

R. Moldenke Kod. 9c (Z).

VERBENA URTICIFOLIA var. LEIOCARPA Perry & Fernald

Additional bibliography: Moldenke, Phytologia 11: 411--420. 1965; R. B. Clarkson, Castanea 31: 100. 1966.

Additional citations: OHIO: Bartholomew Co.: A. R. Moldenke 1249 (Rf). Decatur Co.: A. R. Moldenke 1247 (Rf). Franklin Co.: A. R. Moldenke 1246 (Ac). Jackson Co.: A. R. Moldenke 1250 (Ac). ILLINOIS: Calhoun Co.: A. R. Moldenke 1273 (Rf). Clay Co.: A. R. Moldenke 1253 (Rf). Fayette Co.: A. R. Moldenke 1262 (Ac). Greene Co.: A. R. Moldenke 1270 (Ac). Macoupin Co.: A. R. Moldenke 1267 (Ac). Marion Co.: A. R. Moldenke 1260 (Ac).

xVERBENA VAGA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 275. 1966; Moldenke, Résumé Suppl. 14: 10. 1966.

VERBENA VALERIANOIDES H.B.K.

Additional bibliography: Bocq., Adansonia 3: [Rev. Verbenac.] 203. 1863; Moldenke, Phytologia 13: 275. 1966.

VERBENA WEBERBAUERI Hayek

Additional & emended bibliography: Moldenke, Phytologia 10: 148 & 297 (1964) and 13: 275. 1966.

The Hammarlund specimens cited below were incorrectly cited by me in 1964 as V. parvula Hayek.

Additional citations: BOLIVIA: La Paz: Hammarlund 167 (N), 196 (N).

VERBENA WRIGHTII A. Gray

Additional bibliography: Moldenke, Phytologia 13: 276. 1966; Moldenke, Résumé Suppl. 14: 1. 1966.

ADDITIONAL NOTES ON THE GENUS AVICENNIA. I

Harold N. Moldenke

AVICENNIA L.

Additional synonymy: Arvicennia Beebe, Zoologia 1: 59, sphalm. 1909. Avacinea Braungart & Arnett, Introd. Pl. Biol. 321, fig. 268, sphalm. 1962. Avicinnia P. Beauv. ex Espirito Santo, Junt. Invest. Ultramar Est. Ens. & Docum. 104: 27, sphalm. 1963. Aviceinnia P. Beauv. ex Espirito Santo, Junt. Invest. Ultramar Est. Ens. & Docum. 104: 74, sphalm. 1963.

Additional & emended bibliography: P. Browne, Civil & Nat. Hist. Jamaic., ed. 2, 263 & Index 1: 12 (1789) and 2: 7. 1789; A. L. Juss.,

- Gen. Pl., ed. 1, 108 (1789) and ed. 2, 121. 1791; Raf., Atl. Journ. 1: 148. 1832; F. Krauss, Flora 28: 68. 1845; W. Griff., Trans. Linn. Soc. Lond. 20: 1—7, pl. 1, fig. 1—14. 1846; A. Rich., Tent. Fl. Abyss. 2: 173. 1851; Seem., Bot. Herald 65 & 66. 1852; N. J. Anderss., Galap. Veg. 201. 1854; N. J. Anderss., Vet. Akad. Handl. Stockh. 1853: 201. 1855; Hassk., Retzia 1: 17 & 246. 1855; Bocq., Adansonia 2: 91—92. 1862; Turcz., Bull. Soc. Nat. Mosc. 36 (2): 226. 1863; Bocq., Rev. Verbenac. 91—92, 178, 179, & 181. 1863; Beddome, Fl. Sylv. Anal. Gen. 174, pl. 22. 1872; Scheffer, Ann. Jard. Bot. Buitenz. 1: 44. 1876; A. Gray, Syn. Fl. N. Am. 2 (1): 334 & 340—341. 1878; Treub, Ann. Jard. Bot. Buitenz. 3: 79—88, pl. 14 & 15. 1883; Lefroy, Bull. U. S. Nat. Mus. 25: 97. 1884; Schenck, Flora 72 [new ser. 44]: [83]—88, pl. 3, fig. 1—6. 1889; Kuntze, Rev. Gen. Pl. 2: 502 & 986. 1891; Warb. in Engl., Bot. Jahrb. 13: 426—427. 1891; W. A. Talbot, Syst. List Trees Shrubs Bomb., ed. 1, 159, 163, & 214. 1894; Just, Bot. Jahresber. 23 (1): 134 & 506 (1897) and 23 (2): 135 & 506. 1897; J. Ramirez, Veg. Méx. 110. 1899; Brenner, Bericht. Deutsch. Bot. Gesell. 20: 175—189, pl. 6—8. 1902; Schimper, Fl. Geogr., ed. Croom & Balfour, 400, 403, 406, & 826. 1903; E. D. Merr., Philip. Journ. Sci. Bot. 1, Suppl. 1: 122. 1906; Beebe, Zoologia 1: 59. 1909; Kawakami, List Pl. Formos. 83. 1910; A. Stewart, Proc. Calif. Acad. Sci., ser. 4, 1: 131—132. 1911; W. A. Talbot, Forest Fl. Bombay 2: 361—363. 1911; Dunn & Tutchner, Kew Bull. Misc. Inf. Addit. Ser. 10: 201 & 205. 1912; J. Matsumura, Ind. Pl. Jap. 2 (2): 528. 1912; Liebau, Beitr. Anat. & Morphol. Mangrove 2, 4, 10—13, 15, 16, 18, 19, 26, 29, & 33. 1913; J. H. Holland, Kew Bull. Misc. Inf. Addit. Ser. 9 [Useful Pl. Nigeria]: 527. 1915; R. T. Baker, Journ. & Proc. Roy. Soc. N. S. Wales 49: 257—281. 1916; Unwin, W. Afr. Forest. 397. 1920; H. N. Ridl., Journ. Fed. Malay States Mus. 10: 150—152. 1920; Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 199—226, [V], & VI, pl. 14—22. 1921; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 2, 102—104, & [106]. 1921; Sprague & Riley, Kew Bull. Misc. Inf. 1924: 3—5. 1924; Gamble, Fl. Madras 1086 & 1105—1106. 1924; P. C. Standl., Contrib. U. S. Nat. Herb. 23: 1235 & 1251. 1924; Cheeseman, Man. N. Zeal. Fl., ed. 2, 764—765. 1925; Den Berger, Handel. de Ned. Ind. Naturwet. Congr. Batavia 1926, 397 & 404. 1927; S. Sasaki, List Pl. Formos. 349. 1928; Schnarf in Linsb., Handb. Pflanzenanat. 10 (2): 233 & 380. 1929; F. R. Irvine, Pl. Gold Coast xlviii, lxvi, lxxix, & 44, fig. 17. 1930; A. Chev., Rev. Bot. Appl. 1931: 1000. 1931; Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 1, 2 (1): 268 & 270. 1931; C. E. C. Fischer, Kew Bull. Misc. Inf. 1932: 295. 1932; Dop & Capdefosse, Cong. Soc. Sav. Toulouse. 1933; Kanehira, Fl. Micron. 456. 1933; Patern., Beitr. Zytol. Verbenac. 30. 1935; Jovet, Bull. Soc. Bot. France 82: 218—219. 1935; Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 1, 2 (2): 613. 1936; Dalz., Useful Pl. W. Trop. Afr. 453. 1937; Sampaio, Bol. Mus. Nac. Rio Jan. 13: 256 & 282. 1937; Fletcher, Kew Bull. Misc. Inf. 1938: 409 & 443—444. 1938; Anon., Kew Bull. Misc. Inf. 1938: index 27. 1938; Robledo, Lecc. Bot. 2: 499. 1940; Lam & Meese in Holthuis & Lam, Blumea 5: 235. 1945; Le Cointe, Amaz.

- Bras. III Arv. & Pl. Uteis, ed. 2, 149--150 & 498. 1947; E. D. Merr., Ind. Raf. 204. 1949; De Sousa, Anais Jun. Inv. Col. 3: 52. 1949; W. A. Talbot, Syst. List Trees Shrubs Bomb., ed. 3, 407--408. 1949; J. Leonard, Nat. Belges Bull. Mens. 34 (3): 53--65. 1953; E. L. Little, U. S. Dept. Agr. Forest Serv. Agric. Handb. 41: 62 & 450. 1953; Symoens, Biol. Abstr. 27: 2768. 1953; Aristeguieta, Clave & Descrip. Fam. Arb. Venez. 192, 193, 246, & 279. 1954; Berhaut, Fl. Sénégal 113 & 115. 1954; Van Steenis, Proc. Sympos. Humid Trop. Veg. 216. 1958; Puri, Proc. Sympos. Humid Trop. Veg. 21. 1958; Wyatt-Smith & Kwan, Proc. Sympos. Humid Trop. Veg. [24]. 1958; F. R. Fosberg, Proc. Sympos. Humid Trop. Veg. 46. 1958; Van Steenis, Fl. Males., ser. 1, 54: 431--445. 1958; Aubrév., Fl. For. Cot. IV. 3: 234, pl. 338. 1959; Reitz, Sellowia 11: 74 & 89. 1959; J. Hutchinson, Fam. Flow. Pl., ed. 2, 2: 395. 1959; Anon., Kew Bull. Gen. Index 1929-1956, 27. 1959; Angely, Liv. Gen. Bot. Bras. 13, 35, & 39. 1960; Soukup, Biota 5: 131. 1960; A. Castellanos & al., Fl. Restinga 22. 1960; Angely, Fl. Paran. 15: 2 & 17. 1960; E. C. G. Gray, Sympos. Impact Man Humid Trop. Veg. 351. 1960; Moldenke, Biol. Abstr. 35: 2177 & 3688 (1960) and 36: 719. 1961; Stearn, Cat. Bot. Books Coll. Hunt 2: xciv. 1961; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1960: 60. 1961; F. R. Irvine, Woody Pl. Ghana 750, fig. 140. 1961; Runner, Rep. G. W. Groff Coll. 362. 1961; Padmanabhan, Curr. Sci. India 30: 425--426. 1961; Khan, Pakist. Journ. Forest. 11: 43--45. 1961; Padmanabhan, Journ. Madras Univ. 32B: 13--19. 1962; Padmanabhan, Curr. Sci. India 31: 434. 1962; Cuf., Bull. Jard. Bot. Brux. 32: Suppl. 803. 1962; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: 1201, pl. 1009. 1962; Angely, Fl. Bacia Paran. 22: 28. 1962; Van Steenis, Proc. Nederl. Akad. Wetens., ser. C, 65: 165--167. 1962; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1961: 60. 1962; Moldenke, Biol. Abstr. 37: 1062. 1962; Hocking, Excerpt. Bot. A.5: 45--46. 1962; Pesman, Meet Fl. Mex. 165--166. 1962; Braungart & Arnett, Introd. Pl. Biol. 321, fig. 268. 1962; Anon., Biol. Abstr. 38: 1203. 1962; Soukup, Biota 4 (31): 112 (1962) and 4: 297. 1963; D. B. Ward, Castanea 28: 174. 1963; Malaviya, Proc. Indian Acad. Sci., ser. B, 58: 45--50 & 351, fig. 1--20. 1963; Siddiqui & Aziz, Planta Med. 11: 458--464. 1963; Sidhu, Ind. For. 89: 337--351. 1963; Espirito Santo, Junt. Invest. Ultramar Est. Ens. & Docum. 104: 27, 29, 31, 35, 41, 54, 56, 61, 64, & 74. 1963; Shelford, Ecol. N. Am. 72, 480, 481, 549, & 578, fig. 19-4. 1963; Compère, Taxon 12: 150--152. 1963; Miranda & Hernández Xolocotzi, Bot. Soc. Bot. Mex. 28: 42, 64, & 110, pl. 38. 1963; H. P. Riley, Fam. Flow. Pl. S. Afr. 128. 1963; Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 322, 323, 325, 439, 547, & 556. 1963; Li, Woody Pl. Taiwan 816--818, fig. 329. 1963; Anon., Biol. Abstr. 44: B.13. 1963; R. Paris in T. Swain, Chem. Pl. Tax. 345. 1963; Meher-Homji, Trav. Sect. Scient. Inst. Franç. Pond. 7 (1): 164 & 166. 1963; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1962: 63 (1963) and 1963: 60. 1964; Menninger, Seaside Pl. 13 & 286. 1964; D. E. Ferguson, Biol. Abstr. 45: 4257 & B.13. 1964; Punt, Reg. Veg. 11. 1964; Moldenke in Shreve & Wiggins, Veg. & Fl. Son. Des. 2: 1263. 1964; G. Kunkel, Veget. Act. Geobot. 12: 97. 1964; Corner, Life of Pl. 26 & 162, pl. 36a. 1964;

Angely, Bibl. Veg. Paran. 143 & 195. 1964; Langman, Select. Guide Lit. Flow. Pl. Mex. 79, 105, 369, 451, 664, & 1010. 1964; B. Singh, Bull. Nat. Bot. Gard. Lucknow 89: 14. 1964; Malaviya, Biol. Abstr. 45: 5670 & 7016 (1964) and 45 (16): B.13. 1964; Van Steenis, Fl. Males. Bull. 19: 1113. 1964; G. Kunkel, Willdenovia 3: 641, 646, & 652. 1964; Anon., N. Y. World Teleg. & Sun R.5, November 17. 1964; A. L. Moldenke, Phytologia 11: 72. 1964; H. & E. Boyko, Trans. N. Y. Acad. Sci., ser. 2, 26: 1091. 1964; Moldenke, Biol. Abstr. 45: 3321. 1964; Moldenke, Résumé Suppl. 11: 5 (1964) and 12: 3, 8, & 9. 1965; Backer & Bakh., Fl. Java 2: 595 & 613. 1965; A. D. Hawkes, Guide Pl. Everglades Nat. Park 41, 43, 45, & 48. 1965; De Naurois & Roux, Bull. Inst. Franç. Afr. Noire 27: 843—857. 1965; A. L. Moldenke, Phytologia 12: 248. 1965; Marg. Nielsen, Introd. Flow. Pl. W. Afr. 17, 51, 53, 162, & 163, fig. 43a. 1965; Liogier, Rhodora 67: 350. 1965; G. Kunkel, Biol. Zentralbl. 84: 642. 1965; G. Kunkel, Ber. Schweiz. Bot. Gesell. 75: 20, 22, 24, 26, 29, 30, 37, & 39, fig. 8, 9, & 14. 1965; F. R. Fosberg, Govt. Sarawak Sympos. Ecolog. Res. Humid Trop. Veg. 272 & 278. 1965; J. Muller, Govt. Sarawak Sympos. Ecolog. Res. Humid Trop. Veg. 148. 1965; Heyligers, Govt. Sarawak Sympos. Ecolog. Res. Humid. Trop. Veg. 253. 1965; Van Steenis, Fl. Males. Bull. 20: 1290. 1965; Moldenke, Phytologia 12: 6 & 30. 1965; Gooding, Loveless, & Proctor, Fl. Barbados 365 & 465. 1965; Giglioli, Ann. Entomol. Soc. Amer. 58: 885, 888, & 890. 1965; Thornton & Giglioli, Journ. Appl. Ecol. 2: 257—261. 1965; Anon., Biol. Abstr. 47 (9): S.15 (1966), 47 (11): S.16 (1966), 47 (17): S.18 (1966), and 47 (18): S.96. 1966; G. Taylor, Ind. Kew. Suppl. 13: 14. 1966; Moldenke, Phytologia 13: 401 & 507. 1966; Anon., Gen. Costa Ric. Phan. 10. 1966; Fournier, Imp. Tree Fam. Costa Ric. 13. 1966; Thornton & Giglioli, Biol. Abstr. 47: 4303. 1966; Macnae, Austral. Journ. Bot. 14: 67—104. 1966; Mathis in T. Swain, Compar. Phytochem. 248 & 267. 1966; Moldenke, Biol. Abstr. 47 (17): S.92. 1966; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1965: 67. 1966; G. W. Lawson, Pl. Life W. Afr. 58 & 59, fig. 21. 1966.

It is of interest to note that Santapau (1960) enumerates the following plants as typical "mangroves" in the Bombay area of India: Acanthus ilicifolius L., Aegiceras corniculatum Blanco, Bruguiera gymnorhiza Lam., Ceriops tagal C. B. Robinson, Clerodendrum inerme (L.) Gaertn., Excoecaria agallocha L., Kandelia rheedii Wight & Arn., Lumnitzera racemosa Willd., Rhizophora mucronata Lam., Sonneratia acida L., and S. apetala Ham.

Backer & Bakhuizen van den Brink (1965) describe the Javan members of this genus as "Trees of the mangrove and the banks of tidal streams, surrounded by emerged, so-called respiratory roots arising vertically from far-creeping horizontal roots. The fruits of the Jav. species drop unopened; soon afterwards they open by 2 valves. The discharged embryo, which is devoid of a testa, possesses 2 large, unequal, fleshy green, conduplicate cotyledons (large one embracing the smaller one), a robust, basally or entirely hairy hypocotyl and a rather far-developed plumule. It floats for some time on the water-surface; young seedlings often

form large intricate clumps. The undersurface of the leaves, and the young branchlets are densely clothed with grey, white or brownish, short, dense, papilloid hairs; the lower surface of the leaves often bears minute salt-crystals; the upper surface is always studded with numerous sunken glandular dots. The horizontal roots from which the so-called respiratory roots arise lie at slight depth in the muddy soil and may reach a length of several metres; the vertical respirators roots arising from them emerge for a length of 20--50 cm from the mud or from the water; they are of moderate thickness, have a tapering top, or not or very sparingly branched and coated with a thick, easily compressible corky layer bearing many lenticels. It is not yet quite sure that they really play a part in the respiration." These same authors also note that these trees are "Sometimes planted between and along coastal fish-ponds. The wood is of very inferior quality, and is almost exclusively used for fuel. This tree is often spared in localities where producers of better wood are continually felled; consequently in the course of time there may locally arise an almost pure Avicennia forest. Such forests are in Java always anthropogenous; they constitute a climax-form of selective devastation of litoral forests coupled with spontaneous regeneration, and are found only in inhabited regions."

Corner (1964) says "A seed must lodge somewhere for some time in order that the young plant within may emerge and root. Such lodgements cannot be made on the rocks in the moving water of seaweed life, though sea grasses and mangrove trees bring their seed heritage from land and establish a new order of seed sea plants on muddy and sandy flats.....On muddy tropical coasts, and their muddy estuaries or lagoons, there develops directly the mangrove forest with its gloomy character. About the limits of the tropics, mangrove trees peter out. The colder air and water of winter, seem to stop them. They cannot withstand frost and they have no subtropical or temperate counterpart. In extratropical waters therefore their place is taken by the characteristic saltmarsh herbs, as the sea lavenders, sea asters, sea chenopods (beets, Salicornia, Obione, Sueda) and the seagrasses."

Of interest to students of history is the report by Siddiqui & Aziz (1963) that a recently discovered manuscript of Abu ben Sina (ca. A.D. 1010) discusses no less than 64 cardiac drugs known to him, with their mode of action. Both physiologic and psychologic principles of therapy are discussed by him.

It should be noted here that the A. St.-Hil., Mém. Mus. Nat. Hist. Paris 4: 387--394 (1818) reference in the bibliography of this genus is sometimes incorrectly cited as "3: 381--394". Similarly, the Hutchinson & Dalz., Fl. W. Trop. Afr. reference is sometimes incorrectly cited as "2: 270 & 613. 1927".

H. P. Riley (1963) reports that the sporophytic chromosome number in this genus is ca. 33. Aristeguieta (1954) records the following vernacular names as applied to this genus as a whole, but he is probably referring only to the local A. germinans: "mangle", "mangle amarillo", "mangle negro", "mangle prieto", and "mangle

salado". Nielsen (1965) says "Genus may be placed in a separate family Avicenniaceae because of unilocular ovary and free central placenta".

The R. M. King 1550, distributed as Avicennia, is actually Laguncularia racemosa (L.) Gaertn. f.

AVICENNIA AFRICANA P. Beauv.

Additional synonymy: Avicinnia africana P. Beauv. ex Espirito Santo, Junt. Invest. Ultramar Est. Ens. & Docum. 104: 27, sphalm. 1963. Aviceinnia africana P. Beauv. ex Espirito Santo, Junt. Invest. Ultramar Est. Ens. & Docum. 104: 74, sphalm. 1963. Avicennia africana Jacq. ex G. Kunkel, Willdenovia 3: 652. 1964.

Additional & emended bibliography: Just, Bot. Jahresber. 23 (2): 135 & 506. 1897; A. Chev., Rev. Bot. Appl. 1931: 1000. 1931; J. H. Holland, Kew Bull. Addit. Ser. 9 [Useful Pl. Nigeria 3]: 527. 1915; Unwin, W. Afr. Forest. 397. 1920; F. R. Irvine, Pl. Gold Coast xlviii, lxvi, & 44, fig. 17. 1930; Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 1, 2 (1): 270 & 631, fig. 271 (1931) and 2 (2): 613. 1936; Dalz., Useful Pl. W. Trop. Afr. 453. 1937; De Sousa, Anais Jun. Inv. Col. 3: 52. 1949; Berhaut, Fl. Sénégal 113 & 115. 1954; Aubrév., Fl. For. Cot. Iv. 3: 234, pl. 338. 1959; Moldenke, Biol. Abstr. 35: 2177 (1960) and 36: 719. 1961; F. R. Irvine, Woody Pl. Ghana 750, fig. 140. 1961; Espirito Santo, Junt. Invest. Ultramar Est. Ens. & Docum. 104: 27, 29, 31, 35, 41, 54, 56, 61, & 64. 1963; Compère, Taxon 12: 150—152. 1963; Hepper in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 448 & 449, fig. 309. 1963; G. Kunkel, Willdenovia 3: 652. 1964; Moldenke, Résumé Suppl. 11: 5. 1964; Giglioli, Ann. Entomol. Soc. Amer. 58: 885, 888, & 890. 1965; Marg. Nielsen, Introd. Flow. Pl. W. Afr. 17, 51, 53, 162, & 163, fig. 43a. 1965; G. Kunkel, Ber. Schweiz. Bot. Gesell. 75: 20, 22, 24, 26, 29, 30, 37 & 39, fig. 8, 9, & 14. 1965; Thornton & Giglioli, Journ. Appl. Ecol. 2: 257—269. 1965; G. W. Lawson, Pl. Life W. Afr. 58 & 59, fig. 21. 1966.

Additional illustrations: F. R. Irvine, Pl. Gold Coast fig. 17. 1930; Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 1, 2 (1): fig. 271. 1931; Aubrév. Fl. For. Cot. Iv. 3: pl. 338. 1959; F. R. Irvine, Woody Pl. Ghana fig. 140. 1961; Hepper in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 2: fig. 309. 1963; G. Kunkel, Ber. Schweiz. Bot. Gesell. 75: fig. 8, 9, & 14. 1965; Giglioli, Ann. Entomol. Soc. Amer. 58: 885—891. 1965; Marg. Nielsen, Introd. Flow. Pl. W. Afr. fig. 43a. 1965; G. W. Lawson, Pl. Life W. Afr. fig. 21. 1966.

Giglioli (1965) reports that the females of the mosquito, Anopheles melas, lay their eggs after dark in the first half of the night on damp mud under Avicennia trees during neap tides. Thornton & Giglioli (1965) report that the highest concentrations of water-soluble sulfate and free sulphur were found in Gambia under Avicennia where this tree appeared as a secondary colonizer. Additional vernacular names reported for this species are "bùle", "bulé", "cabêco", "cabêso", "cabaca", "djibicum", "iô", "iôfo",

"pebadije", "petá", "pule", "púle", "tarafe", "tarafé", and "úle". The name "tarafe" is applied also to Laguncularia and Rhizophora. The Hutchinson & Dalziel reference cited above is sometimes misdated "1927".

Hepper (1963) records the species as flowering in July, and fruiting in January, February, April, July, and August. He cites the following specimens, doubtless from the Kew herbarium: MAURITANIA: Döllinger 73, in part. SENEGAL: Döllinger 73, in part; Baldwin 5753; Chevalier 2759 & 2760; Leprieur s.n. GAMBIA: Fox 106; Pitt 693; Frith 34; Ruxton s.n. PORTUGUESE GUINEA: Esp. Santo 1219 & 1766. GUINEA: Debeaux s.n. SIERRA LEONE: Deighton 2362; Don 168; Glanville 246; T. S. Jones 410; Lane-Poole 320; Thomas 7070. LIBERIA: Baldwin 13050; Dinklage 1910; T. Vogel 101; Whyte s.n. IVORY COAST: Chevalier 19908. GHANA: Andoh 5604; Chipp 175; DeWit & Morton A.2971; Irvine 754; Johnson 984; Morton A.494. TOGO REPUBLIC: Warnecke 63. SOUTHERN NIGERIA: Barter 46; MacGregor 341; Rosevear 16; Talbot s.n.; Unwin 56. BRITISH CAMEROONS: Maitland 30. FERNANDO PO: Mann 231; Milne s.n. He notes that it "Extends along the coast of western Africa to Cabinda and Congo; also in S. Tome. If this plant is regarded as conspecific with similar ones in America, as does Compère in Taxon 12: 150—152 (1963), the correct name appears to be A. germinans (Linn.) Linn."

Compère (1963) makes the following interesting comments: "I have compared the African material named Avicennia africana P. Beauv. with the American material of A. germinans deposited in the Brussels 'Herbarium du Jardin Botanique de l'Etat'. Though these plants show a wide variability, I am unable to find any constant character separating the African plants from the American ones. According to Moldenke.....A. africana should have mostly narrow and elongate leaf-blades, up to 24 cm. long, and not nigrescent in drying, whereas A. germinans would have shorter and broader leafblades, 4.5—15 cm. long, and nigrescent in drying. I have measured the leaves of all the specimens in Brussels; the African plants have leaves 8—16 cm long and 12 of the 33 specimens are nigrescent on drying, whereas the American ones have leaves 5,5—16 cm long and only 9 of the 22 specimens are nigrescent on drying. Thus, these plants show a close parallel variation on both sides of the Atlantic Ocean and it does not seem possible to separate them at a specific level."

Dalziel (1937) says "The sapwood is white, the heart light brown, darkening, fairly hard and durable, said to be termite-proof. It is used on the coast for boat and house-building, piles, wharves, gunstocks, etc. It yields firewood, and charcoal for fish ovens, and is used in the Niger Delta to prepare salt, chiefly from the leaves and roots; the salt from A. nitida is better than that from other mangroves, etc. The bark yields tannin (12.5 percent) and is suitable for local use in tanning (B. I. I. 1913:417, analysis). It is also said to be used as a red dye. The bark is used to treat

parasitic skin diseases, itch, etc. In Western Senegal some island people are said to use the germinating seeds of Avicennia as a famine food, but these, when uncooked or improperly prepared, are actually poisonous (Ref. — A. Chev. in R. B. A. 1931: 1000). He lists many vernacular names: "white mangrove" [also given to Laguncularia], "black mangrove", "palétuvier blanc", "sana" [also applied to Rhizophora], "mbougand" [the fruit], "tarrafe", "ufiri", "é-bure", "ka-bure", "garigari", "grigri", "buwe", "nja-wului" [= "waterside tree"], "jaia-guli", "gbělěti", "buě", "buě-dintě", "asukuru", "asokoro", "asopro", "asokpolo", "angma-taho", "mutukutsho", "tra-tsho", "amu-tsi" [= "lagoon tree"], "amu-ati", "ogbun", "ede", "ehrodo", "afia-nunung", "ata-nunung", "odonumon", and "boandjo". He notes that some of these names are used for any of the various mangrove plants of the region.

Irvine (1961) describes A. africana as follows: "A shrub or tree 60—70 ft. high; 'breathing roots' (pneumatophores) numerous, protruding 1—2 in. from lagoon-side mud, slender 'stilt roots' near trunk base, bark scaly, deciduous, dark red-brown, branchlets puberulous; leaves lanceolate to oblong-lanceolate, rarely narrowly elliptic, shiny above, closely pitted, dull olive-green below, 7 x 3 in., lateral nerves 10—12 pairs, raised on both surfaces, looped and joined near edges, forming intra-marginal nerves; flowers (Apr., June-July, Oct.) fragrant, bird-pollinated, dull white, thin purplish stripes inside, petals usually 4, flowers crowded on short stalks often as small panicle; fruits (Jan.) 1—2 in. long, green, obliquely ellipsoid, flattened laterally, beaked, tomentellous. The germinating seeds are used in certain western Senegalese islands in famine, and said to be actually poisonous if eaten raw or improperly cooked.....The sapwood is white, the heartwood light brown. It is fairly hard and durable, and is said to resist termites and is useful for housebuilding, furniture (e. g. chair-legs), and boats. It stands well under water and forms excellent fuel and charcoal. The bark yields 12.5 per cent. tannin, is used to tan leather, and is used in S. Leone as a red dye. Salt prepared mainly from the leaves and roots in the Delta region of Nigeria is said to excel that made from other mangroves. The dry pulverized bark in warm water is used as a paste for parasitic skin diseases, itch, and dermatitis. The pulverized bark, with palm-oil, is made into an ointment which is used in Fr. Equat. Africa for itch, lice, and 'flesh worms' (Abbé Walker). The leaves are said to be used as an enema in Liberia for piles." He says that the plant inhabits the mangrove association, is gregarious, and is distributed from "Senegambia to Gaboon and B. Congo". He records the vernacular names "amutsi", "asokplo", "asudur", "asoporo", "asokoro", "anmaatso", "black mangrove", "esukuru", "mutukutxo", "olive mangrove", and "tratzo" -- "amutsi" meaning "lagoon tree". He cites Chipp 175, Deakin 24, Foggie 4842, Irvine 754, and Johnson 984. In his 1930 work he describes this tree as "One of the tallest trees in lagoon community" and records the vernacular names "adma'txo", "asokpolo", and "white mangrove".

According to Nielsen (1965) "it is to be noticed that all the

youngest and most active feeding roots are carried on the underground portions of the breathing roots. Since they are able to grow continually upwards, they can bear more and more new roots as the soil level rises. It is viviparous like the red mangrove. It is seen as a shrub in great numbers near ports or as a tree in less disturbed areas near beaches, creeks or lagoons subject to flooding twice a month, usually on higher ground than Rhizophora. It is known as white mangrove in Africa."

Lawson (1966) calls this plant "white mangrove" also, and comments that "mangroves form a good example of convergent evolution because they have a number of marked characteristics in common even though they consist of a group of plants derived from widely divergent families, such as evergreen leathery leaves, breathing roots, and vivipary. Found in open type lagoons influenced by twice daily flooding."

Additional citations: LIBERIA: Dinklage 1910 (A).

AVICENNIA ALBA Blume

Additional synonymy: Avicennia officinalis var. alba Hook apud Talbot, Forest Fl. Bombay 2: 364, in syn. 1911. Avicennia marina var. alba Bakh. apud Fletcher, Kew Bull. Misc. Inf. 1938: 444. 1938. Avicennia officinalis var. alba C. B. Clarke apud Fletcher, Kew Bull. Misc. Inf. 1938: 444. 1938.

Additional & emended bibliography: Hassk., Retzia 1: 17 & 246. 1855; Scheffer, Ann. Jard. Bot. Buitenz. 1: 44. 1876; Talbot, Forest Fl. Bombay 2: 361, 363, & 364, fig. 457. 1911; H. N. Ridl., Journ. Fed. Malay States Mus. 10: 151. 1920; Bakh. in Bakh. & Lam, Nov. Guinea 14, Bot. 1: 172. 1924; Gamble, Fl. Madras 1105 & 1106. 1924; C. E. C. Fischer, Kew Bull. Misc. Inf. 1932: 295. 1932; Kanehira, Fl. Micron. 456. 1933; Fletcher, Kew Bull. Misc. Inf. 1938: 443-444. 1938; Anon., Kew Bull. Misc. Inf. 1938: index 27. 1938; Anon., Kew Bull. Gen. Index 1929-1956, 27. 1959; E. C. G. Gray, Sympos. Impact Man Humid Trop. Veg. 351. 1960; Santapau, Fl. Bombay & Salsette [3]. 1960; Moldenke, Phytologia 7: 151-158 & 293. 1960; Moldenke, Biol. Abstr. 36: 719. 1961; Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 323, 547, & 556. 1963; Moldenke, Dansk Bot. Arkiv 23: 85. 1963; Meher-Homji, Trav. Sect. Scient. Inst. Franç. Pond. 7 (1): 166. 1963; Backer & Bakh., Fl. Java 2: 614. 1965; Moldenke, Résumé Suppl. 12: 8. 1965.

The fig. 457 in Talbot, Forest Fl. Bombay 2: 363 (1911), previously cited by me, as well as by other authors, as A. alba, and so labeled by Talbot, is actually a representation of A. marina (Forsk.) Vierh.

The leaves on Elmer 21250 are exceptionally broad. Material of A. alba has been misidentified and distributed in herbaria under the name A. alba Wight, which is a synonym of A. marina (Forsk.) Vierh. The A. alba of Karsten is A. eucalyptifolia Zipp., as is also A. alba var. acuminatissima Merr. On the other hand, the Purseglove P.5098, distributed as A. alba, is actually var. latifolia Moldenke, Hoogland 4699 is A. eucalyptifolia Zipp., and Elmer

11990 is in part A. alba and in part A. eucalyptifolia.

The natural distribution of A. alba seems to be from India and Burma, through Indochina and Thailand to Malaya, the Philippines, Caroline Islands, Riouw Archipelago, Sumatra, Java, Borneo, Celebes, Lesser Sunda Islands, the Moluccas, New Guinea, Bismark Archipelago, Solomon Islands, and northern Australia. Fischer (1932) cites Tahir s.n. [Herb. Forest Dept. 1232] from British North Borneo.

Additional citations: INDOCHINA: Cochinchina: Pierre s.n. [Baria, 12.1865] (Ca—38881). WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Island undetermined: Herb. Philip. Forest Bur. s.n. (Bi). INDONESIA: GREATER SUNDA ISLANDS: British North Borneo: Elmer 21250 (Vi). Java: Hochreutiner 2776 (Ca—41253). Kambangan: Collector indig. s.n. [12-6-09] (Bi). Sumatra: Yates 1110 (Mi). MELANESIA: NEW GUINEA: Papua: Brass 28889 (W—2409563); Hoogland 4184 (W—2213809). BISMARCK ARCHIPELAGO: New Britain: Dissing 2692 (Ac, Cp).

AVICENNIA ALBA var. LATIFOLIA Moldenke

Additional bibliography: Moldenke, Phytologia 7: 158—159. 1960.

Purseglove describes this plant as a tree to 40 feet tall, with peg-like breathing roots, the corollas deep-yellow, and the fruit gray-green tomentose, growing in pure stands along tidal creeks, flowering and fruiting in May. He identified it as A. alba Blume.

Additional citations: INDONESIA: GREATER SUNDA ISLANDS: Sarawak: Purseglove P.5098 (N).

AVICENNIA BICOLOR Standl.

Additional bibliography: Moldenke, Phytologia 7: 160—161. 1960.

Additional citations: PANAMA: Darien: Duke 5488 (Z). PEARL ISLANDS: San José: I. M. Johnston 1259 (Rf).

AVICENNIA EUCALYPTIFOLIA Zipp.

Additional bibliography: Moldenke, Phytologia 7: 162—165. 1960; G. Taylor, Ind. Kew. Suppl. 13: 14. 1966.

Additional vernacular names recorded for this species are "kabubu" and "utukap". Material has been misidentified and distributed in herbaria under the name A. tomentosa Jacq.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Mindanao: Elmer 11990, in part (Bi). MELANESIA: SOLOMON ISLANDS: Malaita: Kajewski 2344, in part (Bi). NEW GUINEA: Papua: Hoogland 4699 (Bi, W—2213989); J. C. Saunders 138 (W—2213494). AUSTRALIAN REGION: AUSTRALIA: Western Australia: Kaspiew 23 (S).

AVICENNIA GERMINANS (L.) L.

Additional & emended synonymy: Avicennia germinans (L.) P. Browne,

Civil & Nat. Hist. Jamaic., ed. 2, index 1: [12] (1789) and 2: [7]. 1789. Avicennia floridana Raf., Atl. Journ. 1: 148. 1832. Avicennia nitida Beebe, Zoologia 1: 59, sphalm. 1909. Avicennia germinalis (L.) Stearn apud Soukup, Biota 5: 131, sphalm. 1960. Avicennia nitida (Alter.) Sessé & Moq. ex Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 556. 1963.

Additional & emended bibliography: L., Sp. Pl., ed. 1, 1: 110 (1753) and ed. 3, 2: 891. 1764; P. Browne, Civil & Nat. Hist. Jamaic., ed. 2, 263, index 1: [12] (1789) and 2: [7]. 1789; Willd. in L., Sp. Pl., ed. 4, 3: 394—395. 1800; Benth., Bot. Voy. Sulphur 155. 1846; Seem., Bot. Herald 65 & 66. 1852; N. J. Anderss., Galap. Veg. 201. 1854; N. J. Anderss., Vet. Akad. Handl. Stockh. 1853: 201. 1855; J. Torr., Bot. Mex. Bound. 128. 1858; Turcz., Bull. Soc. Nat. Mosc. 36 (2): 226. 1863; A. Gray, Syn. Fl. N. Am. 2 (1): 341. 1878; Lefroy, Bull. U. S. Nat. Mus. 25: 97. 1884; Schenck, Flora 72: [83]—88, pl. 3, fig. 1—6. 1889; Just, Bot. Jahresber. 23 (2): 135 & 506. 1897; J. Ramírez, Veg. Méx. 110. 1899; Brenner, Ber. Deutsch. Bot. Gesell. 20: 175—189, pl. 6—8. 1902; Altamirano, An. Inst. Méd. Nac. Méx. 5: 54—60. 1903; Schimper, Pl.-Geogr., ed. Groom & Balfour, 406. 1903; Beebe, Zoologia 1: 59. 1909; A. Stewart, Proc. Calif. Acad. Sci., ser. 4, 1: 131—132. 1911; Liebau, Beitr. Anat. & Morphol. Mangrove 4. 1913; P. C. Standl., Contrib. U. S. Nat. Herb. 23: 1251. 1924; Sprague & Riley, Kew Bull. Misc. Inf. 1924: 3—5. 1924; F. R. Irvine, Pl. Gold Coast xlviii, lxvi, & 44. 1930; Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 1, 2 (1): 270, fig. 271. 1931; Dalz., Useful Pl. W. Trop. Afr. 453. 1937; Sampaio, Bol. Mus. Nac. Rio Jan. 13: 256 & 282. 1937; Robledo, Lecc. Bot. 2: 499. 1940; H. Pittier, Cat. Escog. Geogr. Fis. & Prehis. Costa Rica 26. 1942; LeCointe, Amaz. Bras. III. Arv. & Pl. Uteis, ed. 2, 149—150. 1947; E. D. Merr., Ind. Raf. 204. 1949; E. L. Little, U. S. Dept. Agr. Forest Serv. Agric. Handb. 41: 62. 1953; Hocking, Dict. Terms Pharmacog. 135. 1955; H. Hildebrand, Ciencia 17 (7-9): 151—173. 1958; J. F. Macbr., Field Mus. Publ. Bot., ser. 13, 5: 721. 1960; Soukup, Biota 5: 131. 1960; Moldenke, Phytologia 7: 165—168 & 179—206. 1960; Moldenke, Biol. Abstr. 35: 2177 & 3688. 1960; Hocking, Excerpt. Bot. A.5: 45. 1960; Angely, Fl. Paran. 16: 38 (1960) and 17: 15. 1961; F. R. Irvine, Woody Pl. Ghana 750. 1961; E. L. Little, Phytologia 8: 49—57. 1961; Soukup, Biota 4: 112. 1962; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: 1201, pl. 1009. 1962; Moldenke, Biol. Abstr. 37: 1062. 1962; Pesman, Meet Fl. Mex. 165—166. 1962; Hocking, Excerpt. Bot. A.5: 45. 1962; Braungart & Arnett, Introd. Pl. Biol. 321, fig. 268. 1962; Compère, Taxon 12: 150—152. 1963; Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 322, 323, 547, & 556. 1963; Miranda & Hernández Xolocotzi, Bol. Soc. Bot. Mex. 28: 42, 55, 64, & 110, pl. 38. 1963; Shelford, Ecol. N. Am. 72, 480, 481, 549, & 578, fig. 19—4. 1963; D. B. Ward, Castanea 28: 174. 1963; Langman, Select. Guide Lit. Flow. Pl. Mex. 79, 369, 451, & 1010. 1964; Menninger, Seaside Pl. 13. 1964; Anon., N. Y. World Teleg. & Sun R.5, November 17. 1964; Punt, Reg. Veg. 36: 11. 1964; Moldenke in Shreve & Wiggins, Veg. & Pl. Son. Des. 2:

1263--1264. 1964; Little & Wadsworth, U. S. Dept. Agr. Handb. 249: 12 & 476--478, pl. 225. 1964; A. L. Moldenke, Phytologia 11: 72 (1964) and 12: 248. 1965; A. D. Hawkes, Guide Pl. Everglades Nat. Park 41, 43, 45, & 48. 1965; Scholander, Science 148: 1488. 1965; Liogier, Rhodora 67: 350. 1965; Scholander, Hammel, Bradstreet, & Hemmingsen, Science 148: 339, fig. 3. 1965; Kunkel, Bericht. Schweiz. Bot. Gesell. 75: 24. 1965; Gooding, Loveless, & Proctor, Fl. Barbados 365 & 465. 1965; Moldenke, Résumé Suppl. 12: 1 & 3. 1965; Thornton & Giglioli, Journ. Appl. Ecol. 2: 257, 261--264, & 267--269. 1965; G. Taylor, Ind. Kew. Suppl. 13: 14. 1966; Fournier, Imp. Tree Fam. Costa Ric. 13: 1966; G. W. Lawson, Pl. Life W. Afr. 58 & 59. 1966.

Additional illustrations: Schenck, Flora 72: pl. 3, fig. 1--6. 1889; Brenner, Ber. Deutsch. Bot. Gesell. 20: pl. 6--8. 1902; Pesman, Meet Fl. Mex. 165. 1962; Braungart & Arnett, Introd. Pl. Biol. fig. 268. 1962; Miranda & Hernandez Xolocotzi, Bol. Soc. Bot. Mex. 28: 110, pl. 38. 1963; Shelford, Ecol. N. Am. 481, fig. 19-4. 1963; Little & Wadsworth, U. S. Dept. Agr. Handb. 249: pl. 225. 1964; A. D. Hawkes, Guide Pl. Everglades Nat. Park 41. 1965; Scholander, Hammel, Bradstreet, & Hemmingsen, Science 148: 339, fig. 3 [second from left]. 1965.

Recent collectors describe this plant a shrubby, to 10 feet tall, a shrub, 2 m. tall, or a tree, to 25 m. tall; trunk to 50 cm. in diameter at breast height; pneumatophores present; leaves succulent; calyx green or greenish; stamens white above, with a yellow base; anthers dark-brown; pistil light-green.

The flowers are described as "white" on Crosby & Anderson 1192, Irwin 542, Turner 2143, and Yuncker 17136 & 18159; "white with yellow tube" on Harling 4966; "white above with yellow base" on Crosby, Hespenheide, & Anderson 803; and "creamy-white with yellow center" on Carter 2721. Irwin 542 has leaves which are much like those normally seen on *A. africana* P. Beauv. In fact, it is not at all beyond the realm of possibility that the long-leaved specimens found sporadically in the New World are actually the African species. I have never been fully satisfied that they are conspecific with typical *A. germinans* material. The fig. 271 in Hutchinson & Dalziel (1931), labeled "*Avicennia nitida*", is actually an illustration of typical *A. africana*.

Avicennia germinans inhabits seashores, saline shores and flats, tidal bays, and rocky beaches, from sea-level to 25 m. altitude. Recent collectors have found it in anthesis in February, May, July, and October. King calls it "not common in flat open grazed areas behind beach, in sandy soil, the vegetation mainly thorny leguminous shrubs" in Oaxaca, while Wiggins found it growing "along muddy strand with *Rhizophora mangle*" in Baja California, Hernandez Xolocotzi & Segalen encountered it "with *Rhizophora*, *Laguncularia*, *Spartina*, and *Acrostichum*" in Tabasco, and Carter describes it as "abundant on low dunes" in Baja California, Mexico. Irwin found it "in wet alluvial clay immediately above

hightide zone" in British Guiana. Box tells us that in Antigua it is found in "all coastal associations, often forming large mangrove swamps on mud flats, frequent to abundant around the coast"; Yunker encountered it at the edge of mangrove swamps and associated with Rhizophora in Jamaica. On this same island Crosby, Hespenheide, & Anderson describe it as "common at edge of mangrove swamps", while Crosby & Anderson call it "common on rocky beach". In Pasco County, Florida, it was found by Ray, Lakela, & Patman "in sandy marl, open grassy area with cabbage palmetto and scrub oak", while on Mustang Island, Texas, it is "locally abundant" according to Jones.

On Indefatigable Island, according to Taylor, "this is the less frequent of the mangroves, which are almost all Rhizophora. This forms tall trees (40--50 ft.) which show up above the shrub vegetation of the adjacent dry belt.....the wood of this trees is said to be very bad for firewood."

In Shreve & Wiggins (1964) the general distribution of this species is given as "Mangrove lagoons, from southern Florida and southeastern Texas, Bermuda, the Bahamas, and both coasts of Mexico, through the West Indies to the coasts of Brazil and Peru; also on the Galapagos and other islands off the coasts of tropical and subtropical America. In our area [Sonoran Desert] from the vicinity of Mulegé, Magdalena Bay, and Guaymas south along the coast."

Little & Wadsworth (1964), in their work on the flora of Puerto Rico and the Virgin Islands, say "The virgin forests along the shores of protected bays, lagoons, and estuaries were dense stands of mangrove, the trees of only 4 species growing to a height of 60 feet or more. Five public forests bordering the coast still contain mangroves. In the water itself is Mangle colorado (Rhizophora). On the adjacent area normally subject to tidal flooding are Mangle blanco (Laguncularia) and Mangle negro (Avicennia). On the landward side is Mangle botón (Conocarpus). The discussion of our plant by these authors is so excellent that it is well worth repeating here:

"This is 1 of the 4 kinds of mangrove trees which form swamp forests at sea level in salt water and brackish water along silty seashores. Mangle prieto is distinguished by: (1) opposite lance-shaped or narrowly elliptic leathery leaves 2--4 1/2 inches long and 1/2--1 3/4 inches broad, the upper surface yellow green and often shiny, the lower surface gray green with a coat of fine hairs giving a grayish color to the crown, and both surfaces often with scattered salt crystals and salty to the taste; (2) clusters of several crowded stalkless white 4-lobed flowers about 1/4 inch long and 3/8 inch across; (3) elliptic flattened blunt-pointed seed capsules 1 -- 1 1/4 inches long and about 3/4 inch wide, yellow-green and finely hairy, often splitting open into 2 parts; and (4) bright orange to yellow inner bark.

"Commonly a small tree or shrub 10--40 feet high and attaining a trunk diameter of 1 foot in Puerto Rico, evergreen with rounded crown of spreading branches. Bark is smooth and dark gray or brown

on small trunks but becomes dark brown, fissured and scaly, and thick. The inner bark, brown, deeper within, has a slight salty taste. Twigs are gray or brown, finely hairy when young, with enlarged and ringed joints or nodes.

"Often numerous fleshy pencillike projections (pneumatophores) rise vertically from the long horizontal roots in the mud under a tree, perhaps aiding in bringing air to the roots. Masses of roots $1/2$ to $1\ 1/2$ feet long sometimes hang in the air from the upper part of large trunks.

"The short petioles are $1/8$ -- $1/2$ inch long. Blades are short-pointed or blunt at apex, short-pointed at base, and not toothed on edges.

"Flower clusters (spikes or panicles) are terminal and lateral, erect on 4-angled stalks $1/2$ -- $1\ 1/2$ inches long, and bear several finely hairy flowers. The gray-green calyx is cup-shaped, $3/16$ inch long, deeply 5-lobed, with 3 smaller scales (bracts) outside; the corolla tube about the same length has 4 slightly unequal spreading rounded or notched lobes, white but yellowish at base; 4 stamens $3/16$ inch long are inserted on corolla tube near base; and the pistil $3/16$ inch long has a 1-celled ovary, slender style, and 2-lobed stigma.

"The fleshy seed capsule contains 1 large dark green seed which is an embryo plant without seedcoat. Often the seed germinates on the tree, splitting open the fruit. Upon falling, the young plant continues growth in the mud or may float and be transported by tide and currents. Flowering and fruiting nearly throughout the year.

"The sapwood is light brown and thick. The heartwood is dark brown or blackish. The wood is very hard, very heavy (specific gravity 0.9), and strong. It has a coarse, uneven, interlocked grain and prominent growth rings and is very susceptible to attack by dry-wood termites.

"Seldom sawed into lumber, the wood is used primarily for posts in Puerto Rico. Timbers of larger size have been employed elsewhere for various purposes, such as piers, wharves, and other marine construction, as well as for telegraph and power poles and crossties. The wood is used also for fuel and charcoal, and the bark for tanning.

"This is an important honey plant of coastal areas, producing clear white honey of high quality. The flowers are rich in nectar and attract bees. It is reported that the sprouting seeds are edible when cooked but poisonous raw. Salt for cooking or eating purposes can be obtained from the salt-coated foliage.

"This species seems more hardy than the other 3 kinds of mangroves, to which it is not related. It penetrates farther inland along rivers and in the United States ranges farther northward, beyond the tropical zone. In Puerto Rico it appears to withstand prolonged flooding better than white-mangrove (Laguncularia racemosa). The advancing thickets of mangroves with networks of roots collect and hold silt, thus building up the shores.

"In mangrove forests in brackish water near protected silty

shores and at mouths of rivers around Puerto Rico, usually with other species of mangrove but rarely forming pure stands. Also Culebra, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

"Public forests. -- Aguirre, Boquerón, Ceiba, Guánica, and San Juan.

"Range. -- Very widely distributed along tropical silty sea-shores of Bermuda and throughout West Indies (except Dominica) from Bahamas and Cuba to Trinidad and Tobago and Bonaire and Curaçao. Coasts of Florida from northern part to Florida Keys, Mississippi, Louisiana, and Texas in southeastern United States and both coasts of Mexico south along Central America to Ecuador, northwestern Peru, and Galapagos Islands and to Brazil. Also west coast of Africa.

"Other common names. -- mangle negro, mangle bobo, siete cueros, salado (Puerto Rico); mangle prieto, mangle negro, mangle blanco (Spanish); black-mangrove, manglecito (commerce); puyequé (Mexico); palo de sal (Central America); istatén, árbol de sal (El Salvador); culumate, mangle salado (Costa Rica); manglé salado, white-mangrove (Panama); iguanero (Colombia); mangle salado, mangle rosado, mangle prieto (Venezuela); mangle iguanero (Ecuador); black-mangrove, honey-mangrove, saltbush (United States); black-mangrove (English); blackwood-bush (Bahamas); limewood (Trinidad); courida, cruda (British Guiana); manglier noir, palétuvier (Haiti); palétuvier blanc, mangle blanc, chêne Guadeloupe, palétuvier (Guadeloupe); palétuvier blanc, manglier noir (French Guiana); mangel blancu, saltpond-tree (Dutch West Indies); parwa (Surinam); siriuba, seriba (Brazil)."

Additional vernacular names recorded by collectors are "mangle amarillo", "mangle cenizo", "mangle gris", "mangle pardo", "mangle senico", "mangue amarelo", and "palétuvier branco". Sampaio (1937) records "mangue", "mangue cereibuma", "mangue cereitinga", "seriba", and "seriúba", but notes that the first of these is applied also to Laguncularia and to Rhizophora.

Carter describes Avicennia germinans as abundant on low dunes on "sand dune peninsula extending into a bay" and says that the flowers are "creamy white and a yellow center". Carter & Ferris found it growing along with Allenrolfea, Salicornia, and Batis on low saline flats, with Laguncularia as an associate and Suaeda farther inland. Le Cointe (1947) says "Predomina nos mangais de Marajó e na parte setentrional do litoral paraense", the wood "Pardo-escuro; para construção civil, formentes. D = 0,95. -- O lenho e otimo combustivel. Ind. -- A casca é rica em tanino. -- Dá boa pasta para papel de impressão (43,7 % de celulose)."; in medicine "Adstringente poderoso, anti-hemorrágico, anti-diarréico". Beebe (1909) reports that its leaves are eaten by the haotzin (Opisthocomus hoazin).

Pesman (1962) tells us that in Mexico "Strangely enough it is called both white and black (mangle blanco and mangle prieto or negro). It does not have stilt roots but sends out vertical rootlets above the water to breathe. Seeds, as in Rhizophora, may sprout while on the tree. On falling they are kept afloat until finding a

likely place to grow, along the shoreline.....The tree is often lopped for firewood, reducing it to low shrubs." It grows to 75 feet tall. Ward (1963) records it from Cedar Key and Seashore Key, Levy County, Florida; Bonet says "Introducida de Isla Pájaro (Campeche) en 1948".

Sprague & Riley (1924) state that mangrove swamps cover the low coast line of British Honduras and numerous cays or coral islands, giving a densely wooded appearance -- the principal trees being red, white, and black mangroves. Rovirosa, in *La Naturaleza*, reproduced by Ramirez (1899), refers to Avicennia on the sea-coast of Tabasco; Seeman (1852) mentions it with Rhizophora and Acrostichum aureum as the principal elements in the littoral flora of Panama. Schimper (1903) states that the mangrove formation of west Africa and of the American coasts consists of 4 species: Rhizophora mangle (on the outer edge), Laguncularia racemosa (on the inner boundary), and Avicennia nitida & A. tomentosa (in the intermediate position).

Little (1961) presents very fully the arguments in favor of the legal conservation of the name A. nitida for this species. Stearn (1958) presents the arguments for the rejection of this binomial and its replacement by A. germinans (L.) Stearn. Punt (1964) accepts the name, A. germinans (L.) P. Browne, as the proper one for this taxon, but Compère (1963) maintains A. germinans (L.) L. as the proper form. His paper is of such importance that it may be well to reproduce it here:

"For a long time this plant was called Avicennia nitida Jacq., but, in 1958, Stearn....made for it the new combination Avicennia germinans (L.) Stearn, based on the older Bontia germinans L. Recently, E. L. Little.....showed that the name Avicennia germinans had been published already by Linnaeus in 1764 and by P. Browne in 1789, which obviously anticipates Stearn's combination. In his paper, Little gives a very complete account of the literature on the nomenclature of this species and concludes that Avicennia nitida Jacq. remains the correct name. His conclusion is based on the assumption that A. germinans L. was a new name, superfluous when published, and not a new combination based on Bontia germinans L. It is this assumption that I wish to discuss here.

"Linnaeus first published the name Bontia germinans in his *Systema Naturae* ed. 10: 1122. 1759. His description is very short: "A. B. fol. oppositis, pedunculis spicatis. Brown. jam. 263. Loebl. hisp. 193."

"The lectotype of this species, proposed by Stearn and later accepted by Little (*Phytologia* 8: 49. 1961) and Moldenke (*Phytologia* 7: 183. 1960) is a specimen from Browne in the Linnaean Herbarium, no. 813, 2, which was first described by P. Browne (*Civ. Nat. Hist. Jam.*: 263. 1756) to whom Linnaeus refers by means of the citation Brown. jam. 263.

"In the second edition of his *Species Plantarum* 2: 891. 1763, Linnaeus took up Bontia germinans again, but he expanded its circum-

scription to include the Avicennia officinalis of the first edition 1:110. 1753; here it is described in this way:

"BONTIA foliis oppositis pedunculis spicatis.

Bontia foliis subtus tomentosis. Jacq. amer. 25.

Bontia foliis integris oblongis oppositis, petiolis crassis brevissimis subamplexantibus, floribus racemosis. Brown. jam. 263

Mangle laurocerasi foliis, flore albo tetrapetalo. Sloan. jam. 156. hist. 2. p. 66. Raj. dendr. 115.

Avicennia. Fl. zeyl. 57. Mat. med. 42. Sp. pl. I. p. 110.

Anacardium. Bauh. pin. 511.

Oepata. Rheed. mal. 4. p. 95. t. 45.

Habitat in Indiis.

Reduxi hanc speciem ex sententia D. Jacquini autoptiae.'

"One year later, in the third edition of Linnaeus' Species Plantarum 2: 891. 1764, this species was transferred from Bontia to the genus Avicennia as A. germinans; here the account is almost the same as in the preceding edition:

"AVICENNIA foliis subtus tomentosis. Jacq. americ. 25. t. 112. f. 2.

Avicennia. Fl. Zeyl. 57. Mat. med. 42. Sp. pl. I. p. 110.

Bontia foliis integris oblongis oppositis, petiolis crassis brevissimis subamplexantibus, floribus racemosis. Brown. jam. 263.

Mangle laurocerasi foliis, flore albo tetrapetalo. Sloan. jam. 156. hist. 2. p. 66. Raj. dendr. 115.

Anacardium. Bauh. pin. 511.

Oepata. Rheed. mal. 4. p. 95. t. 45.

Habitat in Indiis. †

Reduxi hanc speciem ex sententia D. Jacquini autoptae.'

"As said above, the descriptions in the second and third edition of the Species Plantarum are almost identical, the first sentence of the second edition only being omitted in the third as inappropriate, because Bontia had been restricted to B. daphnoides. Thus, it is evident that the editor of the third edition, almost certainly Jacquin, when publishing Avicennia germinans in 1764 had in mind the plant Linnaeus had called Bontia germinans in 1763. Therefore, we must consider Avicennia germinans (L.) L. 1764¹ as a new combination based on Bontia germinans L. 1763, though there is no direct reference to the former work in the latter. ['Mr. Ross kindly informed me that the third edition of the Species Plantarum was published at Vienna, probably at the instigation of Jacquin, and probably without Linnaeus having any part in its production. The corrections made in the third edition (reestablishment of the genus Avicennia with the two species recognized by Jacquin and characterized by Jacquin's own diagnostic sentences, completion of the citations from Jacquin's works) strongly suggest Jacquin's intervention, but as long as we have no direct evidence of it, it seems better to attribute the combination A. germinans to Linnaeus as the whole work is attributed to him.] The question to be settled

now is to know whether Bontia germinans L. 1763 can be regarded, as Little does, as a new name, different from Bontia germinans L. 1759. In 1763, Linnaeus did not explicitly refer to his Systema Naturae ed. 10, but his description began with a sentence which repeated textually the 1759 diagnosis, and, in the synonymy, he referred to Brown. jam. 263. where the type of the 1759 species was described. Both these elements make a strong indirect reference to the previous description, and it is clear that Bontia germinans L. 1763 is nomenclaturally the same as Bontia germinans L. 1759; it is typified by the same specimen, i.e., the Browne specimen in the Linnaean Herbarium 813, 2. In 1763, when including in his Bontia germinans the earlier Avicennia officinalis, Linnaeus was not correct according to the present rules of the botanical nomenclature, as he ought to have kept the older epithet., i.e. officinalis; but, as B. germinans was not a new name, article 7, 4 of the Montreal Code has no application here and B. germinans must keep its initial type. Thus, Avicennia germinans (L.) L. 1764 must be treated as a new combination with Bontia germinans L. 1759 as basionym. This combination, when published, was superfluous as including the older, validly published Avicennia officinalis L.; nevertheless, it is not illegitimate since article 63 (note) of the Montreal Code reads: 'A nomenclaturally superfluous new combination is not illegitimate if the epithet of the basionym is legitimate. When published it is incorrect but it may become correct later.' Incorrect when published, Avicennia germinans (L.) L. becomes correct when restricted to the American plant described as Bontia germinans in 1759. The binomial A. germinans was first correctly used in this restricted sense in the second edition of P. Browne's Civil and Natural History of Jamaica, 1789."

Material of A. germinans has been misidentified and distributed in herbaria as A. officinalis L., Conocarpus erecta L., and Laguncularia sp. On the other hand, the F. Shreve s.n. [Herb. Umbach 25666], distributed as this species, is actually Laguncularia racemosa (L.) Gaertn. f. Hahn 654 is a mixture with A. schaueriana Stapf & Leechman.

Additional citations: FLORIDA: Dade Co.: Totten & Gifford s.n. [December 26, 1940] (Hi--22672). Levy Co.: Godfrey & Redfearn 52828 (Hi--142519). Pasco Co.: Ray, Lakela, & Patman 9980 (Hi--201871). Pinellas Co.: R. F. Thorne 9489 (Ca--905241). Saint Johns Co.: Ward & West 1343 (Hi--181984). Anastasia Island: Ward & Ward 2311 (Hi--183520). Big Coppitt Key: F. H. Sargent 6541 (St). Big Pine Key: Brizicky & Stern 181 [wood no. Y-51034] (B); Killip 32899 (Mi), 40946 (Au--120836); Muenschner & Thorne 18073 (Ca--770902). Jug Island: R. K. Godfrey 55942a (Hi--139123). Largo Key: Russell & Totten s.n. [Dec. 28, 1940] (Hi--20906a, Hi--21834, Hi--21834a, Hi--21906). Longboat Key: N. A. Reasoner s.n.

[Dec. 27, 1915] (Hi--59489). Merritt's Island: Kral 4972 (Ca--95424). LOUISIANA: Jefferson Par.: Reese 4075 (Hi--187011). TEXAS: Cameron Co.: Lundell & Lundell 8760 (Ca--7342); Tharp, Gimbrede, & Johnson 52-525 (St). Nueces Co.: F. B. Jones 2257 (Fj); Tharp s.n. [Port Aransas, 7/2/39] (Ca--882435). Mustang Island: F. B. Jones 5610 (Fj). Padre Island: Correll, Lundell, & Johnston 25539 (Ld). MEXICO: Baja California: A. Carter 2721 (Ca--916211, Ld); Diguet s.n. [environs de La Paz, 1913] (Mi); Guzman Huerta H.84 (Ip); F. Shreve 6516 (Mi), 7099 (Mi); I. L. Wiggins 5455 (Ca--660825, Mi, Rf), 11487 (Ca--758693, Gg--401258), 16174 (Mi); Wiggins & Wiggins 18239 (Mi). Campeche: Sauer 2406 (Ws). Jalisco: J. Rzedowski 14605 (Ip). Michoacán: B. L. Turner 2143 (Mi). Oaxaca: F. H. Elmore D.21a (Mi), D.22 (Ca--945981, Mi); R. M. King 1549 (Au--183170, N, W--2301510). Sinaloa: Breedlove 1577 (Mi); Mercado 11 (Ip). Sonora: W. S. Phillips 3483 (Gg--371586), 3486 (St, St); I. L. Wiggins 6341 (Mi). Tabasco: Hernández Xolocotzi & Segalen 245 (Ip); Sauer & Gade 3144 (Mi). Tamaulipas: Edw. Palmer 484 (Gg--45646); Sauer & Gade 2911 (Mi). Vera Cruz: J. Rzedowski 14797 (Ip, Mi); Sánchez R. s.n. [17.V.1963] (Ip). Yucatán: G. F. Gaumer 635, in part [Herb. Umbach 15479] (Ws). MUJERES ISLAND: Sauer & Gade 3265 (Mi). CARMEN ISLAND: Carter & Ferris 3733 (Ca--199587); R. V. Moran 3926 (Ca--1726). TRES MARIAS ISLANDS: Maria Magdalena: F. H. Elmore IB2 (Mi). PEREZ ISLAND: Bonet M.21 (Ip). HONDURAS: Choluteca: Paray 562 (Ip). EL SALVADOR: La Union: Beetle 26263 (Ca--648848). COSTA RICA: Guanacaste: F. H. Elmore E.1 (Ca--946054, Mi). Puntarenas: Lems 5026 (N). PANAMA: Canal Zone: Stern, Chambers, Dwyer, & E-binger 50 (Bm). BERMUDA ISLANDS: Main: W. R. Taylor 49-1055 (Mi). BAHAMA ISLANDS: Easter: Howard & Howard 10205 (Ca--926206). CUBA: Camaguey: Shafer 1124 (Bi). Havana: Ekman 456 (Mi). JAMAICA: Crosby & Anderson 1192 (Mi); Crosby, Hespenheide, & Anderson 803 (Mi); Harris & Lawrence C.152 (Ca--984463), C.159 (Ca--984464); Sauer 1828 (Ws); Webster, Ellis, & Miller 8237 (Mi, S); Yunker 17136 (Mi), 18159 (Mi). HISPANIOLA: Dominican Republic: B. Augusto 1603 (N). Haïti: Holdridge 1064 (Mi); Sauer 1936 (Ws). PUERTO RICO: Otero M.77 (Mi). LEEWARD ISLANDS: Five Islands: Box 1356 (Mi). Guadeloupe: Stehlé 1587 (Mi). WINDWARD ISLANDS: Grenada: R. A. Howard 10955 (N). Martinique: Hahn 654, in part (Ca--232488); Stehlé & Stehlé 5143 (W--2453678), 6163 (W--2453695). CURAÇAO: Arnoldo 2063 (W--2110330). MARGARITA ISLAND: Gines 3332 (W--2174527), 3347 (W--2174541). COLOMBIA: Atlántico: Dugand & Jaramillo 4178 (W--1900171); Elias 1156 (W--1594975), 1494 (Mi); Feddema 2038 (Mi). Magdalena: H. H. Smith 420 (Hi--196908, Mi), 1937 (Ca--95792, Hi--196909, Mi). VENEZUELA: Anzoategui: F. D.

Smith 206 (W--2121447), 207 (W--2121448); Tamayo 2070 (W--1857790).
Delta Amacuro: Gines 5131 (W--2167912).

BOOK REVIEWS

Alma L. Moldenke

"The Plant Cover of Sweden" edited by Societas Phytogeographica in "Acta Phytographica Suecica" : 50, x & 316 pp., illus. Uppsala University Press. 1965.

This excellent study is dedicated to G. Einar du Rietz on his 70th birthday -- April 25, 1965 -- by his pupils in the traditional "Uppsala School of Phytosociology". And how considerate these authors were to produce such a work while their colleague and mentor was still alive!

The papers covered a symposium on the general features of Swedish vegetation. Du Rietz himself would have been the most acceptable author for work on the littoral lichen communities.

The Regional Survey covered features of land and climate. Aspects of the South covered vertical zonation of littoral algae in Bohuslän, coastal algae off Göteborg, salt marsh vegetation, growth on rocks, woods on Jungfrun Isle, etc. Aspects of the North covered mires and calcareous fens in Jämtland, Lappland, major rivers, etc. Past and present covered changes from late Quaternary, effect of 600,000 reindeer, etc.

The print, the illustrations and the paper are all of good quality.

"Plant Diversification" by Theodore Delevoryas, VII & 145 pp., illus. Holt, Rinehart & Winston Press, Inc., New York, N. Y. 10017. 1966. \$2.25 (paper back).

"Plant Diversification", along with the other books in this Modern Biology Series, provides an integration of the general and the comparative, the cellular and the organismic, the structural and the functional phases of dynamic biology.

It is well organized, clearly illustrated, and effectively presented plant histology found in almost any good botany text. When used with the other topical texts in this series, it proves itself of considerable value.

The author emphasizes that double fertilization is the critical characteristic of angiosperms, and that wind pollination of these plants is a derived, not primitive condition, on the basis of vascular bundle traces.

"Cartilaginous" is misspelled on page 102.



Moldenke, Harold N. 1967. "Additional notes on the genus *Avicennia*. I." *Phytologia* 14, 301–320. <https://doi.org/10.5962/bhl.part.18528>.

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