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NOTES ON NEOTROPICAL AMANOA (EUPHORBIACEAE)

W. JOHN HAYDEN

Hayden, W. John (Department of Biology, University of Richmond, Richmond, VA 23173). Notes on neotropical *Amanoa* (Euphorbiaceae). Brittonia 42: 260–270. 1990.—Lectotypes are designated for *Amanoa caribaea* Krug & Urban and *A. guianensis* Aublet; presumed syntypes of the latter taxon are shown to be heterogeneous by inclusion of a previously unrecognized species. Four new species of *Amanoa* are described: *A. congesta* from French Guiana and northeastern Brazil; *A. gracillima* from Manaus, Brazil; *A. nanayensis* from Amazonian Peru and adjacent Colombia and Brazil; and *A. neglecta* from French Guiana and Surinam. *Amanoa sinuosa* is proposed as a new name for the later homonym *A. robusta* Leal. A key to the 13 neotropical species is presented.

Amanoa Aublet, as presently understood, is a genus of 16 species ranging widely through the tropics of Africa and the Americas. The genus was last monographed by Pax and Hoffmann (1922), who recognized nine species. In the intervening years, some seven additional species have been described. Recent study of the genus for ongoing revisionary and floristic projects indicates that not all previously named taxa are worthy of recognition. Further, it has become apparent that the nomenclature of some existing taxa requires attention, and several new taxa have come to light. Herein are lectotypifications for two species, descriptions of four new species, one new name, and a key (with synonyms) to neotropical species. The new names are being published at this time so they will be available for treatments of the genus for several upcoming floras, as well as for ongoing morphological studies (wood anatomy, leaf anatomy, etc.). The key is offered to provide collectors and curators an interim means of identifying species of *Amanoa* until the appearance of a more comprehensive revision.

Within the ranks of biovulate Euphorbiaceae, *Amanoa* may be characterized by sessile or nearly sessile axillary clusters of petaliferous flowers with imbricate sepals, an extrastaminal disk, and sessile stigmas. Despite striking morphological specializations, such as the presence of an androphore in a few species, and some useful discontinuities in the dimensions of flowers and fruits, the neotropical species are remarkably uniform in the morphology of reproductive structures. The systematic utility of reproductive structures in the genus is further limited by the apparently fugacious character of the numerous staminate flowers. Flowers at anthesis are somewhat uncommon on herbarium specimens; indeed, specimen packets are often full of tightly closed, prematurely abscised buds. Further, most species appear to be protandrous, so herbarium specimens only rarely bear both staminate and pistillate material. Nevertheless, the limited suite of useful reproductive characters in concert with careful observation of vegetative features permit the recognition of 13 reasonably well-marked species in the neotropics. Data from pollen (Köhler, 1965; Punt, 1962, 1987) and foliar epidermis (Rothdauscher, 1896; Gaucher, 1902; Levin, 1986; Hayden, unpubl.) support the species circumscriptions thus recognized.

AMANOA CARIBAEA Krug & Urban

Amanoa caribaea Krug & Urban, Notizbl. Königl. Bot. Gart. Berlin 1: 326. 1897. TYPE: DOMINICA, Pleasant Valley, *Eggers 603* (LECTOTYPE selected here: G—sheet no. 2; ISOLECTOTYPES: A, G—sheets no. 1 and 3, L, W. Z).

Of the several syntypes listed by Urban, *Eggers 603* seems most widely distributed; the sheet selected is copiously floriferous and notable for bearing both staminate and pistillate flowers.

***Amanoa congesta* W. J. Hayden, sp. nov. (Fig. 1)**

Habitu *A. guianensi* Aublet similis, sed inflorescentiis congestis, pollinis granis reticulatis, capsulis triangularibus, seminibus oblongis, et testa chartacea absimilis.

Monoecious trees, to 35 m tall and 70 cm diam; twigs gray, glabrous, with abundant lenticels. *Leaves* elliptic, 6–16 cm long, 2.5–7 cm wide, coriaceous, the apex apiculate to acuminate, the base acute to rounded; petioles 5–12 mm long, corky, blackened, canaliculate on the upper surface; stipules distinct, 2–3 mm long, 1.5–2 mm wide. *Inflorescence axes* straight, glabrous, 2–3.5 mm thick; proximal flower clusters often subtended by minute leaves 1–3.5 cm long, the distal clusters confluent forming cylindrical masses 8–15 mm in diam; floral bracts with a median row of short trichomes abaxially; flowers green to yellowish green. *Staminate flowers* sessile, 8–12 mm in diam; sepals 3–4 mm long, imbricate, oblong, with rounded apex; petals scale-like, 1 mm long, 1–2 mm wide, clawed, reniform; disk annular, ca 3 mm in diam; filaments 2–3 mm long, inserted on the receptacle; anthers 1.5–2 mm long; pollen reticulate; pistillode cylindrical, ca 1.5 mm tall, 0.7 mm in diam, distal 1 mm divided forming 3 erect styles. *Pistillate flowers* on glabrous pedicels 1.5–5 mm long; sepals ca 3 mm long, tapered slightly to the rounded apex; petals 1 mm long, 1 mm wide, clawed, reniform; disk 0.5 mm tall; ovary 3–3.5 mm tall; styles entire or lobed. *Fruits* green, strongly triangular in cross-section, 24–30 mm long, as wide as long, borne on pedicels 5–10 mm long; pericarp ca 4 mm thick, dehiscing into 6 mericarps (cocci), the endocarp separating from mesocarp, the mericarp margins smooth. *Seeds* subcylindrical, with two basal lobes, 10–20 mm long, 8–11 mm wide; hilum elliptic, up to 3 mm wide and 4 mm long; testa dark brown, not lustrous, ca 0.1 mm thick.

TYPE: BRAZIL. AMAPÁ: Rio Iaué, 0.5 km E of confluence with Rio Oiapoque, near first cachoeira, 2°53'N, 52°22'W, *Irwin & Westra 47755* (HOLOTYPE: NY!; ISOTYPES: B!, GH!, K!, MO!, U!, US!).

Additional specimens examined: BRAZIL. AMAPÁ: Rio Oiapoque, 2°8'N, 52°55'W, *Irwin et al. 48006* (MO, NY, US); Rio Iaué near confluence with Rio Oiapoque, 2°53'N, 52°22'W, *Irwin & Westra 47742* (NY, US); Rio Ingarari near confluence with Rio Oiapoque, 2°15'N, 52°37'W, *Irwin et al. 48366* (MO, NY, U, US). PARÁ: Brazilian Highway Bridge 22, km 64, *Prance & Silva 58870* (B, F, GH, NY, US); Rios Pacaja and Muirapiranga, 2°41'N, 50°44'W, *Prance et al. 1659* (MO, US); Santarém, *Silva & Souza 2348* (U). FRENCH GUIANA: Lower Oyapock River, downstream from Saut Fourmi, 4°00'N, 49°30'W, *Oldeman B-3356* (CAY, P); Upper Oyapock River, Trois Sauts, *Grenand 575* (CAY, U), *Grenand 582* (CAY); Oyapock River, near Saut Moutouci, 2°30'N, 52°30'W, *Oldeman B-3230* (CAY); Yaroupi River, between Saut Ouaimicouaré and Saut Couéki, *Oldeman T-595* (CAY, P); Camopi River (tributary of Oyapock), upstream from Saut Yanioué, *Oldeman B-1415* (CAY, U, US).

All the above specimens had been referred to *A. guianensis* Aublet. Indeed, the two species are remarkably similar in gross aspect and are virtually identical vegetatively. Credit for the initial recognition of the distinction between *A. guianensis* and *A. congesta* goes to Geoff Levin who (pers. comm.) pointed out that *Prance & Silva 58870* possesses reticulate pollen similar to that of species such as *A. oblongifolia* Muell. Arg. and thus sharply distinct from the spiny grains of *A. guianensis* (cf. Punt, 1962, plate IV number 6 and plate V number 1). Examination of additional specimens (*Irwin & Westra 47742, 47755; Silva & Souza 2348*), primarily from the Oiapoque (Oyapock) River basin in French Guiana and adjacent Amapá, Brazil, revealed reticulate pollen grains to be correlated with densely congested inflorescences (to which the specific epithet refers). From the same area, fruiting specimens bear strongly triangular fruits with subcylindrical seeds enclosed in a paper-thin testa, in contrast to the globose fruits and globose-triangular seeds with stony testa of *A. guianensis*. It is assumed that the morpho-

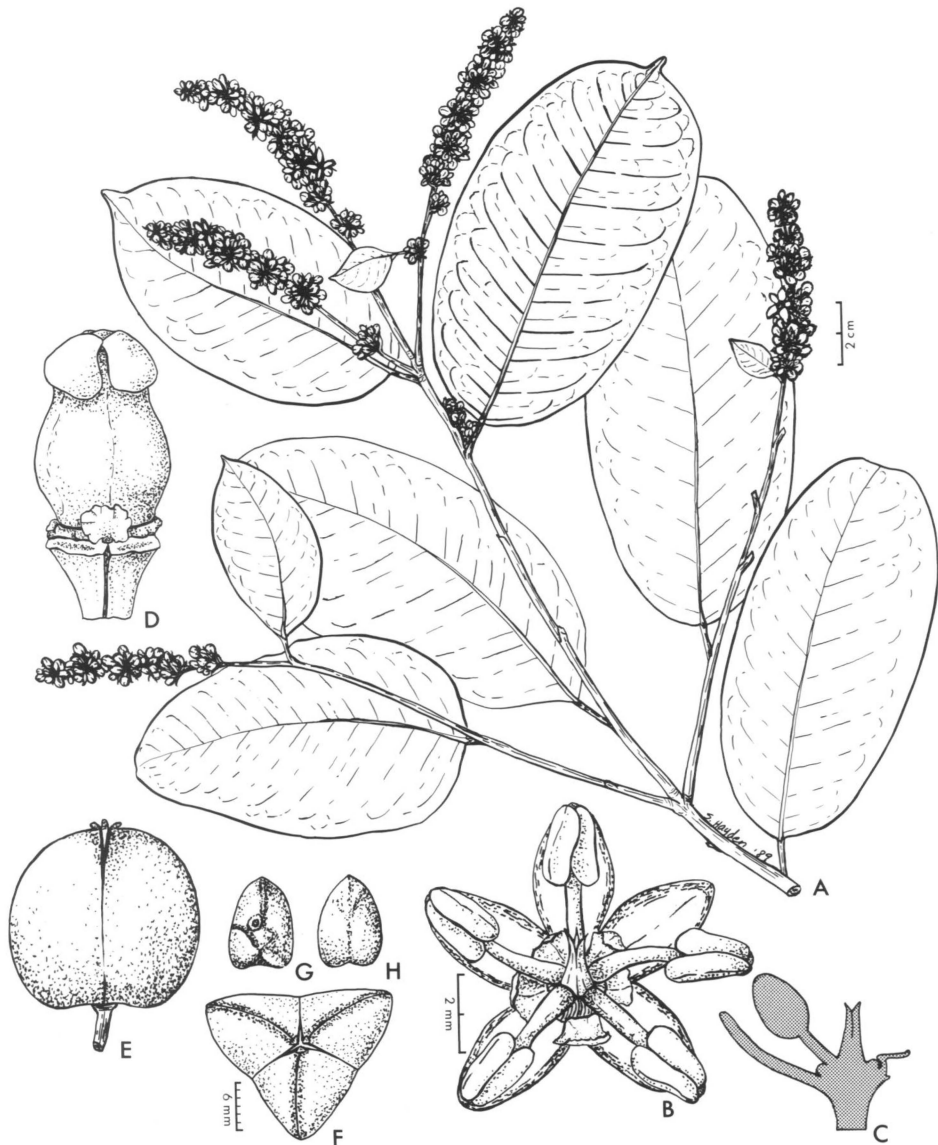


FIG. 1. *Amanoa congesta*. A. Habit, holotype, Irwin & Westra 47755 (NY). B. Staminate flower, Prance & Silva 58870 (NY). C. Staminate flower, diagrammatic longitudinal section. D. Pistillate flower, all perianth parts but one petal abscised, Irwin & Westra 47742 (US). E, F. Mature fruit, lateral and top views, Grenand 582 (CAY). G, H. Seeds, ventral and dorsal sides, Oldeman B-3356 (P). A, 2 cm bar; B-D, 2 mm bar; E-H, 6 mm bar.

logical differences between *A. guianensis* and *A. congesta* indicate different systems of pollination and seed biology, reinforcing the case for recognition of two distinct species.

***Amanoa gracillima* W. J. Hayden, sp. nov. (Fig. 2)**

Arbor parva, 6–13 m; ramuli glabri; folia elliptica, 5–9 cm longa, 1.5–4 cm lata, apice acuminata, margine planis; ramuli inflorescentiarum sinuosi, glabri, 3–6 cm longi, ca 1.5 mm diam; flores ignoti;



FIG. 2. *Amanoia gracillima*, isotype, *Pessoal do Centro Pesquisas Florestais 6067* (U). A. Habit. B. Dehisced capsule valve, meso- and epicarp portion, internal surface. C. Same as B, lateral view at carpel margin. D. Same as B, external surface. E. Dehisced capsule valve, i = inner (endocarp) surface, o = outer (mesocarp and epicarp) surface. F, G. Seeds, ventral and dorsal sides. A, 2 cm bar; B-G, 6 mm bar.

fructus laevis, 12–13 mm longus; pericarpium tenue, ca 0.5 mm crassum, in 6 cocca dehiscens, endocarpio a mesocarpio secedens; mesocarpium nervi 2–3 mm ultra dehiscendum coccorum marginem lateralem projecti; semina subcylindrica, 9–11 mm longa, ca 7 mm lata; testa laevigata, castanea, chartacea, ca 0.1 mm crassa.

Small trees, 6–13 m tall; twigs glabrous. *Leaves* elliptic, 5–9 cm long, 1.5–4 cm wide, the apex acuminate, the base acute, the margins flat; petioles 5–8 mm long, blackened, canaliculate on the upper surface; stipules distinct to connate, ca 2 mm long, 1–2 mm wide. *Inflorescence axis* sinuous, 3–6 cm long, ca 1.5 mm thick; flower clusters 3 or 4 per cm at middle of axis. *Flowers* unknown. *Fruits* smooth, 12–13 mm long, borne on pedicels 5–6 mm long; pericarp thin, ca 0.5 mm thick, dehiscent into 6 mericarps (cocci), the endocarp separating from mesocarp, the inner surface of mesocarp bearing raised veins that project 2–3 mm beyond lateral margin of dehisced valves. *Seeds* subcylindric, somewhat flattened ventrally, with 2 small basal lobes and a low dorsal ridge, 9–11 mm long, ca 7 mm wide; hilum elliptic ca 2 mm wide and 3 mm long; testa glossy, dark chestnut-brown, chartaceous, ca 0.1 mm thick.

TYPE: BRAZIL. AMAZONAS: Manaus, terreno do Dr. Vieralves, *Pessoal do Centro Pesquisas Florestais 6067* (HOLOTYPE: U!; ISOTYPE: INPA, n.v.).

Additional specimen examined: BRAZIL. AMAZONAS: Manaus, igarapé do Parque 10, *Pessoal do Centro Pesquisas Florestais 6029* (U).

As suggested by the specific epithet, *A. gracillima* is easily distinguished from *A. guianensis*, to which both specimens had been referred, by its small leaves,

slender inflorescences, and small fruits. In this respect, *A. gracillima* is even more diminutive than *A. almerindae* Leal, *A. nanayensis* W. J. Hayden, and *A. oblongifolia*, species that generally have smaller leaves, flowers, and narrower inflorescence axes than *A. guianensis*. Dehisced fruits of *A. gracillima* are also distinctive by virtue of their mesocarp venation. Following their separation from the endocarp, mesocarp fragments display a series of distinctly raised veins on their inner surfaces. Moreover, these mesocarp veins project prominently beyond the mericarp edges that represent the suture between carpels; in contrast, the opposite mericarp edge, representing the carpel midline, is smooth (Fig. 2, B & C).

AMANOIA GUIANENSIS Aublet

Amanoa guianensis Aublet, Hist. Pl. Guiane 1: 256, pl. 101. 1775. *A. guianensis* var. *genuina* Muell. Arg. in DC., Prodrromus XV. 2: 219. 1866. TYPE: *Aublet s.n.* (LECTOTYPE selected here: W!; ISOLECTOTYPE: F—fragment!; photographs of lectotype: A!, F!, MO!).

There are four known Aublet collections of *Amanoa*, each housed in a different herbarium and each curated as the type of *A. guianensis*. The current study has shown, unexpectedly, that these specimens comprise two discordant elements. Specimens from the Rousseau Herbarium (P) and the British Museum (BM) match each other and are clearly different from the fragment at the Field Museum (F) and that fragment's presumed source, a specimen from the Naturhistorisches Museum of Vienna (W). Because Aublet's name was published without explicit citation of a type, it is necessary to choose among these specimens to designate a lectotype.

The specimen at W is a plant with glabrous stems and inflorescence axes; the leaves have dried dark brown above and purplish brown below, rendering the secondary veins somewhat obscure. Presumably, the specimen was collected late in the flowering period since the inflorescence bracts are empty, but four carefully pressed staminate flowers and two immature fruits are present in the packet. Based on color and venation, the F fragment, labelled simply "ex Herb. Aublet," was most likely derived from the W specimen. Both of these specimens clearly match the present application of the name *Amanoa guianensis*, a widespread species with relatively large flowers and fruits. The specimen at W was examined by Ferdinand Pax sometime prior to Pax and Hoffmann's (1922) treatment of the genus for *Das Pflanzenreich* and is fully consistent with nineteenth century collections cited therein and in the *Prodrromus* (Mueller, 1866).

The specimens from BM and P, however, differ significantly. The BM specimen bears a dense hirtellous tomentum on inflorescence axes and the youngest vegetative stems; further, its leaves have dried a dark olive green above, tan below, leaving secondary veins clearly visible. These features are matched by the P specimen (S. Barrier, pers. comm.). The BM specimen bears only immature flower buds whereas the inflorescence axes of the P specimen appear to represent both pre-flowering and post-fruiting stages. As interpreted here the BM and P specimens represent a new species (*A. neglecta* W. J. Hayden, described below), distinguished from all previously described species by the above-mentioned pattern of stem pubescence. The minute trichomes, readily apparent on the BM specimen at 7× magnification, are not detectable on a photograph of that specimen at NY.

On the basis of the NY photograph of the specimen at BM, Jablonski (1967) listed this pubescent specimen as the type of *A. guianensis*, which, nevertheless, he characterized in his key as having glabrous inflorescence axes. Jablonski never annotated the BM sheet and it is clear he was unaware of its discordance with every other specimen that he cited for the species. (Most of these other specimens match the W specimen, i.e., the traditional application of *A. guianensis*, but under

this species he also included specimens referable to *A. almerindae*, *A. congesta*, *A. nanayensis*, *A. oblongifolia*, *A. sinuosa* W. J. Hayden, and *A. steyermarkii* Jablonski.) Since he makes no mention of them, it appears Jablonski was unaware of the Aublet specimens at W, the fragment at F, and photographs of the W specimen at A, F, and MO. Jablonski did not explicitly specify the BM specimen as a lectotype, although his action might be construed as such. In essence, Jablonski arbitrarily cited the BM specimen as the type of *A. guianensis* since it was the only Aublet specimen of *Amanoa* known to him; he was unaware of its discordance with his own concept (however unrefined) of the species, and he provided no indication that he was consciously selecting a particular specimen from an assortment of different entities. Such an arbitrary action, compounded by a series of errors, should not constitute a valid lectotypification of *A. guianensis*. No other author has attempted to specify which Aublet specimen should serve as the type of *A. guianensis*.

There is little in the description and protologue of *A. guianensis* that unequivocally indicates the proper selection of a lectotype. There is no mention of stem pubescence, nor is there any indication of trichomes on the accompanying illustration, although it is conceivable that because of its fine texture the indumentum may have been overlooked. Aublet's description of staminate flowers, pistillate flowers, and immature fruits (and his explicit statement that he had not seen mature fruits) is consistent with the W specimen, but would be difficult to reconcile with the apparent phenological stage of the BM and P specimens. Although far from overwhelming, the evidence suggests the W specimen to be the superior choice as lectotype. Fortunately, this selection is also consistent with Recommendation 7B of the ICBN, since it will preserve current usage of the name.

***Amanoa nanayensis* W. J. Hayden, sp. nov. (Fig. 3)**

Arbor monoica; folia elliptica, 5–13.5 cm longa, 1.5–6 cm lata, apice acuminata, margine planis; ramuli inflorescentiarum glabri, ca 1 mm diam; pedicelli glabri; flores masculini sessiles; stamina supra discum affixa; pollinis granis reticulatis; fructus 12–18 cm longus, in cocca 6 dehiscens, pericarpio ca 1 mm crasso, endocarpio ex mesocarpio secedenti, margine cocci laevi; testa dura, 0.5–1.0 mm crassa.

Monoecious trees, 4–20 m tall; twigs brown, glabrous, with abundant lenticels. *Leaves* elliptic, 5–13.5 cm long, 1.5–6 cm wide, coriaceous, the apex acuminate, the base acute to obtuse; petioles 4–10 mm long, corky, canaliculate on the upper surface; stipules distinct, 2 mm long, 1 mm wide. *Inflorescence axis* slightly sinuous or straight, with prominent lenticels and/or transverse corky ridges, glabrous; floral bracts with a median row of short trichomes abaxially; flowers greenish-white to cream or yellow. *Staminate flowers* sessile, about 5 mm in diam; sepals 2–3 mm long, imbricate, oblong, with rounded apex; petals scale-like, 1 mm long, clawed, the limb peltate-concave; disk annular, lobed, ca 0.5 mm tall, ca 2.5 mm in diam; filaments ca 1.5 mm long, inserted above the disk; anthers ca 1 mm long; pollen reticulate; pistillode cylindric, ca 1 mm tall, 0.3 mm diam. *Pistillate flowers* 5–6 mm wide, on glabrous pedicels 1–3 mm long; sepals 2–3 mm long, ovate, with acute apex; petals 1 mm long, 1 mm wide, clawed, the limb planar-reniform or peltate-concave; disk 0.5 mm tall; ovary 2–3 mm tall. *Fruits* minutely warty, green, 12–18 mm long, borne on pedicels 3–4 mm long; pericarp ca 1 mm thick, dehiscing into 6 mericarps (cocci), the endocarp separating from mesocarp, the mericarp margins smooth. *Seeds* subglobose to hemispheric, more or less flattened ventrally, with a longitudinal dorsal ridge, 10–12 mm long, 8–9 mm wide; hilum round to elliptic, up to 2 mm wide and 4 mm long; testa tan to brown, 0.5–1 mm thick, the inner sclereid layer well developed; embryo ca 8 mm long.

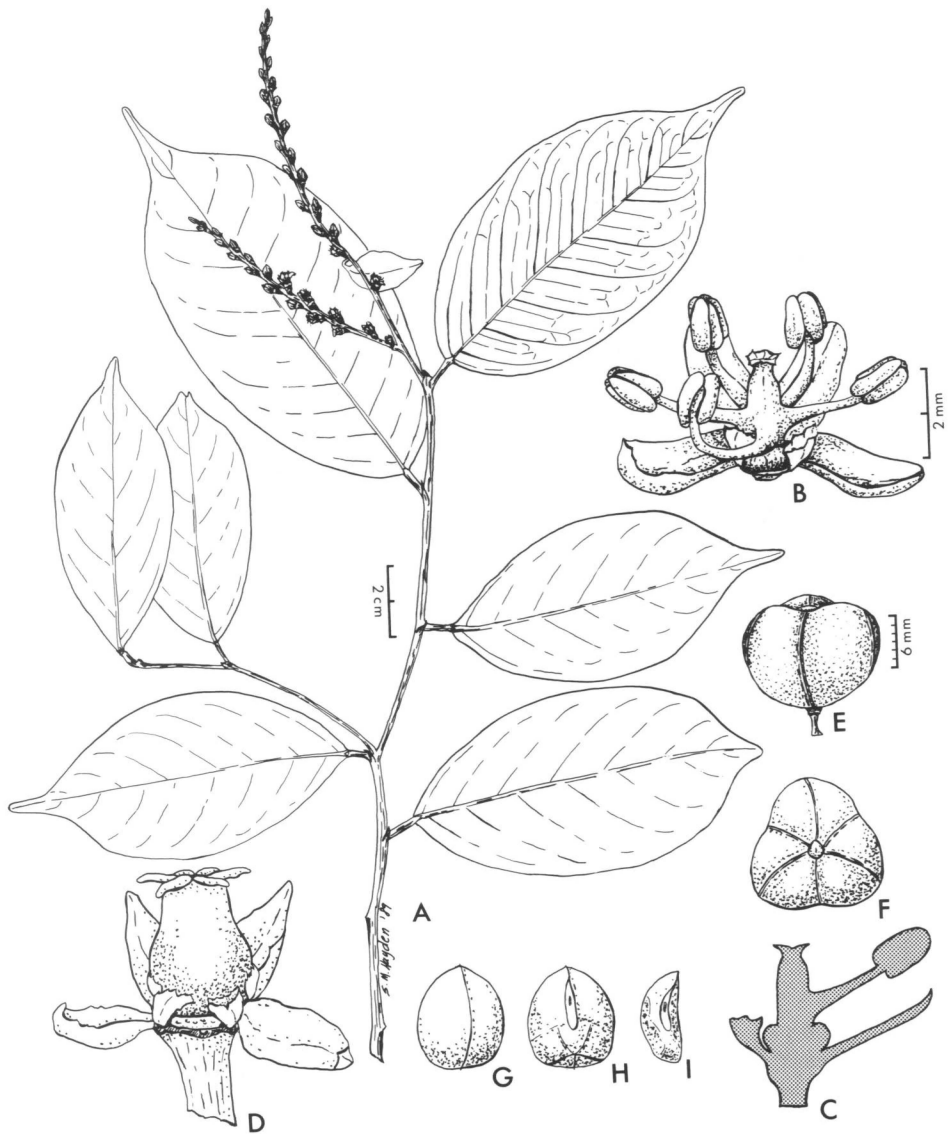


FIG. 3. *Amanoa nanayensis*. A. Habit, *McDaniel 13552* (NY). B. Staminate flower, *Rimachi Y. 2560* (NY). C. Staminate flower, diagrammatic longitudinal section. D. Pistillate flower, *McDaniel & Rimachi Y. 20332* (NY). E, F. Mature fruits, lateral and top views, *Davidson & Jones 9735* (F). G, H. Seed from one-seeded locule, dorsal and ventral sides, *Rimachi Y. 944* (NY). I. Seed from two-seeded locule, ventral side, *Rimachi Y. 944* (NY). A, 2 cm bar; B-D, 2 mm bar; E-I, 6 mm bar.

TYPE: PERU. LORETO: Maynas, Departamento Iquitos, Río Momón (tributary of Río Nanay), *Rimachi Y. 1911* (HOLOTYPE: NY!; ISOTYPES: F!, NA!).

Additional specimens examined: BRAZIL. AMAZONAS: Río Tatumá, *Ducke 305* (A, F, K, MO, NY, US). Without definite locality, *Ducke 179* (A, F). COLOMBIA. AMAZONAS-VAUPES: Río Apaporis, Soratama, *Schultes & Cabrera 19766* (GH, US). PERU. LORETO: Río Chambira, Pucacuro, 73°54'W, 3°35'S, *Vásquez et al. 7453* (F, MO); Río Mazán, Barranca, *Schunke 187* (A, F, NY, US); Río Momón, *Croat 20019* (MO, NA), *Davidson & Jones 9735* (F), *McDaniel et al. 2467* (US), *McDaniel 13552* (MO, NY), *Rimachi Y. 3169* (F, MO, NA, NY), *Rimachi Y. 3287* (F, NY), *Rimachi Y. 3310* (F, MO),

Rimachi Y. 4581 (MO, NA, NY); Moronillo, 73°15'W, 3°55'S, *Vásquez et al. 5576* (F, MO); Moropón (tributary Río Nanay), between Bellavista and Pampa Chica, *McDaniel et al. 24183* (MO); Río Nanay, Bellavista, *McDaniel & Rimachi Y. 18405* (F, NY), *McDaniel & Rimachi Y. 20332* (F, MO, NA, NY), *McDaniel & Rimachi Y. 25291* (MO, NA, NY), *Rimachi Y. 944* (F, NY), *Rimachi Y. 2560* (F, NY); Río Nanay, Puerto Almendras, *Moore et al. 103* (F); Río Nanay, Mapa Cocha, *McDaniel & Rimachi Y. 20553* (DAV); Quebrada Santa Cruz, 73°35'W, 3°50'S, *Vásquez & Ruiz 2957* (F, MO); Quebrada Tahuayo above Tamishiyaco, *Croat 19840* (AAU, NA, NY, U, US); Quistococha, *Ellenberg 2846* (U); Río Yavari, *Gentry & Revilla 20811* (AAU, F).

Amanoa nanayensis, named after the type locality, appears to be the most abundant *Amanoa* along riverbanks in the vicinity of Iquitos, Peru, having been collected extensively along Río Nanay and its tributary, Río Momón. *Amanoa guianensis*, *A. oblongifolia*, and *A. sinuosa* are sympatric with *A. nanayensis*. For the most part, specimens cited above have been referred to either *A. guianensis*, which differs by larger flowers, larger fruits, and spiny pollen, or *A. oblongifolia*, which may be distinguished by its abaxially punctulate leaves, partially dehiscent capsules (3 rather than 6 mericarps), and paper-thin testa. *Amanoa sinuosa* is easily distinguished from *A. nanayensis* by strongly sinuous inflorescence axes and larger fruits.

One of the above collections, *Rimachi Y. 3169*, included bulk samples of stem bark that have been investigated for potential anti-cancer activity. A single active compound was detected and isolated, the lignan 4'-demethyldeoxypodophyllo-toxin (Fang et al., 1985). Other secondary metabolites that have been isolated from this collection include: (+)-sesamin, and paulownin (lignans); friedelin, canophyllol, betulin, betulinic acid, and ursolic acid (triterpenes); cryptomeridiol, pterocarprtriol, 4-epicryptomeridiol, and selina-3 β ,4 α ,11-triol (hydroxylated sesquiterpenoids); and β -sitosterol and daucosterol (sterols) (Fang et al., 1985; Nanayakkara et al., 1986). Unfortunately, in both of these publications, these compounds were attributed to *A. oblongifolia*, which, to my knowledge, has not been scrutinized for its chemical constituents.

***Amanoa neglecta* W. J. Hayden, sp. nov. (Fig. 4)**

Ab aliis generis speciebus ramulis inflorescentiisque pilis parvulis rufis crispis indutis differt.

Trees; young twigs densely rufous-hirtellous. *Leaves* ovate to elliptic, 4–10 cm long, 2–4.5 cm wide, glabrous, the apex acuminate, the base rounded; petioles 5–10 mm long, canaliculate on the upper surface, blackened, irregularly corrugate; stipules distinct, deltate, 2–3 mm long, ca 2 mm wide at base. *Inflorescence axes* densely rufous hirtellous, ca 2 mm thick, somewhat sinuous. *Flowers* and *fruits* unknown.

TYPE: FRENCH GUIANA: without specific locality, *Aublet s.n.* (HOLOTYPE: P (photocopy seen); ISOTYPE: BM!).

Additional specimens examined: FRENCH GUIANA: Cayenne, *Bena 132h* (U). SURINAM: without specific locality, *B.B.S. 177* (U).

It is most remarkable that in the two centuries since Aublet first collected this species, only two additional specimens have come to light. Given its poor record of collection and the long span of time that Aublet's specimens were erroneously mixed with *A. guianensis* (see above), the epithet *neglecta* seems most appropriate for this still poorly understood taxon. The types, *Aublet s.n.*, bear inflorescence axes, some prior to anthesis, others, apparently, post-fruited; the other two specimens cited are sterile, but are an easy match for the Aublet specimens. Even in the absence of flowering and fruiting material, *A. neglecta* is a distinctive species readily separated from all others in the genus by the fine pubescence of both vegetative stems and inflorescence axes. Only *A. almerindae*, from the Orinoco



FIG. 4. *Amanoa neglecta*. A. Habit, isotype, *Aublet s.n.* (BM). B. Apex of immature inflorescence, *Aublet s.n.* (BM). C. Vegetative stem with stipule and base of petiole, *Aublet s.n.* (BM). D. Apex of vegetative stem with base of petiole and stipule over terminal bud, *B.B.S. 177* (U). A, 2 cm bar; B-D, 2 mm bar.

and Negro drainage basins, has similarly pubescent inflorescence axes. *Amanoa almerindae* differs, however, in its glabrous, usually blackened, branchlets. Geographically, *A. neglecta* is sympatric with *A. guianensis* and is adjacent to the range of *A. congesta*. In addition to its distinctive pubescence, herbarium material of *A. neglecta* dries dark olive green and thus immediately stands apart from *A. guianensis* and *A. congesta*, which typically dry dull brown or reddish-brown.

***Amanoa sinuosa* W. J. Hayden, nom. nov.**

Amanoa robusta Leal, Arq. Jard. Bot. Rio de Janeiro 11: 68, plate IX. 1951. TYPE: BRAZIL. AMAZONAS: Manaus, Cachoeira do Mindu, *Ducke s.n.*, 17 Dec 1929, (RB, 4 sheets, no. 23509!); non *A. robusta* Thwaites, Enum. Pl. Zeyl. p. 428. 1864 [= *Cleistanthus robustus* (Thwaites) Muell. Arg.].

Additional specimens examined: BRAZIL. AMAZONAS: Manaus, *Ducke 1188* (GH, INPA, K, MO, NY, US); *Ducke 1197* (K, MO, NY); *Ferreira 58-183* (INPA, U), *Pessoal do C.P.F. s.n.*, 2 Feb 1958 (INPA, U). MATTO GROSSO: Tabajara, upper Machado River, *Krukoff 1489* (A, BM, F, G, K, MO, NY, U, US). COLOMBIA. VALLE: Alto Yunda, Río Anchicaya, *Hilty Jy-1* (MO). PERU. LORETO: Iquitos, *Ducke s.n.*, 9 Aug 1906 (DAV); Río Nanay, Quebrada de Anguilla, *Rimachi Y. 3492* (DAV).

Renaming of this apparently uncommon species is required since Leal's name is a later homonym of *A. robusta* Thwaites. The epithet *sinuosa* refers to the wavy inflorescence axes which easily distinguish this taxon from *A. guianensis*, with which it has been most frequently confused. *Amanoa guianensis* can further be distinguished by its larger flowers and spiny (not reticulate) pollen. Some specimens cited above had been misidentified as *A. glaucophylla* Muell. Arg., which has pedicellate (not sessile) staminate flowers. Sinuous inflorescence axes occur in several other species of *Amanoa*; of these, the dioecious *A. anomala* Little from coastal Ecuador has longer but less numerous inflorescence branches, *A. neglecta* has axes that are also densely tomentose, and *A. gracillima* has an overall more delicate aspect, with shorter, more narrow inflorescence axes, smaller fruits and seeds.

Key to neotropical species of *Amanoa* Aublet

- 1 Inflorescence axes 20–40 cm long; plants dioecious; coastal Ecuador *A. anomala* Little
- 1 Inflorescence axes less than 15 cm long; plants mostly monoecious and protandrous.
 - 2 Lower leaf surfaces punctulate with uniformly scattered cork warts (10× magnification).
 - 3 Leaves stiffly erect, the margins revolute; staminate flowers pedicellate; plants of elevations above 1500 m; S Venezuela *A. steyermarkii* Jablonski
 - 3 Leaves spreading, the margins flat; staminate flowers sessile; plants of elevations below 500 m; middle to upper Amazonian drainage basin *A. oblongifolia* Muell. Arg.
 - 2 Lower leaf surfaces immaculate, not punctulate, at least not from cork warts (leaves may be spotted with epiphytic organisms or scars from physical damage; such spots are generally of variable size or uneven distribution).
 - 4 Leaf apex rounded or retuse; shrubs mostly less than 2 m tall; NW Brazil, S Venezuela *A. cupatensis* Huber
 - 4 Leaf apex acute to acuminate; trees.
 - 5 Leaf margins revolute.
 - 6 Inflorescence axis strongly sinuous; largest unopened buds ca 2 mm in diam; Loreto, Peru to Matto Grosso, Brazil (*A. robusta* Leal) *A. sinuosa* W. J. Hayden
 - 6 Inflorescence axis straight or at most only slightly sinuous; largest unopened buds 3 mm or more in diam.
 - 7 Staminate flowers pedicellate; leaves oblong; dioecious; Brazil *A. glaucophylla* Muell. Arg.
 - 7 Staminate flowers sessile; leaves elliptic, ovate, or obovate, not oblong; monoecious; widespread in lowland Central America and N South America (*A. grandiflora* Muell. Arg., *A. macrocarpa* Cuatrec., *A. potamophila* Croizat) *A. guianensis* Aublet
 - 5 Leaf margins flat.
 - 8 Inflorescence axis and pedicels hirtellous.
 - 9 Young stems glabrous, glaucous; NW Brazil, S Venezuela (*A. pubescens* Steyermark) *A. almerindae* Leal
 - 9 Young stems tomentose; French Guiana, Surinam *A. neglecta* W. J. Hayden
 - 8 Inflorescence axis and pedicels glabrous.
 - 10 Dehiscent mericarps with fine veins extending beyond one margin; capsules 10–13 mm long, the pericarp ca 0.5 mm thick; Manaus, Brazil *A. gracillima* W. J. Hayden
 - 10 Dehiscent mericarps with smooth margins; capsules greater than 12 mm long, the pericarp ca 1 mm thick or thicker.
 - 11 Staminate flowers pedicellate; androphore present, 1 mm long; testa less than 0.1 mm thick; Guadeloupe, Dominica *A. caribaea* Krug & Urban
 - 11 Staminate flowers sessile; androphore absent or not evident, less than 0.5 mm long; testa hard, 0.5–1 mm thick.
 - 12 Largest unopened buds ca 2 mm in diam; inflorescence axis ca 1 mm

- thick; pericarp ca 1 mm thick; fruits 12–18 mm long; SE Colombia, NE Peru *A. nanayensis* W. J. Hayden
- 12 Largest unopened buds 3 mm or more in diam; inflorescence axis usually 2 mm or more thick; pericarp 3–6 mm thick; fruits (12) 20–40 mm long.
- 13 Flower clusters crowded on the inflorescence axis, the internodes obscure; fruits strongly triangular; seeds subcylindric; pollen reticulate; Surinam, French Guiana, NE Brazil
..... *A. congesta* W. J. Hayden
- 13 Flower clusters well separated, the internodes evident; fruits essentially round, not strongly triangular; seeds hemispheric-triangular; pollen spiny; widespread in lowland Central America and N South America (*A. grandiflora* Muell. Arg., *A. macrocarpa* Cuatrec., *A. potamophila* Croizat) *A. guianensis* Aublet

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