

ADDITIONAL NOTES ON THE GENUS AVICENNIA. I

Harold N. Moldenke

AVICENNIA L.

Additional synonymy: Bontia "L. ex Loefl." apud Soukup, Biota 11: 6, in syn. 1976. Bontia "P. Br. ex Airy Shaw in Willis" apud Soukup, Biota 11: 6, in syn. 1976. Upata "Rheede ex Adans." apud Soukup, Biota 11: 6, in syn. 1976.

Additional & emended bibliography: Jacq., Select. Stirp. Amer., imp. 1, 177—178, pl. 112, fig. 1 & 2. 1763; Sweet, Hort. Brit., ed. 2, 419. 1830; G. Don in Loud., Hort. Brit., ed. 1, 247 (1830) and ed. 2, 247. 1832; Loud., Hort. Brit., ed. 2, 554. 1832; G. Don in Loud., Hort. Brit., ed. 3, 247. 1839; Sweet, Hort. Brit., ed. 3, 554. 1839; A. DC., Prodr. 11: 701. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 46. 1858; Crozet, Voy. Tasmania [transl. Ling Roth] 5: 36. 1891; Estores Anzaldo, Marañon, & Ancheta, Philip. Journ. Sci. 86: 236 & 239. 1958; Puri, Indian Forest Ecol. 1: 31 (1960) and 2: 223—227 & 229—232. 1960; Golley, Odum, & Wilson, Ecology 43: 9—19. 1962; Gaussen, Viart, Legris, & Labroue, Trav. Sect. Scient. Techn. Inst. Franç. Pond., Hors Ser. 5: 25 & 26. 1965; Burns & Rotherham, Austral. Butterflies 104. 1969; Gill, Forest Sci. 17: 462—465. 1971; Jacq., Select. Stirp. Amer., imp. 2, 177—178. 1971; Moore, Miller, Albright, & Tieszen, Photosyn-thetica 6: 393. 1972; Ewel & Whitmore, U. S. Dept. Agr. Forest. Serv. Res. Pap. ITF-18: 16. 1973; Tomlinson & Gill in Meggers, Ayensu, & Duckworth, Trop. Forest Ecosyst. Afr. & S. Am. 129—133, & 142. 1973; Chai, Malays. Forest. 38: 188, 204—205, & 207. 1975; Lugo, Evink, Brinson, Broce, & Snedaker in Golley & Medina, Ecolog. Stud. 11: 336, 338, 339, 344, & 345. 1975; Occhioni Martins, Leandra 5: 138. 1975; Anon., Biol. Abstr. 61: AC1.559. 1976; Anon., Biores. Index 12 (11): B.75. 1976; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 2, 190. 1976; Bultman & Southwell, Biotrop-ica 8 (2): 76 & 92. 1976; Cambie, Journ. Roy. Soc. N. Zeal. 6 (3): 333. 1976; Corner, Seeds Dicot. 1: 276. 1976; Felger & Lowe, Nat. Hist. Mus. Los Angeles Co. Contrib. Sci. 285: 5 & 50. 1976; Fleming, Ganelle, & Long, Wild Fls. Fla. 15 & 41. 1976; Follmann-Schrag, Excerpt. Bot. A.26: 503. 1976; F. R. Fosberg, Biol. & Geol. Coral Reefs 3, Biol. 2: 272. 1976; F. R. Fosberg, Rhodora 78: 112. 1976; Hocking, Excerpt. Bot. A.26: 422 (1976) and 28: 259 & 260. 1976; Lakela, Long, Fleming, & Genelle, Pl. Tampa Bay, ed. 3 [Bot. Lab. Univ. S. Fla. Contrib. 73:] 115, 149, & 150. 1976; Laurence & Mohammed, Journ. Agr. Soc. Trin. & Tob. 76: 345. 1976; Long & Lakela, Fl. Trop. Fla., ed. 2, 17, 732, & 930. 1976; Lugo, Inst. Forest. Latinoam. Invest. Bull. 50: 49 & 54. 1976; Moldenke, Phytologia 34: 18, 70—94, 167—203, 247, 248, 252—256, 261—263, 265—269, 271, 278, 485, 499, 504, 507, & 509 (1976) and 35: 13. 1976; Moldenke & Sm. in Reitz, Fl. Ilust. Catar. I Erioc: 97. 1976; Raven, Evert, & Curtis, Biol. Pl., ed. 2, 427 &

670, fig. 20-12. 1976; Rehm, Environ. Conserv. 3: 47-57. 1976; Rogerson & Becker, Bull. Torrey Bot. Club 103: 145 & 277. 1976; Soukup, Biota 11: [1], 6, 21, & 22. 1976; Jiménez & Liogier, Moscosoa 1 (2): 17. 1977; Moldenke, Biol. Abstr. 63: 2451-2452. 1977; Moldenke, Phytologia 35: 507 (1977) and 36: 31, 32, 34, 38, 39, 46, & 47. 1977; A. L. Moldenke, Phytologia 36: 88. 1977; Rogerson, Becker, & Prince, Bull. Torrey Bot. Club 104: 82. 1977; Ward, Phytologia 35: 409. 1977.

Golley and his associates (1962) aver that mangroves cover about 1/3 of the coastlines of tropical America. Sweet (1830, 1839) places the genus Avicennia in the Myoporinae [Myoporaceae]. Burns & Rotherham (1969) report that the larvae of the Copper Jewel butterfly (Hypochrysops apelles), attended by small black ants, live in the dead or folded leaves of Avicennia in Australia. When feeding, the larvae eat the epidermis of the leaves, leaving a network of veins which become dry and assume a scorched appearance.

It is perhaps worth noting here that Cambie (1976), Lakela, Long, Fleming, & Genelle (1976), Fleming, Genelle, & Long (1976), and Lakela & Long (1976) also accept the family Avicenniaceae as a separate family from the Verbenaceae and Myoporaceae.

AVICENNIA AFRICANA P. Beauv.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 46. 1858; Anon., Biol. Abstr. 61: AC1.559. 1976; Hocking, Excerpt. Bot. A.28: 259 & 260. 1976; Moldenke, Phytologia 33: 239, 250, 252, 259, 261, & 262 (1976) and 34: 74, 202, & 203. 1976.

AVICENNIA ALBA Blume

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 46. 1858; Fedde & Schust. in Just, Bot. Jahresber. 44: 253. 1922; Lambert, Univ. São Paulo Fac. Filos. Bol. 317 [Bot. 23]: 120, 150, 155, 160, & 165. 1969; Chai, Malays. Forest. 38: 188, 205, & 207. 1975; Anon., Biol. Abstr. 61: AC1.559, 1976; Moldenke, Phytologia 34: 70-72, 75, 76, 80, 84, 85, 90, 91, 93, 94, 167, 170, 172, 179, 180, 185-188, 190, 194, 195, 197, 198, 200-203, 262, 265, 267, 268, & 271 (1976) and 36: 38. 1977.

Recent collectors describe this species as a large tree or a small shrub-like tree, 2-30 m. tall, often divided at the base into 2 main stems, the trunks to 20 cm. in diameter at breast height, with many pneumatophores, 10-30 cm. tall, in a radius of 4 m. from the base of the tree, the trunk and branches black, the bark dark-brown, more or less smooth, the leaves dark-green above, grayish-green or whitish beneath, and the fruit light-green. They have found it growing in "open muddy mangrove forests" and "very common on seashores and on mud flats in moderately firm soils or soft mud". Van der Kevie describes the corollas as "yellow to orange", while Foreman & Katik refer to them as simply "yellow". They have found it in anthesis in June and in fruit in August. McCusker describes the corollas as "bright-yellow" and encountered the species "on both seaward and landward edges of mangrove swamps".

Chai (1975) has studied this tree extensively in Malaysia and describes it there as follows: "Small to huge tree to 70 feet tall, 7 ft. girth. Bark dark brown to black. No buttresses but may develop slender, soft stilt roots. Leaves lanceolate or elliptic-obovate with tapering base, lower leaf surfaces whitish, salt being excreted from this surface. Fruit glaucous green, leech-shaped. Another pioneer species colonising newly formed mud flats as Sonneratia alba. Often gregarious along low convex banks of the rivers near the sea but later replaced by Rhizophora apiculata and Bruguiera parviflora. Rare inland." In his key he distinguishes it from the two other species of the genus known there [A. marina and A. officinalis] as follows: "Medium to large tree to 70 ft. tall; bark dark gray to black, often with white patches, not flaky; leaves oblong-elliptic, whitish below; soft mud." He calls it "api-api hitam".

Additional citations: THAILAND: Maxwell 75-918 (Ac); Van der Kevie 1 (Ac). MALAYA: Selangor: McCusker 303 (Ld). BISMARCK ARCHIPELAGO: Mams: Foreman & Katik LAE.59275 (Mu).

AVICENNIA ALBA var. LATIFOLIA Moldenke

Additional bibliography: Anon., Biol. Abstr. 61: AC1.559. 1976; Moldenke, Phytologia 34: 71, 91, 198, & 265. 1976.

AVICENNIA BICOLOR Standl.

Additional bibliography: Anon., Biol. Abstr. 61: AC1.559. 1976; Hocking, Excerpt. Bot. A.26: 422. 1976; Moldenke, Phytologia 33: 240. 1976.

Pohl and Davidse, identifying this as A. germinans (L.) L., refer to it as "one of the dominants in mangrove swamps". They found it in fruit in June.

The H. Kennedy 2281, distributed in some herbaria as A. bicolor, actually represents A. germinans var. guayaquilensis (H.B.K.) Moldenke.

Additional citations: COSTA RICA: Guanacaste: Pohl & Davidse 10588a (W-2774496).

AVICENNIA ELLIPTICA Holm

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 46. 1858; Anon., Biol. Abstr. 61: AC1.559. 1976; Moldenke, Phytologia 34: 71, 202, & 278 (1976) and 36: 32 & 34. 1977.

The Dias da Rocha 108, F. C. Hoehne s.n. [Herb. Inst. Bot. S. Paulo 24908], Löfgren s.n. [Herb. Inst. Bot. S. Paulo 15596], Usteri s.n. [Herb. Inst. Bot. S. Paulo 15598], and Herb. Com. Geogr. & Geol. 3062, distributed as A. elliptica, actually represent A. schaueriana f. candicans instead.

Additional citations: BRAZIL: Bahia: Lanna 716 [Castellanos 25468; Herb. FEEMA 4562] (Ld), 747 [Castellanos 25497; Herb. FEEMA 4561] (Z).

AVICENNIA ELLIPTICA var. MARTII Moldenke

Additional bibliography: Moldenke, *Phytologia* 32: 438, 454, & 455 (1975) and 33: 255, 262, & 269. 1976; Anon., *Biol. Abstr.* 61: AC1.559. 1976; Moldenke, *Phytologia* 36: 32 & 34. 1977.

The Drouet 2442, previously cited by me as A. elliptica var. martii, now seems to me to be only one of the many forms of A. germinans var. guayaquilensis (H.B.K.) Moldenke; the same is true of Ducke 5407, Lanjouw & Lindeman 301, and Smith & Smith 546.

AVICENNIA EOCENICA Berry

Additional bibliography: Moldenke, *Phytologia* 32: 455. 1975; Anon., *Biol. Abstr.* 61: AC1.559. 1976.

AVICENNIA EUCALYPTIFOLIA Zipp.

Additional synonymy: Avicennia marina var. australasica (Walp.) Moldenke, *Phytologia* 34: 72, in syn. 1976.

Additional bibliography: Fedde & Schust. in Just, *Bot. Jahresber.* 44: 253. 1922; Anon., *Biol. Abstr.* 61: AC1.559. 1976; Hocking, *Excerpt. Bot. A.* 28: 259. 1976; Moldenke, *Phytologia* 34: 71-72, 84, 85, 91, 93, 94, 177, 188, 268, & 271. 1976.

Stoddart and Thom refer to this species as it occurs on the Great Barrier Reef as a shrub or tree, 1-3 meters tall, with vertical pneumatophores (and "roots"), the leaves often with prominent leaf-galls, and found it "occasional" on the seaward side of Rhizophora colonies and on shingles, shingle ramparts, and shingle or mangrove cays, flowering and fruiting already (although apparently very sparingly) at 1-3 meters height.

Additional citations: GREAT BARRIER REEF ISLANDS: Hampton: Thom 4211 (W-2744309). Howick: Thom 4203 (W-2744287). Low: Stoddart 4336 (W-2744301). Lowrie: Stoddart 4998 (W-2744204). Low Wooded: Stoddart 4524 (W-2744316). Sand: Stoddart 4210 (W-2744311). Three: Stoddart 4499 (W-2744321). West Hope: Stoddart 4405 (W-2744299).

AVICENNIA GERMINANS (L.) L.

Additional & emended bibliography: Jacq., *Select. Stirp. Amer.*, imp. 1, 177-178, pl. 112, fig. 1 & 2. 1763; Sweet, *Hort. Brit.*, ed. 2, 419. 1830; G. Don in Loud., *Hort. Brit.*, ed. 1, 247 (1830), ed. 2, 247 (1832), and ed. 3, 247. 1839; Schau. in A. DC., *Prodr.* 11: 699-700. 1847; Buek, *Gen. Spec. Syn. Candoll.* 3: 46. 1858; Pat., *Ill. Biol. Monog.*, ser. 2, 4: 482. 1916; Sydow in Just, *Bot. Jahresber.* 44: 595. 1923; Fedde in Just, *Bot. Jahresber.* 44: 1377. 1927; M. F. Baker, *Fla. Wild Fls.*, ed. 2, imp. 1, 190. 1938; Lamberti, *Univ. São Paulo Fac. Filos. Bol.* 317 [Bot. 23]: 40, 41, 45, 46, 120, 149, & 165. 1969; Jacq., *Select. Stirp. Amer.*, imp. 2, 177-178, pl. 112, fig. 1 & 2. 1971; Ewel & Whitmore, *U. S. Dept. Agr. Forest Serv. Res. Pap. LTF-18*: 16. 1973; Tomlinson & Gill in Meggers, Ayensu, & Duckworth, *Trop. Forest Ecosyst. Afr. & S. Am.* 129-133 & 141-142. 1973; Lugo, Evink, Brinson, Broce, & Snedaker in Golley & Medina, *Ecolog. Stud.* [Jacobs, Lange, Ol-

son, & Wieser, Ecol. Stud. 11:] 335--339, 344, & 345. 1975; Anon., Biol. Abstr. 61: AC1.559. 1976; Anon., Biores. Index 12 (11): B. 75. 1976; M. F. Baker, Fla. Wild Fls., ed. 2, imp. 2, 190. 1976; Felger & Lowe, Nat. Hist. Mus. Los Angeles Co. Contrib. Sci. 285: 5 & 50. 1976; Fleming, Genelle, & Long, Wild Fls. Fla. 15 & 41. 1976; F. R. Fosberg, Rhodora 78: 112. 1976; Lakela, Long, Fleming, & Genelle, Pl. Tampa Bay, ed. 3 [Bot. Lab. Univ. S. Fla. Contrib. 73:] 115 & 149. 1976; Laurence & Mohammed, Journ. Agr. Soc. Trin. & Tob. 76: 345. 1976; Long & Lakela, Fl. Trop. Fla., ed. 2, 17, 732, & 930. 1976; Lugo, Inst. Forest. Latinoam. Invest. Bull. 50: 49 & 54. 1976; Moldenke, Phytologia 34: 72--76, 84--86, 91, 93, 94, 170, 172, 177, 180, 199--203, 248, 252--256, & 271. 1976; Raven, Evert, & Curtis, Biol. Pl., ed. 2, 427 & 670, fig. 20-12. 1976; Rehm, Environ. Conserv. 3: 47--57. 1976; Soukup, Biota 11: 6. 1976; Jiménez & Liogier, Moscosoa 1 (2): 17. 1977; Moldenke, Phytologia 36: 31, 34, & 41. 1977; A. L. Moldenke, Phytologia 36: 88. 1977; Ward, Phytologia 35: 409. 1977.

Additional & emended illustrations: Jacq., Select. Stirp. Amer., imp. 1, pl. 112, fig. 1 & 2 (1763) and imp. 2, pl. 112, fig. 1 & 2. 1971; Fleming, Genelle, & Long, Wild Fls. Fla. 41 (in color). 1976; Lugo, Inst. Forest. Latinoam. Invest. Bull. 50: 54. 1976; Raven, Evert, & Curtis, Biol. Pl., ed. 2, 427, fig. 20-12. 1976.

Some of the leaves on Sachet 459, from the Cayman Islands, resemble those seen on typical var. guayaquilensis; still, it seems rather plain that such leaves are far more common in populations of northern South America. Possibly both the typical form and var. guayaquilensis occur in that southern West Indies - northern South American area, a condition not at all unusual; certainly some specimens of Asplund 16588, Budowski 25, Chapin 1129, Fournier 81, Hagen 8 & 809, Haught 4855, Pittier 11011, Romero-Castafieda 7275, D. H. Knight 1032, H. H. Smith 1937, Snodgrass & Heller 368, Stewart 3267, T. W. J. Taylor TT.91, Wiggins 18310, and Wiggins & Porter 517 seem to indicate this. Possibly var. guayaquilensis would better be regarded as a form rather than a variety.

The corollas are said to have been "whitish" on Ventura A. 5226 and the label accompanying this collection makes the remarkable claim that the specimen was collected at "40 m." altitude -- doubtless an error.

Ewel & Whitmore (1973) say that "Some of the low alluvial areas on the south coast of Puerto Rico contain saline soils, such as the Santa Isabel series, and the vegetation on these sites is dominated by Prosopis juliflora.....Mangrove forests....form parts of the coastal associations in this life zone, but the development of tall, luxuriant mangrove forests may, in some locations, be limited by the scarce surface runoff, which can result in higher salinities and lower nutrient inputs than would be the case along coasts with more rainfall." Lugo and his associates (1975) have compared the net daytime photosynthesis, nighttime respiration, and their ration in Rhizophora, Avicennia, Laguncularia, and Conocarpus, noting that only Avicennia among these genera comprises salt-excreting plants.

[to be continued]



Moldenke, Harold N. 1977. "ADDITIONAL NOTES ON THE GENUS AVICENNIA PART 10." *Phytologia* 36, 408–412.

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