.S.dos Santos & J.Hage 8138* (Holotype RB; isotypes CEPEC, US).

Lasiolaena santosii is notable for the distinctive form of tomentum which consists of flaccid thin-walled hairs. The hairs are collapsed when dry and they are often matted into small plate-like sheets. The other three species of the genus all have a denser tomentum of contorted, slender, firm-walled cells. The comparatively thin tomentum covers the undersurface of the leaves unevenly and the darker granduliferous veins can be seen. The upper surface of the leaves also has glandular-punctations, a feature not evident in the other species. The leaves of *L. santosii* are also distinctive in their sharper apices and the fine serrulation of the upper margin.

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Lasiolaena morii R. M. King & H. Robinson, Holotype, Jardim Botânico, Rio de Janeiro. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Lasiolaena santosii R. M. King & H. Robinson, Holotype, Jardim Botânico, Rio de Janeiro.

Lasiolaena enlargements of leaves and heads. Top. *L. morii*. Bottom. *L. santosii*.

NOTES ON NEW AND NOTEWORTHY PLANTS. CXXXII

Harold N. Moldenke

GEUNSIA FARINOSA f. *SERRATULA* Mold., f. nov.

Haec forma a forma typica speciei laminis foliorum margine distincte irregulariterque serrulata.

This form differs from the typical form of the species in having its leaf-blades marginally very distinctly, although irregularly, serrulate, especially on the upper half.

The type of the form was collected by Y. Fox (*SAN.57700*) along tractor trail 1963 in the Longgun area, Sg. Sakong Kechil, Sandakan Bay, Sandakan District, Sabah, Malaysia, on May 12, 1967, and is deposited in my personal herbarium.

STACHYTARPHETA RHOMBOIDALIS var. *PUBERULA* Mold., var. nov.

Haec varietas a forma typica speciei ramis ramulisque laminisque foliorum utrinque puberulis recedit.

This variety differs from the typical form of the species chiefly in having its branches, branchlets, and leaf-blades decidedly puberulent and the lower leaves often shortly petiolate.

The type of the variety was collected by Gates & Estabrook (*no. 69*) in sandy soil on rocky campo near a stream on east-facing hillside of exposed layered sedimentary rock and shallow soil, 1500 m. altitude, at Chapada dos Veadeiros, 5 km. east of Alto Paraíso, lat. 14° S., long. 47° W.. Goiás, Brazil, on January 26, 1979, and is deposited in the herbarium of the University of Michigan at Ann Arbor, Michigan. The collectors describe the plant as a loosely branched shrub to 1 m. tall, the corollas deep-purple with transparent dots, the style purple, and the stigma green.

TEIJSMANNIODENDRON PTEROPODUM f. *CRISTATUM* Mold., f. nov.

Haec forma a forma typica speciei alis petiolorum permagnis latissime cristatis recedit.

This form differs from the typical form of the species in having the wings on its petioles very much and quite uniformly enlarged in the form of a crest, the crest extending from the apex to the base of the petiole and about 5 cm. wide at the midpoint.

The type of the form was collected by G. Mikil (*SAN.37769*) along a stream in primary forest on a steep valley side, Sg. Sosopodon, Penampang District, Sabah, Malaysia, at about 800 feet altitude, on December 16, 1963, and is deposited in my personal herbarium.

VERBENA CAROLINA var. *HIRSUTA* (Mart. & Gal.) Mold., stat. nov.

Verbena hirsuta Mart. & Gal., Bull. Acad. Brux. 11 (2): 321. 1844.

ADDITIONAL NOTES ON THE GENUS *VITEX*. XV

Harold N. Moldenke

VITEX DONIANA Sweet

Additional bibliography: Mold., Phytologia 44: 386, 389, & 416-417. 1979.

Recent collectors describe this species as a tree, 3 to over 25 m. tall, often single-stemmed, or a middle-sized or very large shrub, often solitary; trunk 30--100 cm. in diameter at breast height; wood soft, light; sap colorless; bark rough; branchlets glabrous; leaves "5-lobed" [i.e., composed of 5 leaflets], very dark-green above, grayish beneath, glabrous; inflorescence "covered with rusty-brown hairs"; flowers in dense axillary cymes, hairy, "on long pedicels [i.e., peduncles] in leaf-axils"; fruit "the size of a cherry", green with lighter patches or white spots when immature, blackish-purple when ripe, edible. The chromosome number is reported by the Manguenots (1962) as 2n = 32. Gossweiler calls the plant a "wet hydrophyte". The corollas are said to have been "white" by Den Outer (19720, "yellowish or white with blue-purple corolla-lobes" by Hutchinson & Dalziel (1936), and "petals dirty-white inside with a blue lip" by Williams (1949). It is said to have been "blue to mauve" on *Reckmans 1409* and "white, upper petal purple" on *Richards 25816*.

Siwunmi (1973) describes the pollen as follows: "Pollen grains isopolar, radially symmetrical; 3-colpate; lobate-oblate spheroidal (P 25.7 ±, E 25.0 ± 1.2 μm). Sexine subtectate. NPC: 343. Colpi ca. 17.6 ± 1.4 μm long, width ca. 1.4 ± 0.1 μm. Apocolpium diameter 8.0 ± 0.1 μm. Exine 2.0 μm thick (thinner at the colpi). Sexine reticulate, reticulation finer at apocolpia than at mesocolpia. Muri 0.4 ± 0.1 μm wide, distinctly simplibaculate. Lumina 0.7 ± 0.1 μm wide. Tectal part of muri 0.6 ± 0.1 μm, baculate zone 0.5 ± 0.1 μm, foot layer 0.9 ± 0.1 μm thick", based on *Jos 1965*.

Recent collectors have encountered *V. doniana* in dry gulches, on wooded savannas and secondary savannas in mesophyll forests, at the edges of sandy bushland, on riverbanks and lake shores, in the riverine forest belt, in gallery forests and light forests on heavy loam, on shrubby savannas, in hard stony soil in open parklands, and in gullies in *Brachystegia* woodlands, at 700--1900 m. altitude, flowering in January and February and from April to November, fruiting from January to April and in August. Greenway (1973) describes it as dominant in mixed but mainly compound-leaved *Brachystegia microphylla* wood on hillsides. Kershaw (1967) says that in Nigeria, according to Keay (1948), this species grows in open woodlands with *Lophira alata, Terminalia glaucescens, Daniella oliveri, Hymenocardia acida, Detarium senegalense,* and *Afzelia africana* as the characteristic species of trees. He also lists it as found in the *Isoberlinia-Parinari* and *Monotes-Parinari* associations, as well as in the fringing woodlands with *Pterocarpus erinaceus,* more characteristic of the southern Guinea zone in Nigeria, but widespread in the northern zone where it is valued by the natives for its edible fruit. Irvine (1970) asserts that it occurs in the grass savannas as well as in deciduous and secondary forests in Ghana, thriving especially in very dry and gravelly soil. Lawton (1978) tells us that it is a member of the "chipya ecological group of species growing in an open habitat where dry season fires are intense."

Hutchinson & Dalziel (1936), including *V. divaricata* Baker in the synonymy, record *V. doniana* from savanna forests and open country from "Senegal to N. Nigeria and Lagos Colony! Also in Fernando Po! Extends to E. Sudan, Upper Nile Land, and E. Africa; also Congo Basin and Angola." Crowfoot (1928) records it from northern and central Sudan, Gillett (1970) from Kenya, Paradis & Hougnon (1977) from Dahomey, Gürke (1895) from the Comoro Islands, Amico (1967) from Zambezia in Mozambique, Bouquet (1967) from the Republic of Congo, and Astle (1968) from Zambia. Drar (1970) records it from Bahr El Ghazar, Sudan, citing his *nos. 1069* & *1607;* Gameel (1971) also lists it from Sudan. Chapman (1962) refers to it as "widespread, common" in Nyasaland. Rein (1911) says that it "Kommt in den südlichen Gegenden des weissen und blauen Nils und am Sobat vor, ein grosser Baum mit fünfteiligen Blättern, weissen, sehr leichten Holz." Hyland (1969) lists it as cultivated in Maryland, based on *U. S. Dept. Agr. Pl. Invent. 307744* from Nigeria. Sweet (1826) and Loudon (1832) report it introduced into cultivation in England from Sierra Leone in 1824.

It is worth noting that *Täckholm & Elsayed 86* and *s.n.* [23/6/1961] and *s.n.* [22/11/1961] have extraordinarily long petiolules, while *Staner 1405* exhibits leaflets that are apically very much acuminate-pointed. *Gossweiler 9168* has insect-galled leaves.

Begemann (1969) describes the tree and its wood as follows: "Ein sehr grosser Baum mit breit-ausladender Krone, der Höhen über 25 m und Durchmesser zwischen 40 und 100 c/m erreicht. Der Schaft hat hohe Wurzelanläufe und ist nur selten gerade und zylindrisch gewachsen. -- Die Rinde ist sehr dünn bis dünn und hellbraun bis gelblich-grau. -- Splint und Kernholz gehen in einander über und sind nur schwach zu unterscheiden. Der Split ist etwa 4 bis 6 c/m breit und gelblich-grau, wogegen das Kernholz im frischen Zustande cremefarben ist, später auf hellbraun übergehend. Jahresringe sind mit blossem Auge kaum zu erkennen. Das Holz hat häufig Silikat-Einlagen und keinen besonderen Geschmack oder Geruch. Die Struktur ist durchweg drehwüchsig, die Textur ziemlich grob un ungleichmässig. Das Holz schwindet stark und gilt als bedingt dauerhaft, wenn es nicht ständig dem Wechset zwischen Feuchtigkeit und Trockenheit ausgesetzt wird. Es ist mittelschwer, hart, fest und nur sehr wenig elastisch. Die Trocknung bedarf grosser Sorgfelt, da eine starke Tendenz zum Reissen und Werfen besteht. Im trockenen Zustande ist das Standvermögen im allgemeinen gut. Durch den Kristallgehalt des Holzes ist die Bearbeitung erschwert und erfordert einen grösseren Kraftaufwand. Werkzeuge stumpfen schnell. --

Trotzdem lässt sich das Holz maschinell und von Hand gut bearbeiten. Gehobelte Flächen werden durch den Drehwuchs erst mit Nachbearbeitung glatt und haben matten Glanz. Die Oberflächtenbehandlung bereitet keine Schwierigkeiten. Es empfiehlt sich, Schrauben und Nägel zur Vermeidung von Rissbildung vorzubohren. Holzverbindungen mit Leim oder Zapfen sind leicht herzustellen und haltbar. Auch schäl- und messerfähig. -- Spezifischen Gewicht um -.52 bein 15% Feuchtigkeitsgehalt. Verwendung: Für Aussenzwecke, wie auch als Bau- und Konstruktionsholz wenig zu empfehlen; gut geeignet für Bau- und Möbelschreinerei, als Kisten- un Bindholz, Mittellagen, für die Sperrholz-Industrie u.ä. -- Das Holz fällt inwendig nicht sehr astrein aud. Handel: Trotz ausreichendem Vorkommen in den Wuchsgebieten, hat das Holz bisher im Import noch keine Bedeutung erlangt."

Jaeger & Moldenke (1975) refer to *V. doniana* as "Le plus grand des *Vitex* de l'Afrique Occidentale", growing to 25 m. tall, and found "du Sénégal au Cameroun; très répandi en Afrique tropicale de préférence en savane et en terrain découvert".

Among the common and vernacular names applied to this tree, its fruit, and/or its wood as reported by recent collectors and authors are the following: "abisoa", "abis(wa)", "ada", "adaga", "afetewa", "afua", "akposso", "anago", "anecho", "aranga", "black plum", "boume", "bugink", "bulgelwa", "chinkamba", "dagomba", "dinya", "Don's chaste-tree", "dunya", "dyakossi", "edi", "ekarukei", "ewe", "fo", "fö", "fojiti", "föjiti", "fongjiti", "gídjikő", "heinokohun", "ingari", "kalembe", "kazonga", "Kenya oak", "koro", "koro ba", "koto", "koto", "kratschi", "kukpweli", "kurain", "kurnyuk", "ledo", "lubai", "meru", "meru oak", "mfifya", "mfudu", "mfuru", "mfurulegea", "mfuru ya mtoni", "mfuu", "mgwobe", "mkhulu", "mkunungu", "mpulu", "mpuro", "m'purro", "mufudu", "mufufu", "mufuru", "mufutu", "muholu", "muhomozi", "mukarukei", "munyamazi", "mutahuru", "muviru", "muvuru", "narenga", "npindimbi", "nrindimbi", "nya", "nyarina", "odogo", "ofőn", "omufutu", "omuvyero", "ori", "orli", "oyelo", "panyerō", "samanibir", "sõ", "sod", "sokoro", "tschaudjo", "uolí", "yuelo", and "zeitun".

Volkens (1909) speaks of the inflorescences as white and comments that "Aus den schwarzen, glatten, essbaren, kugligen Früchten und den jungen Blättern wird Tinte gekocht", the species inhabiting "Galleriewäldern, Baumsteppen und auf Farmen" and being "weit verbreitet. Das weisse, mittelschwere Holz dürfte sich besonders für Möbel gut eignen. In Oberguinea werden Schiffsplanken und Furniere daraus gemacht, die Eingeborenen benutzen es für Bootsrippen". Burkill (1966) says that the fruits are "said to be used as a substitute for tea and coffee in tropical Africa". This is also claimed by Rein (1911).

Irvine (1961) provides the longest discussion of the economic uses of this species, saying that "The flowers and fruits attract bees; hives are often put in the branches. It is specially planted in N. T., the leaves being used for stock.....Also planted in villages [in]...N. Nigeria....for the edible fruits and young leaves, used as a pot herb. A sweetmeat (Hausa alewa) made from these and other fruits, and a black molasses or beverage (e.g. tea substitute in Sudan) can be prepared from them. Ink also made from young leaves or fruit or sometimes bark, gum added. Bark and roots used to prepare a cloth dye (for Adink(a)ra cloths) are cut up, boiled with iron slag as mordant; poured into another pot, and boiled till thick; egg or sugar then added. The bark is a substitute for soap in S. Leone......The fruit-pulp is said to contain oil...... The timber is whitish to light brown, darkening later; it rather resembles teak and is of medium weight and straight grain, nails well, and is said to be durable. It is used in housebuilding, furniture, boxes, crates, bowls, stools, shelves, and in Uganda for knife-handles, chairs, and trumpets. A favourite wood for making log beehives. It is useful for firewood; and the ashes for soap-making (S. Leone....).....dried leaves...medicinal...A decoction of pounded roots is used in Fr. Guinea for stomach troubles.. A decoction of the root-bark is recommended as a drink or for baths and is used on the Iv. Coast for children with rickets...... The bark is used in various Iv. Coast remedies for leprosy and sterility. A bark decoction is used as a gargle....The bark is used in W. Ashanti for stomach complaints. The bark and leaves are sometimes given for diarrhoea and dysentery....The leaves are used by the Moshi on the Iv. Coast to keep crocodiles from water holes. A leaf decoction is drunk, or used as an enema for dysenteric diarrhoea.....A leaf infusion is given for colds in Guinea.....The pounded leaves are applied to the body as a febrifuge.....The tender leaves are chewed, or an infusion of leaves and bark are used medicinally in Ghana. The fruits are used in N. Nigeria for constipation....and are sometimes given for diarrhoea and dysentery. In S. Leone they are considered good for conditions due to A and B avitaminosis, associated with sores at the corners of the mouth and eyes, and sometimes in advanced cases, with paralytic symptoms.....*Loranthus* growing on this tree is used in N. Nigeria for leprosy.....In Katanga (B. Congo) the tree is said to be used to induce conception...."

Dale & Greenway (1961) aver that the edible fruit is "sweet, mealy, somewhat resembling a prune in taste. Wood white or yellow-white to pale brown, darkening in age, even and straight in grain, fine and uniform in texture, soft, moderately durable, easy to work with tools; it smooths reasonably but does not take a polish, nails satisfactorily and does not split, tenons, mortises, recesses and moulds well; weight about 53 lb. per cu. ft. air dry. The timber has some resemblance to teak, and is used locally in West Africa for boat timbers (ribs, etc.), for small canoes, house-building and so on. It is suitable for uses to which poplars and deals are put, for interior fitting boxes, crates, shelving, low-grade furniture, etc. It must not be exposed to damp, and is not suitable for purposes calling for great strength." Irvine (193) reports that in Gold Coast the species is used for firewood, dye, ink, and the edibility of its fruit. Williams (1949) found the fruit being eaten by children in Zanzibar and the wood employed there for laths, roof-building, planks, canoe-outriggers, and guitars. Thomas (1972) records its use in treating yellow fever. Altschul (1973), Alain (1974), Gürke (1895), and Watter & Breyer-Brandwijk (1962) all comment on the edibility of the fruit. Tanner reports the species used in Tanzania to treat cases of prolonged labor during childbirth. Sabine (1824) comments that although the fruit is edible, it is inferior in quality to that of both the yellow and sugar plums of tropical Africa. Schweinfurth (1874) reports that the "sweet, olive-shaped fruit is relished exceedingly by natives of central Africa". Uphof (1968) repeats that the fruit is the size of an olive and much esteemed. "A gum is used for compounding Mallam's ink; also considered an antidote for arrow poison. Leaves used as a substitute for tea in Trop. Afr." Watt & Breyer-Brandwijk (1962) claim that in Zambia *V. doniana* is used as a remedy for anemia and the root for gonorrhoea. Rein (1911) says that "Die harten Früchte werden geröstet und augfekocht als Ersatz fur Tee und Kaffee genossen". Irvine (1930) reports the fruit sold in native markets in Ghana.

Hansford (1961) reports *V. doniana* as a host for the fungus, *Meliola cookeana* var. *viticis* (Hansf.) Hansf. in Uganda, based on the type collection of the fungus, *Hansford 799*, and *M. cookeana* Speg. in Sierra Leone, based on *Deighton 564, 987, 1551,* & *1766*. Cohic (1969) found it to be host to the insects, *Aleurotuberculatus nigeriae* Mound, *A. gambiae* Gameel, and *Bemisia hancocki* Corbett. Roberts (1969) reports it as host to the larvae of the lepidopteron, *Bunaea alcinoë* (Stoll) and the beetle, *Premnobius cavipennis* Eichhoff in Nigeria.

Baker (1900) separates his various taxa, now regarded by most authors as being conspecific, as follows:

1. Leaves usually 3-foliolate........................*V. doniana*.
1a. Leaves usually 5-foliolate.
  2. Leaflets not coriaceous........................*V. dewevrei*.
  2a. Leaflets coriaceous.
    3. Corolla-tube as long as the calyx.............*V. cuneata*.
    3a. Corolla-tube longer than the calyx.......*V. cienkowskii*.

As being typical of *V. doniana* he cites *Heudelot 379* from Senegal. As typical of *V. dewevrei* he cites *Dewevre s.n.* from Lower Congo; of *C. cuneata* he lists *Thonning s.n.* from Upper Guinea, and as typical of *V. cienkowskii* he cites *Barter 1108, Millen 118, Rowland s.n., Scott Elliot 5211,* and *Vogel 67* from Upper Guinea, *Cienkowsky s.n., Heughlin s.n., Schweinfurth 1307* & *1890, Scott Elliott 7179,* and *Speke & Grant 81* from Nile Land, *Smith s.n.* from Congo, *Welwitsch 5633, 5645,* & *5746* from Angola, *Kirk 1* from Zanzibar, *Hildebrandt 1123* from Tanganyika, *Kirk 40* from Mozambique, and *Buchanan 80, Kirk s.n., Meller 5,*and *Scott s.n.* from Nyasaland.

Good & Exell (1930) cite their *nos. 5376* & *5376a* from Angola and *6305, 7851, 8652,* & *9168* from Portuguese Congo, asserting that the tree grows in wet situations and on riversides, often in company with *Canthium schimperianum*. They note that it is "Widespread in Tropical Africa". Palhinha (1947), speaking of an unidentified species of *Vitex* in Portuguese Congo, says that "Esta planta parece-me bastante próxima, señao idêntida, ã *Vitex cuneata* Sch. et Thonn., e igualmente afim da *Vitex Cienkowski* Kotschy et Peyr., da qual difere pelas folhas maiorès e inflorescências um pouco menores e mais fracas."

Roberty (1954) refers to *V. doniana* as "forme la plus commune" in West Africa "surtout près des rivières ou marais. Très variable, 4 formes principales" -- after which he lists, apparently as "forms", *V. barbata* Planch., *V. chrysocarpa* Planch., "*V. doniana* s.s.", and *V. grandifolia* Gürke, but I regard these as four separate and distinct species. To include them all under *Vitex doniana* would most certainly render that taxon "très variable"!

Dale & Greenway (1961) cite *Dale 3115, Graham 25* & *2226,* and *Napier 5329* from Kenya. Hutchinson & Dalziel (1936) cite *Berter 1108, Chevalier 2769, Chipp 463, 727,* & *744, Dalziel 350, Heudelot 379, Lely P.134, Millen 118, Milne s.n., Pobéguin 682, Rowland s.n., Scott Elliot 5211, Warnecke 156,* and *Yates 59.* Lewalle (1972) cites his *no. 608*; Astle (1968) cites his *no. 2718* from Zambia; Amico & Bavazzano (1968) cite their *no. 455*; Cufodontis (1962) cites *Kuls 256, 281,* & *473.* DeWildeman (1914) cites *Homblé 318* as the type of his *V. homblei;* Irvine (1930) cites *Irvine 151* & *194* from Ghana. The *Don s.n.* from Sierra Leone and *Heudelot s.n.* from Senegambia cited by Hooker & Bentham (1849) are most certainly *V. doniana,*

Material of *V. doniana* has sometimes been misidentified and distributed in some herbaria as *V. madiensis* Oliv. On the other hand, the *Angil 2774, Lewalle 2200, Lowe 2049, Reekmans 2702, Richards 25816, Tanner R.T.1758, 4272,* & *4488,* and *Vigne 3541,* all distributed as typical *V. doniana,* are regarded by me as representing var. *parvifolia* (Engl.) Mold., while *Drar & Mahdi 1607* is not verbenaceous.

Additional citations: SIERRA LEONE: *G. Don s.n.* [Mo. Bot. Gard. photo A.851] (N--photo of type, W--photo of type); *Gledhill DH.577* (Mu); *Jaeger 1401* (Ac), *1756* (Ac), *9258* (Ld). LIBERIA: *J. T. Baldwin 10989* (W--2672784, W--2672785). TOGO: *Warnecke 156* (Mu--3857). NIGERIA: *Blum 2502* (Ws). ZAIRE: *Gerard 2504* (Mu); *Louis 12487* (N), *12562* (W--2091094); *W. Robyns 1144* (W--1942516); *Staner 1405* (W--2091224); *Taton 7395* (Mu). BURUNDI: *Reekmans 1409* (E--2209171), *1414* (E--2209177). UGANDA: *Bagshawe 813* (W--1505799). TANZANIA: Tanga: *Tanner 4804* (Ba). ANGOLA: Kongo: *Gossweiler 9168* (W--1373601). Lunda: *Gossweiler 14109* (W--2074458). ZAMBIA: *Evrard 3951* (Mu); *E. A. Robinson 3938* (Mu). MALAWI: *Brass 17074* (W--2061955); *J. Buchanan 194* (W--806717). CULTIVATED: Egypt: *Drar s.n.* [12/1/1960] (Gz); *Täckholm & Elsayed 86* (Gz, Gz), *s.n.* [23/6/1961] (Gz, Gz), *s.n.* [14/11/1961] (Gz), *s.n.* [22/11/1961] (Gz, Gz); *Täckholm & Mahdi s.n.* [17/5/1967] (Gz, Gz).

VITEX DONIANA var. *PARVIFOLIA* (Engl.) Mold.

Additional bibliography: Mold., Phytologia 15: 107--108. 1967; Mold., Fifth Summ. 1: 224, 231, 234, 247, & 252 (1971) and 2: 715, 716, 924, & 968. 1971; Mold., Phytologia 28: 442 & 452 (1974) and 44: 386. 1979.

Recent collectors describe this plant as a "small shrub" or as a small or large spreading tree, 5--20 m. tall, much branched, with a thick bole and dense rounded crown, giving thick cover, the stem single, upright, the bark gray, rough, lined or corrugated, the sap colorless, the wood white, soft to cut, with a brown "slip", the leaflets 5, coriaceous, dark or glossy bright-green, the flowers aromatic, the calyx with pale-brown indumentum, and the fruit (immature?) pale-green. They have found it growing near lakes, in "abercorn" gardens, in light forests on sandy loam soil, in open parkland on hard stony soil, in light forests on hillsides with gravel and loam soil, and "in deep shade in well-grown *Brachystegia* woodland with luxuriant rich undergrowth containing evergreen shrubs", at 500--2165 m. altitude, flowering in September and November, fruiting in February, March, May, and November. Watmough speaks of it as "occasional" in Zambia.

The corollas are said to have been "mauve" on *Tanner R.T.1758*, "violet" on *Reekmans 2702*, "pale yellow-mauve" on *Richards 21451*, "white to pale-mauve" on *Lewalle 2200*, and "white, upper petal purple" on *Richards 25816*.

According to Tanner the bark of this tree is used in the treatment of leprosy in Tanzania. Material has been misidentified and distributed in some herbaria as typical *V. doniana* Sweet, *V. amboniensis* Gürke, and *V. madiensis* Oliv.

Additional citations: SUDAN: Blue Nile: *Kassas, Mobarak, Fadlallah, Omar, & Osman E.1035* (Gz, Gz). Bahr El Ghazal: *Drar & Mahdi 1069* (Gz). GHANA: *Vigne 3541* (N). NIGERIA: *Lowe 2049* (N). BURUNDI: *Lewalle 2200* (W--2595398); *Reekmans 2702* (E--2200855). TANZANIA: Tanga: *Richards 25816* (Mu, N); *Schlieben 1282* (Mu); *Tanner R.T.1758* (Ba, Ca--183319, N), *4272* (Ba), *4488* (Ba). ZAMBIA: *Angils 2774* (N); *Richards 21451* (E--1836522); *Richardson & Livingstone s.n.* [30 October 1960] (Au--220301); *Watmough 209* (Mu). CULTIVATED: Sudan: *Drar & Mahdi 138* (Gz).

VITEX DRYADUM S. Moore

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 39 (2): 320. 1913; Mold., Phytologia 15: 241--242. 1967; Mold., Fifth Summ. 1: 252 (1971) and 2: 924. 1971.

The type of this species, *Swynnerton 1062*, from Gazaland, Mozambique, in the British Museum herbarium has been photographed by the Missouri Botanical Garden as their type photograph number A. 854. It is possible that *V. oxycuspis* var. *mossambicensis* Mold. may belong here.

Additional citations: MOZAMBIQUE: Gazaland: *Swynnerton 1062* [Mo. Bot. Gard. photo A.854] (Gz--photo of type, N--photo of type).

VITEX DUBOISII Mold.

Additional bibliography: Mold., Phytologia 15: 212. 1967; Mold., Fifth Summ. 1: 231 (1971) and 2: 924. 1971.

VITEX DUCKEI Huber

Synonymy: *Vitex duchei* Huber, in herb.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 57. 1948; Mold., Phytologia 16: 499. 1968; Mold., Fifth Summ. 1: 179 (1971) and 2: 924. 1971.

Recent collectors describe this species as a shrub, 80 cm. tall, and have found it growing in sandy soil of capoeira, flowering in June. The corollas are said to have been "purple and white" on *Campbell & al. P.22554*. Material has been misidentified and distributed in some herbaria as "*Bignoniaceae*".

Additional citations: BRAZIL: Amazônas: *Prance, Pena, Allen, & Ramos 2706* (S). Pará: *Campbell, Ongley, Ramos, Monteiro, & Nelson P.22554* (Ld, N, N); *M. Silva 1634* (N).

VITEX DUCLOUXII Dop

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 56 (2): 286. 1937; H. N. & A. L. Mold., Pl. Life 2: 57. 1948; Mold., Phytologia 15: 242. 1967; Mold., Fifth Summ. 1: 290 (1971) and 2: 924. 1971.

VITEX EBERHARDTII Dop

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 56 (2): 286. 1937; H. N. & A. L. Mold., Pl. Life 2: 57. 1948; Mold., Phytologia 15: 242. 1967; Mold., Fifth Summ. 1: 303 (1971) and 2: 924. 1971.

VITEX ELAKELAKENSIS Mold.

Additional bibliography: Mold., Phytologia 15: 242. 1967; Mold., Fifth Summ. 1: 263 (1971) and 2: 924. 1971.

VITEX ELMERI Mold., Phytologia 38: 307--308. 1978.

Synonymy: *Vitex elmari* Mold., Biol. Abstr. 65: 6769, sphalm. 1978.

Bibliography: Mold., Biol. Abstr. 65: 6769. 1978; Mold., Phytologia 38: 307--308. 1978; Hocking, Excerpt. Bot. A.33: 86. 1979.

Collectors have found this tree in flower in February.

Material has been misidentified and distributed in some herbaria as the very closely related *Vitex negundo* L.

Citations: PHILIPPINE ISLANDS: Luzon: *Elmer 5611* (N--type); *E. D. Merrill 3627* (N); *Pancho & Apolinario 285* (Au--11005); *Rothdauscher s.n.* [Manilla, 1879] (Mu--1516, Mu--1517, Z).

VITEX EPIDICTYODES Mildbr.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 57 (2): 402. 1938; Mold., Phytologia 15: 242. 1967; Mold., Fifth Summ. 1: 232, 238, & 250 (1971) and 2: 716 & 924. 1971; Mold., Phytologia 31: 388. 1975.

Recent collectors refer to this species as a shrub, 3 m. tall, the (immature?) fruit green, and have encountered it on savannas and wooded savannas, at altitudes of 900 to 1200 m., fruiting in December.

Material has been misidentified and distributed in some herbaria as *V. madiensis* ssp. *milanjiensis* (Britt.) White.

Additional citations: BURUNDI: *Reekmans 1391* (E--2209172), *2204* (E--2209186).

VITEX ERIOCLONA H. J. Lam

Synonymy: *Vitex erioclona* Lam. ex Uphof, Dict. Econ. Pl., ed. 2, 545, sphalm. 1968.

Additional & emended bibliography: H. J. Lam, Bull. Jard. Bot. Buitenz. ,ser. 3, 3: 48 & 51. 1921; Fedde & Schust., Justs Bot.

Jahresber. 53 (1): 1076. 1932; Uphof, Dict. Econ. Pl., ed. 2, 545. 1968; Mold., Phytologia 15: 242. 1967; Mold., Fifth Summ. 1: 328 (1971) and 2: 716 & 924. 1971.

Uphof (1968), crediting this species to Lamarck, says of it: "Tree. Indonesia, esp. the Poso region. Wood easy to work, durable; keeps a long time when in contact with the soil; used for making small vessels".

VITEX EXCELSA Mold.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 43. 1948; Mold., Phytologia 15: 242. 1967; Mold., Fifth Summ. 1: 179 (1971) and 2: 924. 1971; Mold., Biol. Abstr. 64: 2433. 1977; Mold., Phytologia 35: 277 (1977) and 36: 33. 1977.

VITEX EXCELSA var. *PETIOLATA* Mold., Phytologia 35: 277. 1977.

Bibliography: Mold., Biol. Abstr. 64: 2433. 1977; Mold., Phytologia 35: 277 (1977) and 36: 33. 1977.

Collectors describe this plant as a "tree 111.5 feet tall", with a trunk diameter of 36 inches, and have encountered it at 150 m. altitude, flowering in August. The corollas are said to have been "lilac" in color on *Aróstegui V.123*, a collection said to have been taken from the type tree. The immature leaves are strikingly similar to those of *V. panshiniana* Mold. A vernacular name reported is "quinilla colorada".

Citations: PERU: Loreto: *Aróstegui V.75* (N--type, W--2825839--isotype), *V.123* [field no. 104.I] (N, W--2825838).

VITEX FARAFANGANENSIS Mold.

Additional bibliography: Mold., Phytologia 15: 242. 1967; Mold., Fifth. Summ. 1: 263 (1971) and 2: 924. 1971.

VITEX FERRUGINEA Schum. & Thonn.

Additional synonymy: *Viter fosteri* Aubréville, Ann. Acad. Sci. Colon. 9: 237, sphalm. 1938.

Additional & emended bibliography: Schum. & Thonn. in Schum., Beskr. Guin. Pl. 62. 1827; Hook. f. & Benth. in Hook., Niger Fl. 487. 1849; Buek, Gen. Spec. Syn. Candoll. 3: 501. 1858; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 316 & 324--325. 1900; Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 275 & 276. 1931; Aubréville, Ann. Acad. Sci. Colon. 9: 257. 1938; H. N. & A. L. Mold., Pl. Life 2: 60. 1948; Kerharo & Bouquet, Pl. Méd. Tox. Côte Iv. 234. 1950; Metcalfe & Chalk, Anal. Dicot. 1036, fig. 248 H. 1950; Irvine, Woody Pl. Ghana 762--763. 1961; S. & G. Manguenot, Rev. Cytol. Biol. Veg. 25: 411--447. 1962; Huber in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 446--448. 1963; Ornduff, Reg. Veg. 50: 86 & 121. 1967; Mold., Phytologia 16: 499. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl., imp. 1, 717. 1969; Roberts, Commonw. Forest. Inst. Oxf. Paper 44: 38 & 199. 1969; Gadella, Act. Bot. Neerl. 19 (3): 433. 1970; Gillett, Numb. Check-list Trees Kenya 47. 1970; Anon., Biol. Abstr. 52: 89. 1971; Mold., Fifth Summ. 1: 216, 220--223, 232, 234, & 245 (1971) and 2: 717 & 924. 1971; Mold., Phytologia 23: 420 & 437. 1972;

Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 2, 717. 1974; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Mold., Phytologia 34: 261 (1976) and 44: 408. 1979.

Additional illustrations: Metcalfe & Chalk, Anat. Dicot. 1036, fig. 248 H. 1950.

Recent collectors and authors describe this plant as a tree to 60 feet tall, softly rusty-pubescent, the leaves digitate, the petioles densely rusty-pubescent; leaflets 5--7, sessile, 4 inches long, 2 inches wide; flowers small, borne in cymes, densely pubescent outside; corollas small, pubescent outside; fruits globose, 1/3 inch in diameter. The corollas are said to have been "white" on *Becquaert 17* and "blue/cream" on *Malima 19*. The species has been found growing on savannas, flowering in July. Irvine (1961) gives its distribution as from the Ivory Coast to Ghana. Kerharo & Bouquet (1950) assert that in the Ivory Coast it enters into a composition used to treat trypanosomiasis, reporting the local names, "kpẽpẽsson", "mbolẽ", and "paintou".

The Manguenots (1962), as well as Bolkhovskikh and his associates (1974), give the chromosome number for the species (as *V. fosteri*) as 2n = 32. Gadella (1970) -- whose surname is misspelled "Gadelia" in the Biological Abstracts reference (1971) -- reports the chromosome number for *V. ferruginea* as 2n = 32, based on *Versteegh & Den Outer 562* from Ivory Coast. He also cites seedling material, *Van Steenbergen 205,* both collections deposited in the Wageningen herbarium

Roberts (1969) reports the following insects as attacking *Vitex ferruginea* in Nigeria: *Doliopygus erichsoni, D. interpositus, Platypus hintzi, P. spinulosus,* and *Pycnatmon cribrata*. Of the last-mentioned he says: "Larvae of this species feed on *Vitex ferruginea,*trees of all ages being attacked. They live singly between two leaves held together with silk. At Ibadan larval development takes at least 16 days and the pupal period from 12 to 17 days. Larvae were found in February, June, September, and November."

It is of interest to note that Hutchinson & Dalziel (1931) kept *V. ferruginea* and *V. fosteri* as separate species [although later combined by Huber (1938)], distinguishing them from each other as follows:

1. Leaves tomentose or densely pubescent beneath.......*V. fosteri.*
1a. Leaves glabrous or thinly pubescent or minutely tomentellous beneath...*V. ferruginea.*

Additional citations: ZAIRE: *Becquaert 17* (W--1659331); *Corbisier-Baland 1293* (Gz, Gz, N); *Lebrun 1478* (W--2091172). TANZANIA: Tanga: *Malima 19* (Ld).

VITEX FISCHERI Gürke

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 317 & 330--331. 1900; H. N. & A. L. Mold., Pl. Life 2: 59. 1948; Dale, Descrip. List Introd. Trees Uganda 70. 1953; Snowden, Grass Comm. Mtn. Veg. Uganda 94. 1953; Dale & Greenway, Kenya Trees Shrubs 592 & 595. 1961; Langsdale-Br., Osmoston, & Wils., Veg. Uganda 115 & 118. 1964; Mold., Phytologia 15: 242--243. 1967; Gillett, Numb. Check-list Trees Kenya 47. 1970; Mold., Fifth

Summ. 1: 234, 238, & 242 (1971) and 2: 924. 1971; Mold., Phytologia 44 389. 1979.

Recent collectors describe this species as a tree, 20 feet tall, with a single stem, the bark rough, and the sap clear, and have encountered it in sandy soil of grassland, at 4000 feet altitude, fruiting in May. Tanner reports that the roots are "used for infertility in women and for pain below the ribs". He reports the vernacular name, "mhunda", in Tanzania. Gürke (1895) refers to the species as a tree or shrub with rather long-petiolate leaves and 5 lanceolate-oval glabrous leaflets. Dale & Greenway (1961) assert that it grows in wet savannas at 4000 to 6000 feet altitude in Kenya, where it is known as "mkhulu", "moholu", "mohutu", and "mufutumwe". Langsdale-Brown and his associates (1964) encountered it in undifferentiated semi-deciduous thickets and in *Albizzia-Chlorophora* forests in Uganda.

Baker (1900) cites *Scott-Elliot 7252* & *7411* from Uganda and *Fischer 476* and *Stuhlmann 3394, 4137,* & *4183* from Tanzania.

Additional citations: TANZANIA: Tanga: *Shantz & Tanner 4235* (Tu--129104); *Tanner R.T.4252* (Ba).

VITEX FLAVA Ridl.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 57 (2): 404. 1938; Mold., Phytologia 15: 243. 1967; Mold., Fifth Summ. 1: 328 (1971) and 2: 925. 1971.

This species is based on *Haviland 2025* from "along the path to Tegora", Sarawak, collected on December 20, 1892. The collector speaks of the plant as a small tree with yellow corollas. Ridley (1929) notes that "This is most nearly allied to *V. longisepala* King, of the Malay Peninsula, but that is densely hairy all over, whereas this plant is almost completely glabrous with merely a little deciduous pubescence, the bracts are much smaller and the sepals and corolla are covered with yellow glands as is the ovary and the leaves on both sides".

VITEX FLAVENS H.B.K.

Additional & emended synonymy: *Vitex flavens* Kunth apud Spreng. in L., Syst. Veg., ed. 16, 2: 757. 1825. *Vitex flavens* Humb. & Kunth apud D. Dietr., Syn. Pl. 3: 612. 1843.

Additional bibliography: Spreng. in L., Syst. Veg., ed. 16, 2: 757. 1825; D. Dietr., Syn. Pl. 3: 612. 1843; Schau., Linnaea 20: 484. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 501. 1858; H. N. & A. L. Mold., Pl. Life 2: 80. 1948; Braga, Pl. Nordest., ed. 2, 338. 1960; Macbr., Fieldiana Bot. 13 (5): 692, 694, & 695. 1960; Mold., Phytologia 16: 499--500. 1968; Mold., Résumé Suppl. 16: 29. 1968; Mold., Fifth Summ. 1: 91, 120, 137, 144, & 179 (1971) and 2: 217, 727, & 925. 1971; Mold. in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 131, 135--136, & 148. 1973; López-Palacios, Revist. Fac. Farm. Univ. Andes 17: 50--51. 1976; Soukup, Biota 11: 20. 1976; Mold., Phytologia 44: 412. 1979.

Recent collectors describe this species as a tree or small tree, 5--26 m. tall, the trunk "1 cm. in diameter at breast height" [doubtless a very young tree or a typographical error for 1 dm.], the bark gray, with many deep longitudinal furrows, and the leaves opposite and compound, and have found it growing in dry upland scrub and on "low semi-arid hills back of beach", at altitudes of sealevel to 466 m., flowering in December. The corollas are said to have been "purple" on *Dodson & Thien 1644* and these collectors report the vernacular name, "pechinche", from Ecuador.

Braga (1960) describes *V. flavens* as an "Árvore com fôlhas compostas, digitadas, de flores vistosas, em racemos, sendo o fruto uma pequena drupa, 4-locular. Boa madeira." He regards *V. panshiniana* Mold. as a synonym and calls the species "mama de cachorro".

López-Palacios, in a personal communication to me, says: "No he tenido oportunidad de examiner los tipos de *Vitex cymosa* Bert. y *Vitex flavens* HBK., pero el material que se les asigna en los herbarios es tan similar, que hace pensar que son coespecíficos o que el material ha sido mal interpretado. Téngase en cuenta esta observación para futuros trabajos en esta género."

Macbride (1960) reports the wood of *V. flavens* used for construction, at least in Ecuador. He cites only *Tessmann 3247, 4492, & 4587* from Loreto, Peru, giving its overall distribution as "To Colombia and Amazonian Brazil".

Material of *V. flavens* has been misidentified and distributed in some herbaria as *Godmania* sp. and *Tabebuia* sp.

Additional citations: COLOMBIA: Huila: *Little 9137* (N). ECUADOR: Guayas: *Dodson & Thien 1644* (Ws, Z).

VITEX FLORIBUNDA Legris

Additional bibliography: Mold., Phytologia 15: 243 (1967) and 17: 10 & 21. 1968; Mold., Fifth Summ. 1: 279 (1971) and 2: 925. 1971.

VITEX FLORIDULA Duchass. & Walp.

Synonymy: *Vitex floridula* "Duchass. & Walp. ex Walp." apud Bultman & Southwell, Biotropica 8 (2): 79. 1976.

Additional bibliography: Mold., Phytologia 16: 500. 1968; Mold., Résumé Suppl. 16: 4. 1968; Gibson, Fieldiana Bot. 24 (9): 234. 1970; Mold., Fifth Summ. 1: 91 (1971) and 2: 925. 1971; Mold. in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 131, 135, & 148. 1973; Bultman & Southwell, Biotropica 8 (2): 79, 92, & 93. 1976; Mold., Phytologia 44: 409. 1979.

Illustrations: Pittier, Contrib. U. S. Nat. Herb. 18: 171. 1916.

Recent collectors describe this species as a tree, 20 m. tall, the trunk 12 inches in diameter at breast height, "mostly deciduous", and have found it in flower in April. They record for it the vernacular name, "cuajado", from the Panama Canal Zone. Gentry reports the young fruit eaten by the local inhabitants in Panama. The corollas are said to have been "purplish-blue" on *Gentry 4963*.

The *Seibert 1535*, distributed as *V. floridula*, actually is *V. parviflora* A. L. Juss.

Additional citations: PANAMA: Panamá: *A. Gentry 4963* (N).

VITEX FROESII Mold.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 60. 1948; Mold., Phytologia 15: 243. 1967; Mold., Fifth Summ. 1: 179 (1971) and 2: 925. 1971.

VITEX GABUNENSIS Gürke

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 317 & 327. 1900; Mold., Phytologia 15: 243. 1967; Mold., Fifth Summ. 1: 226 (1971) and 2: 925. 1971.

Baker (1900) cites only the type collection of this species, *Soyaux 163,* from Gabon.

VITEX GAMOSEPALA W. Griff.

Additional synonymy: *Vitex nn. 15, 16* Hook. f. & Thoms. ex C. B. Clarke in Hook. f., Fl. Brit. India 4: 588, in syn. 1885. *Vitis gamosepala* Henderson ex Mold., Résumé Suppl. 3: 42, in syn. 1962. *Vitex gamopetala* Griff. ex Mold., Fifth Summ. 2: 717, in syn. 1971.

Additional & emended bibliography: W. Griff., Notul. Pl. Asiat. 4: 178 & 764. 1854; Benth. in Benth. & Hook. f., Gen. Pl. 2 (2): 1154. 1876; C. B. Clarke in Hook. f., Fl. Brit. India 4: 586 & 588. 1885; Fedde & Schust., Justs Bot. Jahresber. 39 (2): 320. 1913; Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 48. 1921; S. Moore, Journ. Bot. Lond. 63: Suppl. 81. 1925; Fedde & Schust., Justs Bot. Jahresber. 47 (2): 246 (1927) and 60 (2): 576. 1941; H. N. & A. L. Mold., Pl. Life 2: 67 & 82. 1948; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2278. 1966; Mold., Phytologia 15: 243. 1967; Chan & Teo, Chem. Pharm. Bull. Tokyo 17: 1284--1286. 1969; Farnsworth, Pharmacog. Titles 5 (4): xii & item 4122 (1970) and 5, Cum. Gen. Ind. 1971; Mold., Fifth Summ. 1: 298, 306, & 328 (1971) and 2: 710, 717, 718, 723, 731, 732, & 925. 1971; Mold., Phytologia 23: 438 (1972), 34: 266 (1976), and 36: 38. 1977.

Recent collectors describe this species as a tree or small tree, 4--8 m. tall, or as a treelet, 3 m. tall, the branches pendent, the flowers asymmetric, the sepals yellow, and the fruits round, 3/4 inch in diameter, 1-seeded, green or red when immature, and have found it growing along trails in disturbed evergreen forests and in the transition zone between deciduous and evergreen forests, at altitudes from sealevel to 330 m., flowering in December, January, and April, fruiting in January, April, and July. The corollas are said to have been "yellow" on *Larsen & Larsen 33421* and on *Seesink & Santisuk 4960,* while on *Stone 8931* they are described as "outside covered with tiny round yellow glands, tube within violet with white hairs".

Bentham (1876) says of *V. gamosepala*: "insignis est calyce 3-fido, lobis rigidis erectis obtusis, 2 anticis tubo aequilongis, tertio postico duplo longiore; corolla normalis, fructus deest". Clarke (1885) says that "The corolla as well as the inflorescence shows the affinity to *V. vestita*". Burkill (1966) lists the vernacular names, "lĕban nasi" and "lĕban pachat" [meaning, respectively, leech's lĕban and cooked-rice lĕban], "pelong" [probably an error for *Microstemon*], "sĕtulang" [in common with some other small trees, usually with hard wood], and "sulong chong", in Malaya. He describes the species as "A small tree found in Sumatra, the Malay Peninsula and Borneo; in the Peninsula it is apparently throughout. The vernacular names suggest that the wood is hard, but nothing precise is on record regarding it".

Griffith 6065 is a cotype of Lam's var. *typica* and, indeed, may actually be the type collection of the species, although the original description by Griffith does not cite a number. It is cited by Clarke (1885) as *V. gamosepala* [p. 588] and as *V. coriacea* C. B. Clarke [now known as *Teijsmanniodendron coriaceum* (C. B. Clarke) Kosterm.] [on p. 586] -- perhaps the number represents a mixture. Clarke cites for *V. gamosepala* only *Griffith 6065* and *Maingay 1202* from Malacca.

In view of certain confusion regarding to the application of Griffith's name it may be of value to repeat his original description here: "Arbor. mediocris. Fol. trifoliata, foliolis lanceolatis acuminatis venatio apocyneoid. Cymis axillaribus foliis multo brevior. Cal. tubo brevi bilabiat. labio super majore integro inferiore bipartito extus. Cor. tubo anguste infundibulif. glandulosus calyce fere duplo longior, bilabiat., labio super. bifido erecto reflexo infer. 3-lobo, annulus pilorum ad medium tubi. Stam. 4 vix didynama, filam. subulatis robustis basi pubescent. Stylus longitud. stamin., stigma bifidum subaequal. Anth. biloculares narrow horse-shoe-shaped, filam. inserti in sinus. Cells not quite all along the inner margins of the curve, so that the anthers are mucronate at the base. See Fig. II. Pl. CCCCXLVIII. Cor. extus glandulosa, in aestivat. the upper lip is outermost, lower lip middle lobe innermost. Hab. Malacca at Ching Rhingull. Obs. The upper lip of the calyx which is glandular outside, is made up of 3, it often presents faint obsolete traces of composition, sometimes decided. The venation is too irregular to decide the point. In this respect it differs from *Vitex*, but not always unless indeed the anthers and stigma or fruit present corresponding differences."

It should be noted that the plate referred to in the above description in Griffith's "Notulae" (1854) and not appearing therein is undoubtedly the pl. 448, fig. 2, in his "Icones" of the same year. The former work is sometimes erroneously cited as having been published in "1851".

The *Boeea 7155, 7184, 7245, 7532, 7784, 7821, 7971, & 8126*, distributed as typical *V. gamosepala*, actually all represent var. *kunstleri* King & Gamble instead.

Additional & emended citations: THAILAND: *Larsen & Larsen 33421* (Ac, Z), *34054* (Ac, Ld); *Seesink & Santisuk 4960* (Ac). MALAYA: Malacca: *W. Griffith 6065*, in part (Mu--694--cotype, N--cotype, N--photo of cotype, Pd--cotype, S--cotype, Ut--11513--cotype, Z--cotype, Z--photo of cotype), *s.n.* [Malacca] (Mu--695--cotype, Pd--cotype). Selangor: *Hardial & Sidek 400* (N); *B. C. Stone 8931* (Kl--20593).

VITEX GAMOSEPALA var. *KUNSTLERI* King & Gamble

Additional & emended bibliography: Fedde & Schust., Justs Bot. Jahresber. 39 (2): 320. 1913; S. Moore, Journ. Bot. Lond. 63: Suppl. 81. 1925; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1077. 1932; H. N. & A. L. Mold., Pl. Life 2: 67. 1948; Mold., Phytologia 15: 111. 1967; Mold., Fifth Summ. 1: 306 & 328 (1971) and 2: 710, 723, 731, 732, & 925. 1971; Mold., Phytologia 36: 38. 1977.

Recent collectors refer to this plant as a shrub, treelet, or small tree, 4—5 m. tall, the trunk 5 cm. in diameter, the branches pendent, the unripe fruit yellow or yellowish-green, and have found it growing in old jungles and in sandy soil on hillsides, at 80 m. altitude, flowering in March, fruiting in April and August. The corollas are said to have been "yellow" on *Bartlett 6919*.

The Moore reference (1925) in the bibliography above is sometimes cited as authored by Rendle or as "S. Moore in Rendle", but according to the table of contents in the volume in which it occurs, the entire paper was authored by Moore.

Almost all the collections cited below were originally distributed as typical *V. gamosepala* W. Griff.

Additional citations: MALAYA: Pahang: *Balgooy 2468* (Ac, N). GREATER SUNDA ISLANDS: Sumatra: *Bartlett 6919* (W--1551876); *Boeea 7155* (W--1681733), *7184* (W--1682015), *7245* (W--1682040), *7532* (W--1682162), *7784* (W--1861613), *7821* (W--1861617), *7971* (W--1682320), *8126* (W--1682459); *Forbes 2771* (W--2317943); *Soepadmo 181* (Ca--1322018); *Toroes 5599* (N).

VITEX GAMOSEPALA var. *SCORTECHINII* King & Gamble

Additional & emended bibliography: Fedde & Schust., Justs Bot. Jahresber. 39 (2): 320. 1913; S. Moore, Journ. Bot. Lond. 63: Suppl. 81. 1925; H. N. & A. L. Mold., Pl. Life 2: 82. 1948; Mold., Phytologia 15: 111. 1967; Mold., Fifth Summ. 1: 306 & 328 (1971) and 2: 717 & 925. 1971; Mold., Phytologia 34: 266. 1976.

Recent collectors describe this plant as a small tree, 6 m. tall, "with long rambling branches", the trunk 10 cm. in diameter, the bark grayish-white, the young leaves reddish, and the fruit black, and have encountered it growing at 100—1565 m. altitude, flowering in March and August, in fruit in September. The corollas are said to have been "yellow" or "yellow-green" on *Soepadmo & Mahmud 1113* and "pure clear yellow" on *Stone 9540*.

The Moore (1925) reference in the bibliography, above, is sometimes cited as "Moore in Rendle" or even as having been authored by Rendle, but according to the table of contents of the volume in which it was published it was authored by Moore alone.

Additional citations: MALAYA: Kelantan: *Soepadmo & Mahmud 1113* (Kl--16709); *Stone 7332* (Kl--8494, Kl—15504). Selangor: *Stone 9540* (Kl--15941).

VITEX GARDNERIANA Schau.

Additional synonymy: *Vitex gradneriana* Schau. ex Anon., Biol. Abstr. 51: 7701, sphalm. 1970.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 501.

1858; Peckolt, Bericht. Deutsch. Pharm. Gesel. 14: 480--481. 1904; H. N. & A. L. Mold., Pl. Life 2: 60. 1948; Braga, Pl. Nordest., ed. 2, 297. 1960; Mold., Phytologia 15: 243--244. 1967; Anon., Biol. Abstr. 51: 7701 (1970) and 51 (14): B.A.S.I.C. S.228. 1970; Barros, Matos, Vieira, Sousa, & Madeiros, Journ. Pharm. Pharmacol. 22: 116--122. 1970; Farnsworth, Pharmacog. Titles 5 (11): xviii & item 14903 (1970) and 5, Cumul. Gen. Ind. 1971; Mold., Fifth. Summ. 1: 179 (1971) and 2: 717, 718, & 925. 1971.

Peckolt (1904) says of this species: "In den Staaten Alagõas, Pernambuco und Rio de Janeiro corkommend. Volksnamen: Gerimáto, Girimáto, Jeramátaia, Jeramátaia miuda, korrumpierte Tubybenennungen. Die lanzettlichen Blätter des Strauches als Resolvens und gerühmt bei habitueller Verstopfung". Braga (1960) says: "Jaramataia....Árvore. Fôlhas opostas, digitadas, 3--5 folíolos obovais alongados, pubescentes. Flores pedunculadas, roxas, em pequenos cimos axilares densos. Drupa carnosa, 4-locular. Fôlhas calmantes, anti-reumáticas. Conhecida também por Tamanca e Tamanqueira." His statement that the leaves are 3--5-foliolate is remarkable; all specimens seen by me have them merely 1-foliolate and they are so described by Schauer in his original description. It is very probably that Braga's description is based on a misidentification.

Material of *V. gardneriana* has been misidentified and distributed in some herbaria as *Aegiphila* sp.

Additional citations: BRAZIL: Ceará: *Allemao 1179* (P). State undetermined: *Clausen s.n.* (P).

VITEX GAUMERI Greenm.

Additional synonymy: *Vitis gaumeri* Greenm. ex Mold., Résumé Suppl. 16: 30, in syn. 1968. *Vitex gaumeri* Green ex Kribs, Comm. For. Woods, ed. 3, 161, sphalm. 1968

Additional & emended bibliography: Pittier , Contrib. U. S. Nat. Herb. 20: 483 & 486. 1922; Roys, Tulane Univ. Mid. Am. Res. Ser. Publ. 2: [Ethno-bot. Maya] 221, 257, 300, & 326. 1931; Yuncker, Field Mus. Publ. Bot. 9: 330. 1940; H. N. & A. L. Mold., Pl. Life 2: 60. 1948; Kribs, Comm. For. Woods, ed. 2, 161, fig. 473 (1959) and ed. 3, 161, fig. 473. 1968; Mold., Phytologia 16: 500 (1968) and 17: 28. 1968; Mold., Résumé Suppl. 16: 3, 13, & 30. 1968; Pennington & Sarukhán, Man. Ident. Arb. Trop. 370--371. 1968; Echenique-Manrique, 25 Maderas Trop. Mex. 191--198 & [234]. 1970; Gibson, Fieldiana Bot. 24 (9): 234--235, fig. 47. 1970; Mold., Fifth Summ. 1: 77, 81, 82, 84, & 374 (1971) and 2: 593, 717, 718, 726, 732, & 925. 1971; Mold., Phytologia 23: 416. 1972; Altschul, rugs Foods 246. 1973; Menninger, Color Sky 47. 1975; Molina R., Ceiba 19: 96. 1975; Mold., Phytologia 34: 252 (1976) and 44: 409. 1979.

Additional illustrations: Kribs, Comm. For. Woods, ed. 2, 161, fig. 473 (1959) and ed. 3, 161, fig. 473. 1968; Pennington & Sarukhan, Man. Ident. Arb. Trop. 370 & 371. 1968; Echinique-Menrique, 25 Maderas Trop. Mex. [197] & 198. 1970; Gibson, Fieldiana Bot. 24 (9): 235, fig. 47. 1970.

Recent collectors describe this species as a shrub or tree, 3--30 m. tall, the trunk 10--65 cm. in diameter at breast height;

bark gray, lightly fissured, sometimes scaly, the slash green under hard bark, the soft bark yellow, fibrous; wood cream-color, with a light astringent odor; branches ascending, tetragonal when young; leaves decussate-opposite, the leaflets dark-green above, gray or grayish-green beneath; flowers very fragrant, visited by many species of insects; the [immature] fruit green or dark-green, drupaceous, "axillary". They have encountered it in forests in general and more particularly in pine and open pine forests, both low and high forests, as well as in high evergreen forests with *Terminalia amazonia, Dialium guianense, Calophyllum brasiliense, Manilkara zapota, Swietenia macrophylla, Aspidosperma cruentus, Reedia macrantha, Nectandra* spp., and *Brosimum* spp. They have found it growing in thickets, along small streams in pastures, in secondgrowth, in low forests bordering lakes, in clearings and along the edges of rivers, in tintal, and along streams through *Byrsonima-Curatella* savannas, at 300--1100 m. altitude, flowering from May to August, and fruiting in January, May, June, and August to November.

The corollas are said to have been "blue" on *Contreras 855, 2336, 5388, & 5658, Davidse & Pohl 2133, Dwyer 12598 & 12753, Matuda 3905, Molina R. 5459, Molina R. & Molina 25766,* and *Ortîz 1044,* "bluish" on *Contreras 9707,* "bluish-purple" or "blue-purple" on *Lundell 15887* and *Lundell & Lundell 7321,* "lilac" on *Pennington & Sarukhân 9618,* "violet" on *Chavelas & al. 2980,* and "lavender-blue, one lobe larger and darker blue" on *Croat 23540.*

Moreno speaks of "lâtex blanco", but as far as I know true latex in unknown in this genus. The Molinas describe the species as "common in river thickets" in Honduras; Shepherd refers to it as an "occasional canopy tree on mesic sites" in Campeche, Mexico. Pennington & Sarukhân say "Corteza lisa, finamente fisurado, pardo amarillente". Bequaert reports the leaves employed as a horse fodder. Roys (1931) says that *V. gaumeri* is "A tree 30 to 50 feet high.....It is very handsome and puts forth a blue flower from which bees gather honey [nectar]. The shade of this tree is very salubrious......[it has] white wood....The Maya texts prescribe a decoction of the leaves as a bath to cure asthma....malaria...and chills. The crushed leaves are poulticed on ulcers and abscesses ......[the vernacular name] x-kom-yaxnic, applied to *Solanum amazonicum* Ker indicated a real or fancied resemblance to the yaxnîc or *Vitex gaumeri....Ruellia tuberosa* L. is called x-cabal-yaxnic because its blossom resembles that of yaxnic or *Vitex gaumeri.*"

Wood characteristics are given in detail by Echenique-Manrique (1970), while Kribs (1968) describes them as follows: "Color uniform light grayish brown or yellowish brown, or with darker zones which correspond with the growth zones. Luster medium. Odor and taste not distinct. Moderately hard and heavy, sp. gr. 0.64--0.72 (air dry); weight, 40 to 45 lbs. per cu. ft. Grain usually interlocked which produces a ribbon figure on the radial. Texture fine. Growth rings distinct and due to thicker walled fibers at end of ring. Vessels barely visible without lens on the cross section; evenly distributed, solitary and in radial groups of 2--3; tang. diam. 85u to 178u, av., 128u; lumina sometimes with tyloses; pits alternate, small, diam. 4u--5u. Fibers libriform with medium thick walls. Parenchyma vasicentric 1--3 cells wide, occasionally short aliform, and diffuse. Rays visible without lens on the cross section; heterogeneous type III; multiseriates 2--5 cells wide, mostly 3--4 cells and up to 40 cells high; uniseriates scarce; vessel-ray pits round to oval, minute. Ripple marks absent. Gum ducts absent. Uses and source of supply agricultural implements and vehicles, sporting and athletic goods (polo stick heads, golf club heads, mallets, etc.); tool handles and cattle yokes. British Honduras, Honduras, Guatemala, and Mexico."

Yuncker (1940) describes the species as a "Tree about 15 meters tall and 35 cm. in diameter. Leaves palmately compound, the leaflets densely hairy beneath, entire; flowers small, deep blue, with pleasant odor, in paniculate clusters. In open forests on semi-arid highland near the village of Las Flores, at 180 meters altitude" [in Atlántida, Honduras]. Gibson (1970) comments that "*V. gaumeri* is much like *V. hemsleyi* Briq. of Mexico, but differs in its much heavier indument and smaller flowers". The fruits are galled on *Contreras 1639* & *6088*.

Recent vernacular names reported for *V. gaumeri* include "crucillo", "dachnik" [=green ear], "fiddlewood", "jocote de mico", "nichté", "ya'axnik", "yashcabté", "y'ashnik", and "yaxnic".

Pennington & Sarukhán (1968) note that "Se encuentra restringida a la vertiente del Golfo desde el centro de Tab[asco] hasta la peninsula de Yucatán, formando parte del estrato superior de Selvas medianas subperennifolias y subcaducifolias asociada con *Brosimum alicastrum, Manilkara zapota, Bursera simaruba, Astronium graveolens, Pouteria unilocularis,* etc. siempre a altitudes menores a los 500 m. y en suelos derivados de materiales calizos, someros y de buen drenaje superficial. Usos. En la actualidad do se usa su madera pues presenta inconvenientes tales como rajarse con relativa facilidad. Podria usarse en un futuro para fabricar parquet."

Gibson (1970) cites only *Whitford & Stadtmiller 74*.

Material of *V. gaumeri* has been misidentified and distributed in some herbaria as *V. pyramidata* B. L. Robinson and as *Godmania aesculifolia* (H.B.K.) Standl.

Additional citations: MEXICO: Campeche: *Chavelas P. & Pérez J. ES.789* (Mi, Mi); *Matuda 3905* (Ws); *Pennington & Sarukhán K.9625* (N); *Shepherd 50* (Mi, Ws). Chiapas: *Chavelas P., Alanís, & Rosas ES.2980* (Mi); *Pennington & Sarukhán K.9166* (N), *K.9618* (N). Quintana Roo: *Moreno 140* (N). Yucatán: *Enriquez 493* (W--2597466); *A. Gentry 535* (Ws), *538* (Ws); *Lundell & Lundell 7321* (Au--192504, N, Ws). GUATEMALA: El Petén: *Contreras 855* (Au--228053, Ld), *1639* (Ld--278540, Ld, Ld, W--2558710), *2336* (Au--228025, Ld, Ld), *2526* (Au--228020, Ld, N), *5388* (Au--254003, Ld, Ld), *5658* (N), *5836* (Au--254199, Ld, Ld, Mi), *6088* (Ld--278534, Ld, Ld, W--2558712), *9707* (Ld, Ld, W--2795352); *C. L. Lundell 15887* (Ld, N), *15983* (Ld), *16079* (Ld); *Ortíz 1044* (Ws), *1153* (N), *1259* (N). BELIZE: *Croat 23540* (N); *Dwyer 10834* (N), *12598* (Lc, N, W--2742191), *12753* (N); *Dwyer & Liesner 12196a* (W--2800216); *Gentle 2528* (Tu--35170); *A. Gentry 8267* (N), *8511* (N); *Poole & Watson 1017* (Ld, Ld); *Proctor*

30250 (Ld). HONDURAS: Choluteca: *Harmon & Fuentes 5987* (N, Ws); *Hazlett 999* (E--2162966); *A. Molina R. 5459* (W—2572523). Comayagua: *Molina R. 8468* (Ld), *14304* (N). Copán: *Hernández M. & Hernández R. 5197* (Z). El Paraíso: *Davidse & Pohl 2133* (N); *Molina R. 14482* (N, N). Morazán: *Molina R. & Molina 25766* (N). Santa Bárbara: *A. Molina R. 21980* (N).

VITEX GEMINATA H. H. W. Pearson

This taxon is now treated by me as *V. harveyana* f. *geminata* (H. H. W. Pearson) Mold., which see.

VITEX GIGANTEA H.B.K.

Additional & emended synonymy: *Vitex gigantea* Humb. apud Spreng. in L., Syst. Veg., ed. 16, 2: 756. 1825. *Vitex gigantea* Humb. & Kunth apud D. Dietr., Syn. Pl. 3: 611. 1843. *Vitex gigantea* Kunth apud Goyena, Pl. Nicarag. 1: 569. 1911. *Vitex gigantia* H.B.K. ex Mold., Phytologia 23: 438, in syn. 1972.

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 888. 1821; Spreng. in L., Syst. Veg., ed. 16, 2: 756. 1825; Sweet, Hort. Brit., ed. 2, 416. 1830; Loud., Hort. Brit., ed. 2, 551. 1832; Sweet, Hort. Brit., ed. 3, 551. 1839; D. Dietr., Syn. Pl. 3: 611. 1843; Schau. in A. DC., Prodr. 11: 688. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 501. 1858; Macbr., Field Mus. Publ. Bot. 13 (5): 692, 694, & 696. 1960; Acosta-Solis, Divis. Fitogeogr. Ecuad. 27, 57, 60, & 66. 1968; Mold., Phytologia 16: 500. 1968; Mold., Résumé Suppl. 16: 29. 1968; H. Weber in Fittkau, Illies, Klinge, Schwabe, & Sioli, Biogeogr. Ecol. S. Am. 2: [Van Oye, Monog. Biol. 19:] 488. 1968; Mold., Fifth Summ. 1: 137, 144, & 374 (1971) and 2: 717 & 925. 1971; Mold., Phytologia 23: 418 & 438. 1972; Molina R., Ceiba 19: 96. 1975; Zimmerm. & Ziegler in Zimmerm. & Milburn, Transp. Pl. 1 [Pirson & Zimmerm., Encycl. Pl. Physiol., ser. 2, 1]: 503. 1975; Mold., Phytologia 34: 257 & 270. 1976; Soukup, Biota 11: 20. 1976; Mold., Phytologia 36: 33 (1977) and 44: 412. 1979.

Recent collectors describe this species as a tree, 5--25 m. tall, the trunk to 30 cm. in diameter, the flowers with a slight perfume, and the fruit at first green, finally black, edible. They have encountered it in dense forests, dry tropical woods, and wet subtropical forests, from near sealevel to 1000 m. altitude, flowering from October to December, fruiting in January, February, and September. The corollas are said to have been "light bluish-violet" on *Asplund 18198* and "lilac" on *Mexia 6177*.

Vernacular names recently reported for the species are "giant chaste-tree", "moconto", "pechicha". and "pechiche". Macbride (1960) says of it: "Noted by authors as a beautiful tree with globose crown, the wood very hard; originally from Guayaquil. Obviously very closely related to *V. cymosa* Bert. and *V. flavens* HBK.; the Peruvian specimens with young leaves are sparsely puberulent above and Moldenke thinks it is not certain that they are the same species". He cites only *Mexia 6177* and *Tessmann 4723*. Vargas notes "frutas cápsulas [surely an error in observation!], su madera usado en ebanisteria y su fruto en dulces".

Mexia reports that during anthesis the tree is almost leafless, has "good hard wood". and is "common" in Loreto, Peru. Of his *no. 4261* López-Palacios says: "en crecimiento y esteríl". Loudon (1832) avers that it was introduced into cultivation in England from Ecuador in 1826. Molina (1975) lists it as cultivated in Honduras. Goyena (1911) describes rather well a plant which he calls *Vitex gigantea* as growing on the Grand Sabana in Nicaragua, but this seems most unlikely -- it is more likely that the plant which he saw was either *V. cooperi* Standl. or *V. kuylenii* Standl.

Macbride (1960) distinguishes the Peruvian species of *Vitex* known to him as follows:

1. Inflorescence usually a dm. long or longer and rather paniculate or dichotomous-cymose.
  2. Calyx sub-bilabiate, nearly 5.5 mm. long; cymes supra-axillary...*V. klugii.*
  2a. Calyx 5-dentate or -lobate, 2--3 mm. long; cymes axillary or also terminal.
    3. Peduncles about as long as or longer than the petioles.... *V. compressa.*
    3a. Peduncles much shorter than the petioles.
      4. Leaflets 5; petioles often ampliate at apex...V. cymosa.
      4a. Leaflets 3--7; petioles slender, not or little ampliate.....................................*V. pseudolea.*

1a. Inflorescence more or less simply cymose.
  5. Cymes mostly 3-flowered; calyx tubular-funnelform, to 2 cm. long...*V. triflora.*
  5a. Cymes at least mostly or often many-flowered; calyx small.
    6. Peduncles shorter than the petioles; calyx canescent.
      7. Leaflets long-petiolulate; calyx in fruit lax, mucrocrenate...............................*V. pseudolea.*
      7a. Leaflets subsessile or short-petiolulate; fruit enclosed in the dentate fruiting calyx......*V. gigantea.*
    6a. Peduncles longer than the petioles.
      8. Calyx gray, obsoletely dentate..........*V. orinocensis.*
      8a. Calyx flavescent, obviously dentate.........*V. flavens.*

Acosta Solis (1968) cites *Acosta Solis 6452, 13007, & 15821* from Ecuador.

Material of *V. gigantea* has been misidentified and distributed in some herbaria as *V. cymosa* Bert., *Tabebuia* sp., and *Bignoniaceae.*

Additional citations: ECUADOR: El Oro: *Escobar 804* (Ld). Guayas: *A. Gentry 10034* (N). Morona Santiago: *Little, Ortega U., Samaniego V., & Vivar C. 481* (Ld). Napo: *López-Palacios 4261* (Ld). PERU: Loreto: *Mexia 6177* (Au--122925, Ba). Tumbes: *Vargas Alvarez 1* (N, Ws), *32* (N, Ws). CULTIVATED: Ecuador: *Asplund 18198* (Ld, N, W--2652444).

VITEX GIORGII DeWild.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 61. 1948; Mold., Phytologia 15: 244. 1967; Mold., Fifth Summ. 1: 232 (1971) and 2: 925. 1971.

VITEX GLABRATA R. Br.

Additional & emended synonymy: *Vitex cunninghamii* Schau. apud C.

B. Clarke in Hook. f., Fl. Brit. India 4: 588, in syn. 1885. *Vitex leucoxylon* Schau. ex C. B. Clarke in Hook. f., Fl. Brit. India 4: 588, in syn. 1885 [not *V. leucoxylon* Blanco, 1895, nor L., 1829, nor L. f., 1791, nor Naves, 1918, nor Roth, 1956, nor Roxb., 1856, nor Wall., 1847, nor Willd., 1832]. *Vitex leucoxylon* F. I. ex Prain, Beng. Pl., imp. 1, 833, in syn. 1903. *Vitex glabratus* R. Br. ex K. Schum. & Lauterb., Nachtr. Fl. Deutsch. Sûdsee 370. 1905. *Vitex glabratus* K. Sch. ex K. Schum. & Lauterb., Nachtr. Fl. Deutsch. Südsee 370, in syn. 1905. *Vitex pentaphylla* Merr., Philip. Journ. Sci. Bot. 4: 320--321. 1909 [not *V. pentaphylla* Lamb., 1940, nor Pavon, 1940, nor Sessé & Moc., 1940]. *Vitex nitida* Merr., Philip. Journ. Sci. Bot. 7: 343--344. 1912. *Vitex leucoxylon* Kurz ex Troup, Silvicult. Indian Trees 2: 777, in syn. 1921.

Additional & emended bibliography: R. Br., Prodr. Fl. Nov. Holl., imp. 1, 512 (1810) and imp. 2, [Isis 1819:] 512. 1819; Blume, Bijdr. Fl. Ned. Ind. 14: 813. 1826; Wall., Numer. List [48], nos. 1749 & 1751. 1829; D. Dietr., Syn. Pl. 3: 611. 1843; Walp., Repert. Syst. Bot. 4: 86. 1845; Schau. in A. DC., Prodr. 11: 690--692 & 695. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 501 & 502. 1858; Benth. & Muell., Fl. Austral. 5: 31 & 68. 1870; R. Schomb., Fl. S. Austral. 52. 1875; Ceron, Cat. Pl. Herb. Manila 133. 1892; Prain, Beng. Pl., imp. 1, 832 & 833. 1903; K. Schum. & Lauterb., Nachtr. Fl. Deutsch. Sudsee 362 & 369--370. 1905; Brandis, Indian Trees, imp. 1, 505. 1906; Fedde & Schust., Justs Bot. Jahresber. 40 (2): 336. 1915; Heyne, Nutt. Plant. Nederl. Ind., ed. 1, 4: 113--114. 1917; H. Hallier, Meded. Rijks Herb. Leid. 37: 48 & 54. 1918; Kirtikar & Basu, Indian Med. Pl., ed. 1, 1936 & 1941--1942. 1918; H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 49 & 50. 1921; Troup, Silvicult. Indian Trees 776 & 777. 1921; Gamble, Man. Indian Timb. 298 & 542. 1922; Haines, Bot. Bihar Orissa, ed. 1, 4: 711 & 713. 1922; Ridl., Fl. Malay Penins. 2: 634. 1923; Janssonius, Mikrogr. Holz. 4: 754, 758, 762--764, 767, & 824--827. 1926; Béjaud, Essenc. Forest. Camb. 348. 1928; Kanjilal, Das, Kanjilal, & De, Fl. Assam 3: 480, 485, & 561. 1939; Janssonius, Key Javan Woods 54. 1952; Petelot, Pl. Méd. Cambod. Laos Vietn. 2 [Archiv. Recherch. Agron. Past. Vietn. 18]: 248 (1953) and 4: 171, 225, 257, & 289. 1954; R. Br., Prodr. Fl. Nov. Holl., imp. 3, 512. 1960; Haines, Bot. Bihar Orissa, ed. 2, 2: 745 & 747--748. 1961; Prain, Beng. Pl., imp. 2, 2: 621, 622, & 1012. 1963; Backer & Bakh., Fl. Java 2: 604--605. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2277--2279. 1966; Basak, Bull. Bot. Surv. India 10: 256. 1968; Hocking, Excerpt. Bot. A.13: 569. 1968; Mold., Phytologia 16: 500--502 (1968) and 17: 8, 10, 12, 13, 21, & 32. 1968; Mold., Résumé Suppl. 16: 9. 1968; Uphof, Dict. Econ. Pl., ed. 2, 545. 1968; Rao & Verma, Bull. Bot. Surv. India 11: 410. 1969; Sawyer & Chermsir., Nat. Hist. Bull. Siam Soc. 23: 126. 1969; Beard, West Austr. Pl., ed. 12, 113. 1970; Brandis, Indian Trees, imp. 2, 505. 1971; Long & Lakela, Fl. Trop. Fla. 739 & 961. 1971; Mold., Fifth Summ. 1: 269, 279, 284, 298, 303, 306, 318, 319, 328, 331, 333, 338, 349, & 374 (1971) and 2: 603, 714, 716, 718, 720--722, 724, 725, & 925.

1971; Rativanich & Dietrichs, Nat. Hist. Bull. Siam Soc. 24: 147. 1971; Mold., Phytologia 23: 413 & 438. 1972; Townsend, Kew Bull. 27: 148. 1972; Mold., Phytologia 28: 445. 1974; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Long & Lakela, Fl. Trop. Fla., ed. 2, 739 & 961. 1976; Mold., Phytologia 34: 267. 1976; Fundter & Wisse, Meded. Landbowshogsch. Wagen. 77 (9): 205 & 206. 1977; Mold., Phytologia 44: 224 & 329. 1979.

Backer & Bakhuizen van den Brink (1965) describe this species as follows: Young branches densely short-hairy; leaflets 3--5, rarely 6, elliptic-oblong-obovate, acuminate, glabrous on the upper surface (excl. the large veins), pubescent beneath (especially in the primary vein-axils); median leaflet 11--31 cm. by 4--13 1/2 cm., on a 1--3 mm. long petiolule, the other leaflets smaller, on shorter petiolules; petioles 7--17 cm. long; corolla-tube villous inside (at and above the insertion of the stamens), without a ring of hairs near the base, 5--7 mm. long; corolla and calyx outside without glands; filaments villous on their lower halves, rather far exserted; corolla yellowish-white; median segment of lower lip blue-violet; cymes solitary, 7--22 cm. long (inclusive of the peduncles); pedicels 1/2 -- 5 mm. long; drupes (color?) 1 1/2 -- 2 1/2 cm. long. They assert that in Java it occurs in mixed forests, especially in humid localities, flowering there from July to December.

Troup (1921) says of *Vitex glabrata*: "A large deciduous tree with 5-foliate leaves. Bark smooth, white. Wood grey, moderately hard, close-grained, durable, of good quality, used for cart-wheels. Assam, Chittagong, Burma, Andamans; also in the Rajmahal hills, very local (Haines). This is a common and conspicuous tree in the upper mixed deciduous forests of Burma, and is also fairly common in certain types of lower mixed forests, preferring well-drained ground; it is a common companion of teak. Flowers, April-June; fruits, June-July. The fruit is a drupe about 0.5 in. long. Growth, according to Gamble, averaging 6 rings per inch of radius, giving a mean annual girth increment of 1.05 in." Janssonius (1926) describes the structure of the wood and its characters in great detail. The 5-foliolate form described by Troup, above, and other writers, is probably what I call f. *bombacifolia* (Wall.) Mold; true *V. glabrata,* as seen in Australia, is normally at least mostly 3-foliolate.

Basak (1968) reports the species from West Bengal on the basis of *Basak 243,* stating that it occurs also in Cachar, Assam, and Bihar, and that Prain (1903) records it from East Bengal and Chittagong [Bangladesh]. He claims that his record is the first from West Bengal [India].

Burkill (1966) says that *V. glabrata* is "found from north-eastern India to northern Australia; in the [Malayan] Peninsula it is unknown south of Penang. The timber is used for cart-wheels, and deserves attention for furniture and other purposes.....It is moderately hard, tough, close-grained, and grey. Indian Forest officers have proposed the name <u>Yoma wood</u> for it, for marketing purposes. It is sometimes used in Java, and is highly valued in Celebes...... Mrs. Collins says that the fruit gathered quite ripe is eaten in Siam, and taste a little like dried prunes". Rativanich & Dietrichs

(1971) aver that in Thailand the bark is used as an astringent and to treat stomach disorders and diarrhea. Uphof (1968) reports that the "wood is much in demand by the natives [of the Malayan Archipelago] for the construction of houses, for boards and household utensils". Petelot (1953) tells us that "D'après Béjaud.... au Cambodge, l'écorce fait l'objet d'une exploitation intense. Le fruit et l'écorce entrent dans la composition de masticatoires". He claims that the species occurs throughout southern Indochina, as well as in India, Malaysia, and Australia.

Lam (1921) separates *V. nitida* Merr. [based on *Klemme 19546* from Mindanao] from *V. glabrata* R. Br. as follows: in *V. nitida* the cymes are only in large terminal panicles, while in *V. glabrata* they are "axillary, also in the axils of the lower leaves, sometimes composed to a long, interrupted, leafy, terminal panicle". It would seem that this is not a tenable distinction, at least at the specific level, although a varietal or form status may be in order.

Most authors regard *V. bombacifolia* Wall. and *V. pallida* Wall. as identical to typical *V. glabrata,* but I regard them as probably worthy of at least form status and they are discussed hereinafter. Hallier (1918) cites for *V. glabrata* only *Pierre 1838* from Cochinchina, *Merrill 9330* from Palawan, and *Forbes 3784* from Timor, but gives the species' overall distribution as Assam, Chittagong, Burma, Siam, Cochinchina, Kedah, Penang, Java, northeastern New Guinea, northern Australia, and Queensland.

Clarke (1885) gives the distribution of *V. glabrata* as "From S. Assam and Cachar to Malacca, frequent". He comments that "The typical *V. glabrata,* R. Br., has leaves usually 3-foliolate and rounder more glabrate leaflets and fewer-flowered corymbs than the Indian tree; but some of the examples of *V. Cunninghamii* appear identical with Silhet specimens". It should be noted that the name, *Vitex cunninghami,* was published on page 691, not "690" as stated by Clarke, in DeCandolle's Prodromus, volume 11 (1847) and is there written with a single terminal "i".

It is also worth noting that Brown's original description (1810) is cited as "1827" by various authors, including Kanehira & Hatusima (1942), Lam (1924), Lam & Bakhuizen (1924), and in earlier installments of the present series by myself. This date is apparently erroneous.

Schumann (1905), in describing his *V. helogiton,* from New Guinea, notes that "Ich habe diese Pflanze früher mit *V. glabratus* R. Br. identifiziert; sie ist aber vor allem durch die Grösse der Blätter, ferner durch die Gestalt derselben und die Form der Blüten verschieden, wenn sie ich auch von den mir bekannten Arten am nächsten kommt". I am inclined to agree with him that *V. glabrata,* as currently treated in floras and manuals, includes several quite disparate elements, including the one he has described, probably worthy of at least varietal or form rank in addition to the ones hereinafter listed. Merrill's Philippine material may prove the same as Schumann's New Guinean form.

According to Bentham, *V. glabrata,* at least in Australia, has the petioles over 2 inches long, the petiolules 1/2 to 3/4 inch long, and the flowers in loose, dichotomous, axillary cymes, while *V. acuminata* R. Br. has the petioles shorter than the leaflets, the petiolules very short or only to 1/4 inch long, and the flowers in thyrsoid panicles that are terminal or in the uppermost axils only.

Recent collectors have described this species as a shrub or low spreading to large tree, 6.5--20 m. tall, the canopy 8 m. wide, the bole to 8 m. tall, the trunk 23--66 cm. in diameter at breast height, to 90 cm. in girth, the bark hard, light-brown to gray, brownish-gray, or yellowish-gray, smooth or rough and flaky, finely and closely furrowed, peeling off in thin strips, the under bark brown, the inner bark straw-colored, the wood white or cream-color, the heartwood brown, the leaflets discolorous, light- or dark-green, shiny above, dull beneath, the stamens purple, and the fruit small, ovoid to more or less globular, shiny, light-green when young, purple or dark-purple to black when ripe, edible. They have found it growing in thickets, on foreshores, in evergreen or lowland rainforests, on sandy creekbanks, and in dry sclerophyll scrub, in sandy or lateritic soil, at 90--2000 m. altitude, flowering from April to July, as well as in October and November, and fruiting in June, July, September, and October.

The corollas are said to have been "white" on *Lazarides 6975* and *Phusomsaeng 238,* "white with purple tinge" on *Specht 1076* [and so described also by Beard (1970)], "white with purple hairs, base of upper petal-lobe yellow" on *Geesink & Santisuk 4976,* "creamy-purple" on *Katik NGF.37870,* and "pale-violet" on *Kostermans 23907.*

Geesink & Santisuk report the species "common at evergreen forest edge on hillslopes" in Thailand; Kostermans refers to it as "common" in Java; Sawyer & Chermsirivathana (1969) describe it as infrequent to common in Thailand; Specht found it in mixed open forests at the base of sandstone scarps in Australia. Lazarides avers that it "occurs on fringe of creek channels with *Eucalyptus camaldulensis* and *Arundinella nepalensis*", while Wilson encountered it "on sandstone hills, mainly outcrops, with low trees of *Owenia* sp. and *Terminalia* sp."

Vernacular names recently reported include "ashual", "bandikari", "bhodia", "bihbool", "cây den", "gentileng", "goda", "gohera", "horina", "kaping-asing", "khai-nao", "laban ketileng tileng", "langa-thang-thang", "ma", "pani-amora", "popoul ach sat", "popoul tuk", "serlung-baphang", and "xo con".

Color slides or photographs accompany at least some herbarium specimens of *Adams 872, Geesink & Santisuk 4976,* and *Lazarides 6975.*

Schumann & Hollrung (1889) cite only *Hollrung 672* & *708* from New Guinea and Schumann & Lauterbach (1900) cite the same collection, describing the species as a tree 15 to 25 m. tall, with white, violet-veined corollas, "bisher aus Nordaustralien bekannt".

Material of *V. glabrata* has been misidentified and distributed in some herbaria as *V. acuminata* R. Br., *V. littoralis* Decne., and *V. quinata* (Lour.) F. N. Will. On the other hand, the *R. A. Perry 1052,* distributed as *V. glabrata,* is actually *V. acuminata* R. Br., while *Béjaud 519* is *V. glabrata* var. *poilanei* Mold., *M. Ramos s.n.*

[Herb. Philip. Bur. Sci. 23485] and *Sulit s.n.* [Philipp Nat. Herb. 14407] are *V. quinata* (Lour.) F. N. Will. and *Elmer 11602* and *Kanehira 2022* are *V. quinata* var. *puberula* (H. J. Lam) Mold.

Additional citations: BANGLADESH: *C. B. Clarke 20089* (Pd); *King's Collector 407* (Mu--3800). BURMA: Upper Burma: *Kingdon-Ward 22501* (Go). THAILAND: *Geesink & Santisuk 4976* (Ac); *Phusomsaeng 238* (Ac). PHILIPPINE ISLANDS: Culion: *S. S. Ponce s.n.* [Herb. Philip. Forest. Bur. 28904] (W--1262380). Luzon: *Ahern 110* (W--445108). Mindanao: *W. I. Hutchinson s.n.* [Herb. Philip. Forest. Bur. 11245] (W--706282); *D. P. Miranda s.n.* [Herb. Philip. Forest. Bur. 20771] (W--1238733); *Razon s.n.* [Herb. Philip. Forest. Bur. 23671] (W--1293392); *R. S. Williams 2949* (W--708173, W--708174). Mindoro: *M. Ramos s.n.* [Herb. Philip. Bur. Sci. 39371] (W--1376030). Palawan: *E. D. Merrill 9330* (W--902574); *Sulit s.n.* [Philip. Nat. Herb. 12507] (W--2376198). MARIANA ISLANDS: Guam: *Rodin 794* (W--1968684). GREATER SUNDA ISLANDS: Java: *Koorders 10129β* (Pd); *Kostermans 23907* (Ac). LESSER SUNDA ISLANDS: Timor: *Herb. Neth. Ind. For. Serv. BB.23954* (N). NEW GUINEA: Papua: *Katik NGF.37970* (Mu, W--2740694). West Irian: *Herb. Neth. Ind. For. Serv. BB.25755* (N). AUSTRALIA: Northern Territory: *Adams 872* (Ai); *Beens & Spence BS.30* (Ai--9851); *Byrnes & Maconochie 1001* [Herb. North. Terr. 24004] (Ld); *Cunningham 256* (N); *Lazarides 6975* (Ai); *Letts 60* (Ai--8346), *8348* (Ai); *Specht 1076* (W--2125145); *I. B. Wilson 180* (Ai).

VITEX GLABRATA f. *BOMBACIFOLIA* (Wall.) Mold., Phytologia 44: 329. 1979.

Additional & emended synonymy: *Vitex nn. 10 and 18* Hook. f. & Thoms. ex C. B. Clarke in Hook. f., Fl. Brit. India 4: 588, in syn. 1885. *Vitex leucoxylon* Roth ex Mold., Phytologia 5: 382, in syn. 1956 [not *V. leucoxylon* Blanco, 1895, nor F. I., 1903, nor Kurz, 1921, nor L., 1829, nor L. f., 1781, nor Naves, 1918, nor Schau., 1893, nor Span., 1856, nor Wall., 1847, nor Willd., 1832].

Additional & emended bibliography: Voigt, Hort Suburb, Calc. 469. 1845; W. Griff., Notul. 4: 740 & 764. 1854; Buek, Gen. Spec. Syn. Candoll. 3: 501 & 502. 1858; K. Schum. & Hollr., Fl. Kais. Wilhelmsl. 121. 1889; Haines, Bot. Bihar Orissa, ed. 1, 4: 713. 1922; Petelot, Pl. Med. Cambod. Laos Vietn. 2: 248 (1954) and 4: 171. 1954; Haines, Bot. Bihar Orissa, ed. 2, 2: 747. 1961; Mold., Phytologia 16: 500--502 (1968) and 17: 8, 12, 13, & 21. 1968; Mold., Resume Suppl. 16: 9. 1968; Mold., Fifth Summ. 1: 269, 279, 284, 303, & 374 (1971) and 2: 714, 716, 720, 725, & 925. 1971; Mold., Phytologia 23: 438 (1972) and 44: 329. 1979.

This taxon is usually regarded as identical to typical *V. glabrata* R. Br., but as Clarke (1885) points out: "The typical *V. glabrata*.....has leaves usually 3-foliolate and rounder more glabrate leaflets and fewer-fld. corymbs....The typical *V. bombacifolia*, Wallich (*Vitex n. 18,* Herb. Ind. Or. H. f. & T.),....has the leaflets mostly 5, large and broad". He also notes that "*V. pallida*, Wallich (*Vitex n. 10,* Herb. Ind. Or. H. f. & T.), has smaller, more hairy leaflets, and short peduncles".

[to be continued]

New Names in *Senna* P. Mill. and *Chamaecrista* Moench (Leguminosae Caesalpinioideae) precursory to the Chihuahuan Desert Flora

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At the Legume Conference held at Kew in 1978 we proposed the dismemberment of *Cassia* sens. lat. into three genera *Cassia* L. (sens. restr.), *Senna* P. Mill. and *Chamaecrista* Moench. Implementing this taxonomic decision, which will entail an unfortunately large number of new combinations, we here transfer to the appropriate genus those species which will soon be described in the *Chihuahuan Desert Flora*, currently in preparation under the editorship of Dr. M. C. Johnston at Austin.

SENNA P. Miller

S. BAUHINIOIDES (A. Gray) Irwin & Barneby, comb. nov. *Cassia bauhinioides* A. Gray, Boston J. Nat. Hist. 6: 180. 1850.

S. COVESII (A. Gray) Irwin & Barneby, comb. nov. *Cassia covesii* A. Gray, Proc. Amer. Acad. 7: 399. 1868.

S. CROTALARIOIDES (Kunth) Irwin & Barneby, comb. nov. *Cassia crotalarioides* Kunth, Mimoses pl. 40. 1822 & p. 132. 1823.

S. DEMISSA (Rose) Irwin & Barneby, comb. nov. *Cassia demissa* Rose, Contrib. U.S. Nat. Herb. 10: 97. 1906.

S. DEMISSA (Rose) var. RADICANS (Irwin & Barneby) Irwin & Barneby, comb. nov. *Cassia demissa* var. *radicans* Irwin & Barneby, Sida 6 (1): 9. 1975.

S. DURANGENSIS (Rose) Irwin & Barneby, comb. nov. *Cassia durangensis* Rose, Contrib. U.S. Nat. Herb. 10: 98. 1906.

S. DURANGENSIS (Rose) var. ISELYI (Irwin & Barneby) Irwin & Barneby, comb. nov. *Cassia durangensis* var. *iselyi* Irwin & Barneby, Sida 6 (1): 11. 1975.

S. HIRSUTA (Linnaeus) Irwin & Barneby, comb. nov. *Cassia hirsuta* Linn., Sp. Pl. 378. 1753.

S. HIRSUTA (Linnaeus) var. GLABERRIMA (M. E. Jones) Irwin & Barneby, comb. nov. *Cassia leptocarpa* var. *glaberrima* M. E. Jones, Contrib. W. Bot. 12: 7. 1908.

S. LINDHEIMERANA (Scheele) Irwin & Barneby, comb. nov. Cassia lindheimerana Scheele, Linnaea 21: 457 ('Lindheimeriana'). 1848.

S. MENSICOLA (Irwin & Barneby) Irwin & Barneby, comb. nov. Cassia mensicola Irwin & Barneby, Sida 6 (1): 11. 1975.

S. MONOZYX (Irwin & Barneby) Irwin & Barneby, comb. nov. Cassia monozyx Irwin & Barneby, Sida 6 (1): 16. 1975.

S. ORCUTTII (Britton & Rose) Irwin & Barneby, comb. nov. Peiranisia orcuttii Britton & Rose, N. Amer. Fl. 23 (4): 267. 1930.

S. PILOSIOR (Macbride) Irwin & Barneby, comb. nov. Cassia bauhinioides var. pilosior B. L. Robinson ex Macbride, Contrib. Gray Herb. n. ser. 59: 27. 1919. C. pilosior (Macbride) Irwin & Barneby, Sida 6 (1): 10. 1975.

S. PUMILIO (A. Gray) Irwin & Barneby, comb. nov. Cassia pumilio A. Gray, Boston J. Nat. Hist. 6: 180. 1850.

S. RIPLEYI (Irwin & Barneby) Irwin & Barneby, comb. nov. Cassia ripleyi Irwin & Barneby, Sida 6 (1): 13, fig. 1. 1975.

S. WISLIZENI (A. Gray) Irwin & Barneby, comb. nov. Cassia wislizeni A. Gray, Pl. Wright. 1: 60. 1852.

S. WISLIZENI (A. Gray) var. PAINTERI (Britton & Rose) Irwin & Barneby, comb. nov. Palmerocassia painteri Britton ex Britton & Rose, N. Amer. Fl. 23 (4): 254. 1930. Cassia wislizeni var. painteri (Britton & Rose) Irwin & Barneby, Sida 6 (1): 16. 1975.

S. WISLIZENI var. VILLOSA (Britton & Rose) Irwin & Barneby, comb. nov. Palmerocassia villosa Britton ex Britton & Rose, N. Amer. Fl. 23 (4): 254. 1930. Cassia wislizeni var. villosa (Britton & Rose) Irwin & Barneby, Sida 6 (1): 16. 1975.

CHAMAECRISTA P. Miller

CH. GREGGII (A. Gray) Pollard ex A. Heller var. POTOSINA (Britton & Rose) Irwin & Barneby, stat. nov. Ch. potosina Britton & Rose, N. Amer. Fl. 23 (5): 283. 1930.

CH. GLANDULOSA (Linnaeus) Greene var. PARRALENSIS (Irwin & Barneby) Irwin & Barneby, stat. nov. Cassia parralensis Irwin & Barneby, Sida 6 (1): 18. 1975.

CH. NICTITANS (Linnaeus) Greene var. MENSALIS (Greenman) Irwin & Barneby, comb. nov. *Cassia leptadenia* var. *mensalis* Greenman, Proc. Amer. Acad. 41: 238. 1905.

ACKNOWLEDGMENTS

Our revisionary work with Leguminosae tribe Cassieae is supported by National Science Foundation grant DEB 7818365 to New York Botanical Garden.

CORRECTION TO MAESA (MYRSINACEAE) IN MICRONESIA

By F. R. Fosberg and Marie-Hélène Sachet

Due to an unfortunate editorial error in our article on Micronesian Maesa (Phytologia 44: 363, 1979) the texts of pages 365 and 366 were reversed. To correct this the page numbers 365 and 366 should be reversed.

As the article now reads the last part of the treatment of Maesa canfieldiae is on page 366 instead of p. 365; the treatment of M. carolinensis is on p. 366 instead of 365. M. carolinensis var. carolinensis begins on p. 366 and continues on page 365; M. carolinensis var. kusaiensis is on p. 365 instead of 366; M. carolinensis var. subsessilis starts on p. 365 and continues on page 367. It seems best to cite the page numbers as actually published in any uses of the names as basionyms for transfers, but in reading the paper the page numbers should be reversed to avoid confusion. As printed it does not make sense.

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BOOK REVIEWS

Alma L. Moldenke

"THE PESTICIDE CONSPIRACY" by Robert van den Bosch, viii & 227 pp., 4 b/w fig & 3 tab. Doubleday & Company, Inc., Garden City, N. Y. 11530 or New York, N. Y. 10017. 1978. $8.95.

Written by a dedicated and distinguished entomological scientist long cognizant of the problems of pests, pesticides, crops and the environment, this is a "tale of a contemporary technology gone sour under the pressures generated by a powerful vested interest. Bugs provide the theme, but politics, deceit, corruption and treachery are its substance.......It is a tale of personal outrage that [the author hopes] proves highly infectious". So do I. He objects to the oversale and overuse of biocidal insecticide products of the huge highly competitive agri-chemical businesses as not even efficient and to the many documented cases of indecent business tactics. Of course, these biocides at first kill not only the insect predators and pathogen-carriers (until some develop immunities) but also natural enemies, pollinators, etc. and also pollute the air, water, ground and bodies of the human applicators and neighbors. Bosch states that "if society, via legislation, demands safe and selective pesticides, the chemical industry will adjust to that reality and provide the material, simply because a billion-dollar market awaits such products." It is scientifically conceived, integrated pest-management systems or else turning the produce and ourselves over to the "bugs". Easy reading, very interesting, important!

"THE ARUN -- A Natural History of the World's Deepest Valley" by Edward W. Cronin, Jr., 236 pp., 45 b/w photos & 2 maps. Houghton Mifflin Company, Boston, Massachusetts 02107. 1979. $10.95.

The Arun Valley Wildlife Expedition with 14 primary scientists and 40 different workers at the maximum began in 1972 "to learn something about one remote place" through the skills of an ornithologist (the author), a herpetologist, a mammalogist, two botanists, knowledgeable Sherpas, etc. This ecological study includes the plant and animal life as it appears at different elevations in this great river valley in the northeastern part of Nepal and the life of the village people. All this makes for interesting descriptions of things done and observed as well as the Himalaya scenery. *Stellaria decumbens* is mentioned as the highest growing flowering plant in the world. A yeti's footprints were pictured at a high camp. As in all underdeveloped countries, there is now the very serious pregnant problem of more people and less food and less fuel with concomitant irreversible destruction of forests and monsoon leached soils. A bird and a mammal list and a bibliography are given. Those young and old who like reading about far away places, natural history, and biological adventures will enjoy this book.

"PLANTS" edited by Daniel B. Ward as Volume 5 of "Rare and Endangered Biota of Florida" series edited by Peter C. H. Pritchard, xxix & 175 pp., 90 b/w fig. & 336 maps. University Presses of Florida, Gainesville, Florida 32611. 1978. paperbound.

For 69 endangered, 55 threatened, 44 rare and 2 special concern plants the ranges are described and mapped in this state by counties and in the Americas involved. Clear-cut line drawings and descriptions, habitats and ranges, specialized and/or unique characteristics, and bases for status classification and recommendations for survival. The plants of special concern are the coast-line building, nourishing detritus-producing, nursery and rookery providing mangroves, *Avicennia germinans* and *Rhizophora mangle*. Since this and the companion studies have been supported by the Florida Audubon Society, the Florida Defenders of the Environment, the State of Florida Game and Fresh Water Fish Commission, and the Florida Cooperative Extension Service, hopefully several of the recommendations, despite real estate development, will become realities of the future.

"THE SCIENTIST'S THESAURUS -- A Treasury of the Stock Words of Science", Fourth Edition compiled & edited by George F. Steffanides, v & 156 pp., 8 b/w tab. Author published, 66 Lourdes Drive, Fitchburg, Massachusetts 01420. 1978. $3.00 paperbound.

"The greatest service of the Greek and Latin tongues in scientific terminology [is that] they give us specific, unchanging terms the meanings of which all scientists can understand and use from time to time and from country to country." On over a hundred pages key words or their parts are given with their English applications so that the book can be used as in reviewing earlier school training in the classical languages, or in personal piecemeal or regular course study. The author urges the reintroduction of Latin and Greek into the school curricula. This study can be very useful. It is a pity that more careful proof reading was not done.

"TRAVELS IN ALASKA" by John Muir, xiii & 328 pp., 12 b/w photo. Houghton Mifflin Company, Boston, Massachusetts 02107. 1979. $5.95 paperbound reprint.

How good it is to have this inexpensive republication available when interests (conservational/developmental) in Alaska, in mountaineering (and mountaineers) and in Muir and fellow naturalists are on the increase. This edition includes the trips of 1879, 1880 and 1890 as first published in 1914. This wonderfully descriptive writing appeals to all ages and ever so many interests. This edition has an introduction by Edwin Way Teale who reports that Muir "was so absorbed in his delight in the wilderness that he hardly seemed aware of danger or of physical hardship. How thrilled, cool, far-transported from the hot city I felt as a youngster reading the local library copy!"

"THE EDGE OF THE SEA" by Rachel Carson, x & 276 pp., 162 b/w fig., 3 maps, 4 plates. Houghton Mifflin Company, Boston, Mass. 02107. 1979. $4.95 paperbound reprint.

This republication in inexpensive form still has all the beauty of the Bob Hines' accurate sketches of the life forms at the sea edge and the beauty of the famous author's word pictures and the appreciative accurate observations of plants and animals of the rocky shores, the sand beaches and the coral edge . The Atlantic coast of the United States has all of these. "To understand the shore........[we must] sense the long rhythm of earth and sea that sculptured its land forms and produced the rock and sand of which it is composed,.......and sense the surge of life beating always at its shores." Still a lovely book.

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