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A REVISION OF THE BRAZILIAN SPECIES OF STERCULIA L.

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ABSTRACT. Eleven species are recognized in a revision of *Sterculia* L. (Sterculiaceae) in Brazil, of which nine are from the Amazonian hylaea. *Sterculia curiosa* (Vell.) Taroda, comb. nov., is shown to be the correct name for *S. chicha* sensu Schumann non St Hil. *S. chicha* St Hil. sensu str. is shown to be a synonym of *S. apetala* (Jacq.) Karst. A key is provided for the determination of all Brazilian *Sterculia* species.

Sterculia L. is a large, pantropical genus with c.300 species (Willis, 1973; Hutchinson, 1967). Gentry (1976) has pointed out that the genus is much in need of a monographic treatment, and certainly published epithets are in considerable excess of the number of valid species. Tantra (1976), for instance, reduced some 146 epithets to 51 accepted species in his treatment of the genus in the *Flora Malesiana* area.

It would seem that SE Asia, with extensions into the Indian Ocean and Australasia, contains the major diversity with over 60 species. Africa has some 35 epithets listed in *Index Kewensis* but the tropical African Floras by Oliver (1868), Hutchinson & Dalziel (1928), Exell & Mendonça (1951) and Robyns (1963) only recognize a total of 16 species. In the New World some 30 specific epithets are listed for South America and a further eight for Central America, but no modern study for the area exists and it is not known how many valid species occur. The present revision recognizes 11 species in Brazil, although it must be emphasized that three of these are only known from the type collections, and the number of specimens available for study for some of the other species is very limited.

DISTRIBUTION

Nine of the 11 species of *Sterculia* in Brazil are from the Amazonian hylaea where considerable sympatry seems to occur. However, *S. striata* is the most wide-ranging species with a distribution across Central and NE Brazil where it is largely allopatric with the closely related *S. curiosa,* which occurs in the Atlantic coastal forest and the interior ranges of SE and E Brazil.

CYTOLOGY

The only three chromosome counts available for New World species are for *S. curiosa* and *S. striata* (Taroda, 1981—reported in Gibbs & Ingram, 1982) and for *S. apetala* (Bawa, 1973). All counts are $2n = 40$.

MORPHOLOGY

Sterculia species constitute a fairly homogeneous group easily recognized by their characteristic apetalous, diclinous flowers bearing the

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androecium or gynoecium at the end of a curved androphore or gynophore.

Habit: all Brazilian *Sterculia* species are big trees, generally reaching a height of 40 m or so. The only known exception is *S. pendula,* described by Ducke (1950) as a small tree 4 m tall, but this species is only known from the type specimen which probably represents a juvenile individual.

Stipules: prominent stipules, ranging from 7–25 mm in different species, occur on the young branch apices in all species but they are usually rapidly caducous. *S. stipulifera* seems to be distinctive in having persistent stipules, but again this species is only known from the type specimen. Rather persistent stipules also occur in some specimens of *S. excelsa.*

Leaves: in the New World *Sterculia* species leaves may be entire, lobed, or compound digitate, but the last leaf is not found in any Brazilian species. In general, leaf characters provide a convenient way of distinguishing some groups of related species:

lobed leaves: encountered in only three species, *S. curiosa, S. apetala* and *S. striata,* which also have flowers lacking scale-like appendages on the interior of the calyx (see below).

entire leaves: the remaining eight species with entire leaves all have a scale-like appendage on the inner surface of each calyx lobe. The trio *S. excelsa, S. apeibophylla* and *S. stipulifera* are characterized by prominent veinlets on the lower surface, whilst *S. albidiflora, S. frondosa* and *S. rigidifolia* have distinctly coriaceous leaves and obscure veinlets on the lower surface. The two remaining entire-leaved species, *S. pruriens* and *S. pendula* can be distinguished by the long leaves of the latter, 11–30 cm with markedly acuminate to caudate apex, as opposed to leaves 6–8 cm with acute to acuminate apex in *S. pruriens.*

Perianth: petals lacking. The Brazilian species of *Sterculia* have a campanulate calyx 5–20 × 5–20 mm, with the sole exception of *S. striata* which has an urceolate calyx. An interesting feature in the species with entire leaves is the presence of a scale-like appendage on the inner surface of each calyx-lobe: this possibly represents a petal remnant.

A glandular, nectary-like structue is always present on the lower, inner surface of the calyx cup. In *S. curiosa, S. apetala, S. stipulifera* and *S. striata* this has a fine papillate-like structure, which is restricted to the base of the calyx in the former three species and more extensively distributed within the urceolate calyx of *S. striata.* In the remaining species the nectary-like tissue consists of glandular hairs evenly distributed over the inner surface of the calyx lobes.

Staminate flowers: stamens are monadelphous, with the subsessile anthers borne on a very short (less than 3 mm) urceolate tube, which itself is borne on a 3–17 mm (depending on the species) reflexed-curved androphore. Most Brazilian species have 10 anthers, but *S. curiosa* and *S. apetala* have 15 anthers. The staminal tube encloses an ovary rudiment.

Pistillate flowers: the ovary, consisting of five coherent carpels with a common style, is borne on a curved gynophore comparable in size to the androphore of the staminate flowers. The ovary always bears a collar of reduced anthers which produce sterile pollen.

Fruits: *Sterculia* species produce surprisingly large fruits compared with the size of the flowers. During early maturation the fruits separate into individual follicles, such that five (or less by abortion) follicles may each reach c.9–18 × 9–15 cm at maturity, with a pericarp 8–15 mm in thickness, and seeds 3–8·5 cm in length. Fruits of Brazilian *Sterculia* species show the common tropical feature of red-black coloration, with black seeds contrasting against the red lining of the dehiscing follicle. Dispersion is presumably by birds but no data is available.

Sterculia L. Sp. Pl.: 1007 (1753).

Syn.: *Ivira* Aublet, Hist. Pl. Guiane: 694. t. 279 (1775).
Mateatia Vell. Conc., Fl. Flum. 382 (1825); Fl. Flum. Ic. 9: t. 95 (1835).
Xylosterculia Kosterm. in Bot. Tidsskr. 67:317–323 (1973).

Trees to c.40 m tall. Cataphylls glabrous or stellate pilose. Young branches stellate-pilose. Stipules subpersistent or commonly caducous, lanceolate or subulate, stellate-tomentose. Leaves spirally clustered towards the tips of twigs; petiole terete or sometimes slightly canaliculate, usually slightly thickened at the top, glabrescent or stellate-pilose; lamina simple, entire or 3–5-lobed, upper surface glabrescent, lower surface covered with a stellate indumentum which may be puberulous to densely tomentose; venation brochidodromous; midrib and secondary veins prominent on the lower surface; margin slightly revolute or plane, usually slightly undulate.

Inflorescence paniculate, subterminal or axillary with flowers laxly to densely crowded towards the apex of branchlets which are densely stellate-pilose. Bracts and bracteoles subpersistent or caducous, triangular to subulate. Flowers diclinous, actinomorphic, monochlamydeous, borne on articulate pedicels. Calyx campanulate or urceolate, 5-lobed, lobes triangular, lanceolate or oblong; exterior densely covered with stellate brownish hairs; inner surface puberulent to tomentose and in species with entire leaves, furnished with a triangular appendage usually at the middle of each lobe. Staminate flowers usually lateral on the branches of the inflorescence; androphore curved, glabrous, puberulous or tomentose, supporting the glabrous or pilose urceolate staminal tube; anthers 10–15, surrounding a vestigial pistil. Pistillate flowers generally terminal on the main axis and side branches of the inflorescence, usually larger than the male; gynophore curved, glabrous, puberulous or tomentose; ovary densely clothed with long stellate hairs, surrounded by a collar of vestigial anthers at the base; carpels 5, coherent; loculi with 2–8 ovules disposed in two rows on a sutural placenta; style curved, stellate-pilose; stigma capitate, slightly 5-lobed. Fruits, when mature, of five free follicles (or less by abortion), stellate-pilose and commonly pruinose externally; with variable pilosity internally. Seeds glabrous, ellipsoid or globose, smooth; embryo with the radicle opposite to the hilum and well-developed endosperm.

Type species: *Sterculia foetida* L.

KEY TO THE BRAZILIAN SPECIES OF STERCULIA

1a. Leaves compound, digitate . . . . . *S. foetida** (p. 148)

1b. Leaves simple, entire or 3–5-lobed 2

2a. Calyx-lobes with small scale-like appendages on the inner surfaces; leaves entire 3

2b. Calyx-lobes without small scale-like appendages on the inner surfaces; leaves 3–5-lobed. 10

3a. Androphore and gynophore glabrous; stipules lanceolate, persistent 6. *S. stipulifera*

3b. Androphore and gynophore with glandular hairs, at least at the base; stipulates linear or subulate, caducous 4

4a. Inflorescence borne on distinctive, subterminal branchlets which bear modified leaves with short petioles and acute apices, contrasting with the long petioles and emarginate apices of normal leaves 9. *S. rigidifolia*

4b. Inflorescence subterminal and lacking the modified leaves 5

5a. Lower surface of leaf with prominent, raised veinlets 6

5b. Lower surface of leaf with immersed veinlets 7

6a. Leaf with upper surface distinctly and uniformly bullate; pilose, densely so along the veins . . . . . 5. *S. apeibophylla*

6b. Leaf with upper surface smooth or occasionally weakly bullate; glabrous. . . . . 4. *S. excelsa*

7a. Mature follicle thin-walled (c. 2 mm); leaf-apex caudate, base cuneate . . . . . 11. *S. pendula*

7b. Mature follicle thick-walled (more than 5 mm), leaf-apex and base variable but never caudate and cuneate. 8

8a. Leaf-apex acute to acuminate. Calyx inner surface sparsely covered by stellate hairs mixed with glandular hairs. . . . . 10. *S. pruriens*

8b. Leaf-apex obtuse, rounded or emarginate. Calyx inner surface densely covered by stellate hairs; glandular hairs absent 9

9a. Petiole glabrous; leaf upper surface shiny, lower surface minutely tomentose (apparently glabrous). Cataphylls glabrous, shiny, long-acuminate, coriaceous . . . . . 7. *S. frondosa*

9b. Petiole densely stellate; leaf upper surface dull, lower surface evidently tomentose. Cataphylls densely pilose, dull, triangular, chartaceous . . . . . 8. *S. albidiflora*

10a. Calyx urceolate, up to 10 mm; anthers 7–10 . . . . . 3. *S. striata*

10b. Calyx campanulate, longer than 13 mm; anthers 12–15. 11

11a. Calyx-cup 8–13 mm with lobes 7–10 mm; follicle 4–5 cm at dehiscence, the inner surface with an indumentum of simple hairs 2. *S. apetala*

11b. Calyx-cup 3–5 mm with lobes 9–15 mm; follicle 9–18 cm at dehiscence, the inner surface with an indumentum of stellate hairs 1. *S. curiosa*

*Introduced species.

1. S. curiosa (Vell. Conc.) Taroda, **comb. nov.** Fig. 1.

Syn.: *Mateatia curiosa* Vell. Conc., Fl. Flum.: 382 (1825); Fl. Flum. Ic. 9: t. 95 (1835). Type: Fl. Flum. Ic. 9:t. 95 (1835).

Misident.: *S. chicha* sensu Schumann in Mart. Fl. Bras. 12(3):8 (1886), non St Hil.

Cataphylls 7–10 mm, triangular, densely pilose on both surfaces. Stipules 15–20 mm, caducous, lanceolate, densely hairy on the outer surface, glabrous on the inner. Leaves (8·5–)10–17(–22) × (10–)14–22(–29) cm, coriaceous, 3–5-lobed, median lobe ovate, laterals asymmetric: base deeply cordate, apex acute to obtuse or rarely rounded; margin slightly revolute; upper surface densely hairy when young, becoming glabrous, midrib and secondary veins somewhat evident; lower surface densely brownish pilose, midrib and secondary veins prominent; petiole (5–)10–19(–26) cm, glabrescent.

Inflorescence 15–20 cm, lax; main axis and side branchlets stellate-pilose. Bracts and bracteoles subpersistent, densely pilose on the inner surface. Pedicel 2–3 mm, densely stellate-pilose. Calyx 15–20 mm, campanulate, outer surface stellate-pilose; inner surface usually pilose with veins somewhat evident, lobes 9–15 × 5–8 mm at the base, lanceolate, apex acute to obtuse, nectariferous gland conspicuous at the calyx base. Androphore 13–17 mm, tomentose; staminal tube puberulent, anthers 12–15. Gynophore 9–12 mm, puberulent to tomentose; ovary globose with 8 ovules per loculus; style 3–4 mm, pilose. Mature and dehisced follicle 9–18 × 9·5–15 cm with wall 8–15 mm thick, internally sparsely stellate-pilose, with long whitish hairs. Seeds ellipsoid, 3–3·5 cm, glabrous.

The species here referred to as *Sterculia curiosa* has been widely accepted under the name *S. chicha* St. Hil. by most authors who have followed the treatment by Schumann (1886) in the *Flora Brasiliensis*. In this work, Schumann cited several specimens from Rio de Janeiro and Minas Gerais, but did not cite the type specimen which was collected by St Hilaire in Goiás state although it is evident that he had seen this material and indeed recognized its similarity to *S. apetala*.

A recent opportunity to study type material in the Muséum d'Histoire Naturelle, Paris, has revealed that St Hilaire's specimen of *S. chicha* clearly has the floral character, viz. calyx lobes shorter than the calyx cup, of the northern species *S. apetala*. As a consequence, *S. chicha* St. Hil. must be treated as a synonym of *S. apetala* (as proposed by Robert Brown in *Plantae javanicae rariores* p. 328 (1844) but under *S. carthaginensis* Cav.) and a new name be found for the species *S. chicha* sensu Schumann, from E & SE Brazil.

A readily available but hitherto neglected name is provided by *Mateatia curiosa* Vell. Conc. This species, which Vellozo treated as the sole member of his new genus *Mateatia*, is clearly a *Sterculia*. Although Vellozo's type specimens have never been located, the description, illustration and type locality (Rio de Janeiro) are sufficiently detailed to identify *Mateatia curiosa* under *S. chicha* sensu Schumann and the new combination has been effected. Following Art. 42 of the ICBN it is proposed that the illustration of *Mateatia curiosa* in the *Flora Fluminensis* (which features details of the ovary) should be taken as the type of this species.

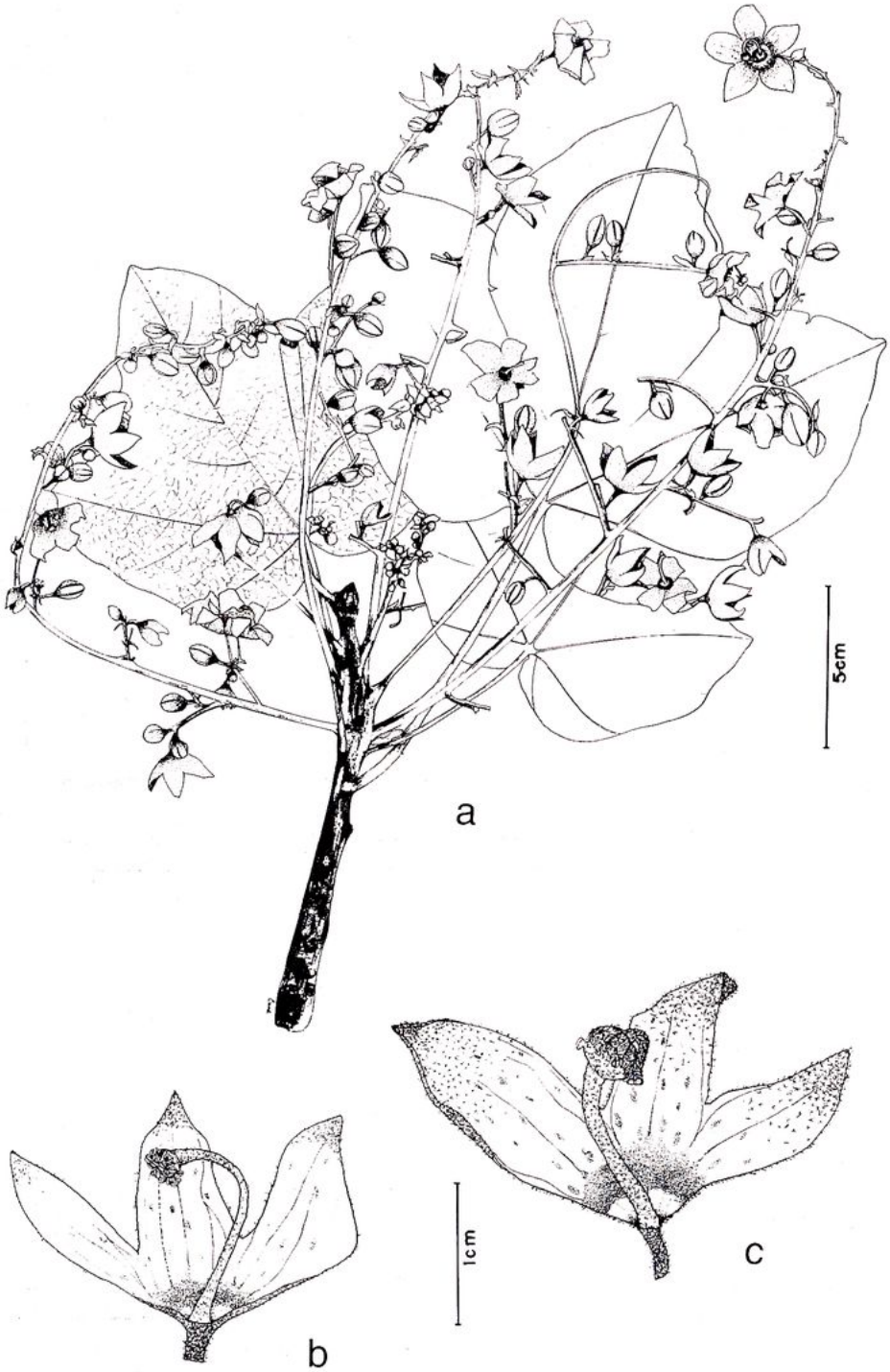

FIG. 1. *Sterculia curiosa* (Vell.) Taroda: a, flowering branchlet; b, staminate flower, partially dissected; c, pistillate flower, partially dissected. All from *Kuhlmann* s.n. (SP 31390).

As a consequence of this nomenclatural change, the account of the floral biology and breeding system of '*Sterculia chicha* St. Hil.' by Taroda & Gibbs (1983) in fact refers to *Sterculia curiosa* (Vell. Conc.) Taroda.
Distribution: E to SE of Brazil: Espírito Santo, Rio de Janeiro, São Paulo and Minas Gerais (Fig. 2).

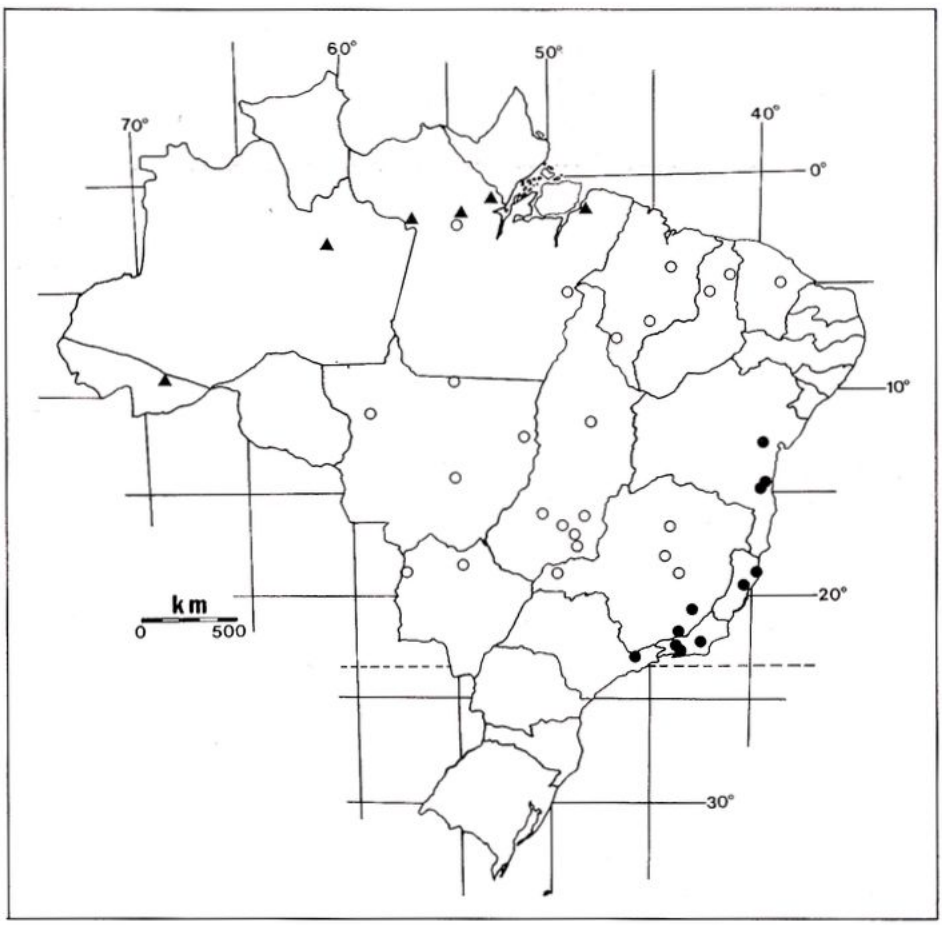

FIG. 2. Distribution of Brazilian Sterculias: ●, *S. curiosa;* ○, *S. striata;* ▲, *S. apetala.*

BAHIA: Uruçuca, cocoa plantation, x 1970, *Santos* 1153 (CEPEC); estrada Coaraci–Almadina, cocoa plantation, ix 1971, *Pinheiro* 1640 (CEPEC); Rodovia Rio do Meio-Itatim, fazenda Bom Sucesso, viii 1973, *Pinheiro* 2227 (CEPEC).
ESPÍRITO SANTO: Concórdia, 1889, *Bello* 647 (R); Linhares, cocoa plantation, iii 1971, *Santos* 1499 (CEPEC); Linhares, Reserva Florestal, i 1973, *Spada* 146 (RB, UEC); Conceiçaõ da Barra, *Mattos, Filho & Magman* 50 (RB).
FEDERAL DISTRICT: Brasília, cult. in the Biological Station of the University of Brasília, iii 1976, *Heringer* 14489 (UB).
GOIÁS: Luziânia, cult., iii 1975, *Heringer* 14502 (UEC).
MINAS GERAIS: Belo Horizonte, cult. in fazenda do Pastinho, iii 1935, *Barreto* 7898 (R); Viçosa, i 1936, *J.G.K.* (RB 963); Coronel Pacheco, ii 1941, *Heringer* (SP 46605); Juiz de Fora, ii 1947, *Kieger & Roth* 1114 (RB); without precise locality, x 1968, *Gomes* (RB 144223).
RIO DE JANEIRO: Quinta de S. Cristóvaõ, ii 1880, *Glaziou* 11792 (R); Rio de Janeiro, cult. in the Parque do Museu, ix 1897, *Ule* 1 (R); Rio de Janeiro, near the administration building

of the Horto Florestal, xii 1927, *Pessoal do Horto Florestal* (RB 960); Rio de Janeiro, i 1929, *Constantino* (RB 7729); Campo Grande, granja Paraíso, viii 1934, *Sampaio* (R 78359); Rio de Janeiro, ix 1934, *Kuhlmann* (RB 949, UEC); Rio de Janeiro, Jacarepaguá, Recreio dos Bandeirantes, iv 1959, *Duarte* 4653 & *Pereira* (RB); Campo de Santa Cruz, *Saldanha* 746 (R).

SÃO PAULO: Serra da Mantiqueira, i 1885, *Saldanha* 8704 (R); São Paulo, cult, in the Jardim Botânico de São Paulo, iv 1937, *Handro* (SP 38667); Itaicy, i 1943, *Zaballa* (SP 48122), Campinas, cult. in the fazenda Santa Eliza, i 1946, *Viegas* (SP 53566); Campinas, cult. in the fazenda Santa Eliza, xi 1975, *Taroda* 530 (UEC).

2. S. apetala (Jacq.) H. Karst., Fl. Colomb. 2: 35, t. 118 (1861) Fig. 3.

Syn.: *Helicteres apetala* Jacq., Select. Stirp. Am. Hist.: 238, t. 181 (1763). Type: not traced.

S. carthaginensis Cav. Diss. 6:353 (1788). Type: Colombia, 'habitat in Carthaganeae sylvis'—n.v.

S. chicha St Hil., Fl. Bras. Mer. 1:278, t. 46 (1828) sensu. str. Type: Brazil. Goiás, s.l., *St Hilaire* (P)!

S. elata Ducke in Arch. Jard. Bot. Rio de Janeiro 3:211 (1922). Type: Brazil, Pará, Paraná do Adauaca, near Faro, x 1907, *Ducke* 8600 (RB)!

Cataphylls 6–10 mm, subulate to lanceolate, densely pilose. Stipules 7–9 mm, lanceolate, densely pilose on both surfaces. Leaves (13–)16–20 (–23) × (19–)25–30(–38) cm, generally coriaceous, rarely membranaceous, 3–5-lobed, base deeply cordate, apex acute to obtuse, sometimes rounded; margin slightly revolute; upper surface densely pilose, when young, becoming glabrous; midrib and secondary veins prominent; petiole (14–) 18–22(–26) cm, glabrescent.

Inflorescence 9–20 cm, lax; main axis and side branchlets brownish stellate pilose, pruinose. Bracts and bracteoles subpersistent, very densely pilose on the inner surface. Pedicel 5–9 mm, densely stellate-pilose. Calyx 1·5–2·0 cm, campanulate, outer surface brownish stellate-pilose, pruinose; glabrous inside except for the apex of the lobes, veins prominent; lobes triangular, with obtuse apex, 7–10 × 6–8 mm (at the base); nectariferous gland conspicuous within the base of the calyx. Androphore 9–12 mm, puberulent to tomentose; staminal tube puberulent, anthers 12–15. Gynophore 5–7 mm puberulent to tomentose; ovary subglobose with 8 ocules per loculus; style 2–3 mm, pilose. Mature and dehisced follicle 4·2–8·2 × 3·2–5·8 cm with wall c.5 mm thick, internally very densely pilose, hairs long-rigid. Seeds not observed.

Type material of *S. elata* Ducke described from the state of Pará together with other specimens referable to this taxon have been examined and are clearly conspecific with *S. apetala* (Jacq.) H. Karst.

S. apetala which was described from Colombia, has a distribution range which extends from Central America and the Caribbean to Peru and Northern Brazil. The inclusion of *S. chicha* St Hil. sensu stricto as a synonym of *S. apetala* (see discussion under *S. curiosa*) extends the distribution of *S. apetala* to the state of Goiás, although the exact locality of the St Hilaire type collection is not known.

Distribution: In Brazil, *S. apetala* is found predominantly in the States of Acre, Amazonas and Pará with a single collection from Goiás (Fig. 2).

ACRE: Boca do rio Macauham, viii 1933, *Krukoff* 5598 (SP).

AMAZONAS: Rio Amazonas, abaixo de Manaus, vii 1936, *Ducke* 262 (MG, K, RB).

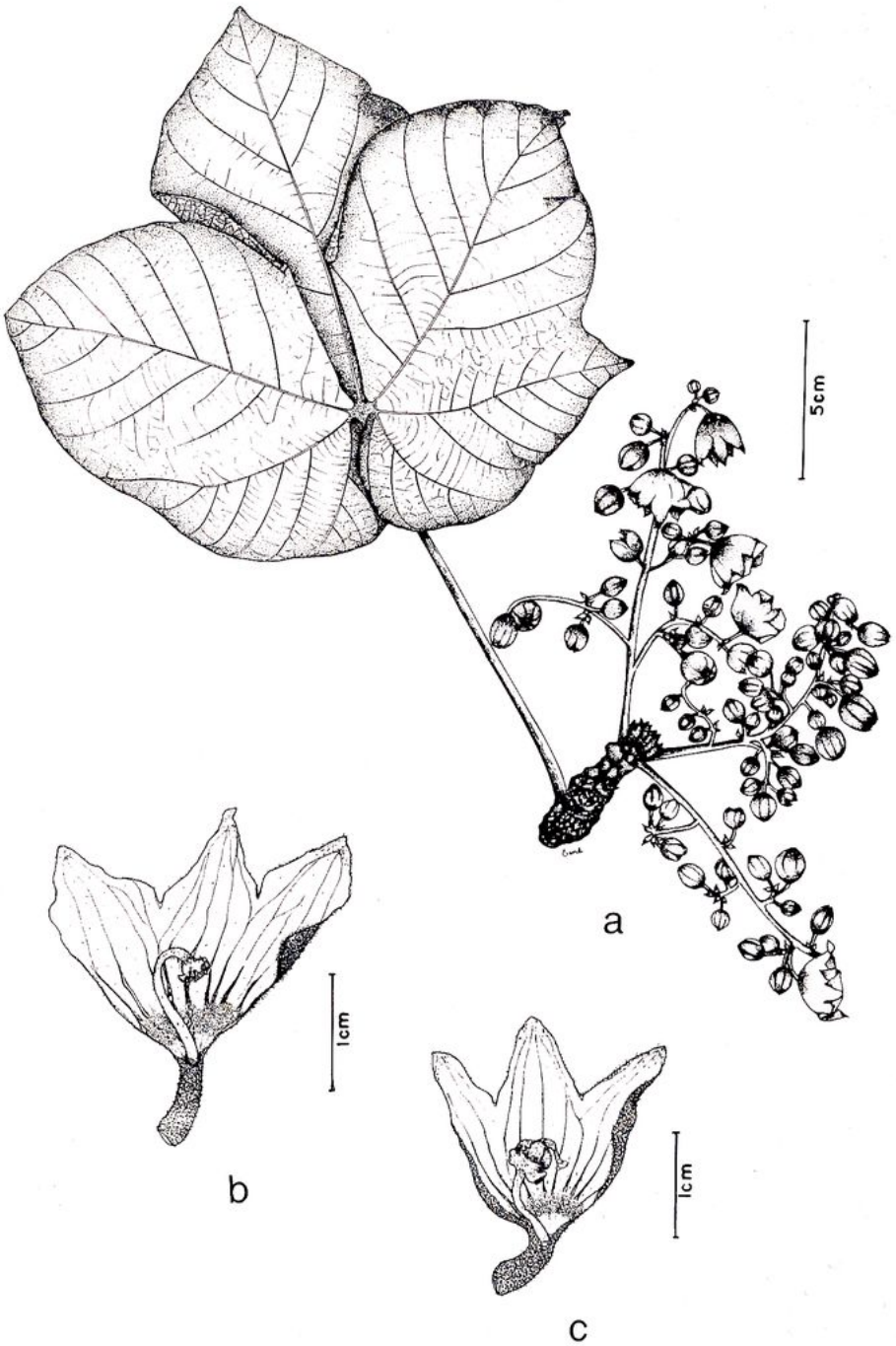

FIG. 3. *Sterculia apetala* (Jacq.) Karst.: a, flowering branchlet; b, staminate flower, partially dissected; c, pistillate flower, partially dissected. All from *Ducke* 262 (MG).

PARA: Paraná de Adauaca, near Faro, x 1907, *Ducke* 8600 (RB). Paraná de Almeirim, x 1919, *Ducke* (RB 14729, K); Monte Alegre, região do igarapé da Mulata, ix 1953, *Froes* 30397 (IAN); Belém, mata de várzea do rio Guaná, ix 1922, *Ducke* (RB 18098); Belém, cult. at the Museu Goeldi, viii 1942, *Archer* 7622 (IAN); Belém, x1942, *Archer* 7963 (IAN).

3. S. striata St Hil. & Naudin in Ann. Sci. Nat. Bot. 2 Sér., 18:213 (1842). Fig. 4.

Type: Brazil. Minas Gerais, s.l., St Hil. (P)–n.v.

Cataphylls 5–10 mm, triangular, densely pilose. Stipules 7–11 mm, lanceolate, both surfaces densely hirsute. Leaves (11–)14–20(–23) × (11–)19–25(–39) cm, coriaceous, 3–5-lobed, median lobe ovate, laterals asymmetric; base deeply cordate, apex acute to obtuse, sometimes rounded; margin slightly revolute; upper surface densely pilose when young, becoming glabrous, midrib and secondary veins somewhat evident; lower surface sparse to densely pilose, midrib and secondary veins prominent; petiole (5–)11–16(–26) cm, canescent-pilose, rarely glabrous.

Inflorescence 14–42 cm, lax to very densely flowered, main axis and side branchlets stellate-pilose mixed with simple strigose hairs. Bracts and bracteoles caducous, triangular or lanceolate, densely pilose on the inner surface. Pedicel 2–3 mm, densely stellate-pilose. Calyx 4–8 mm, urceolate, outer surface densely stellate-pilose; veins evident internally, lobes pilose; lobes 2–3 × 1–3 mm (at the base), triangular, nectariferous glands scattered all over the interior of the calyx. Androphore 3–5 mm, glabrous or puberulent; staminal tube glabrous, anthers 7–10. Gynophore 2–4 mm, glabrous or puberulent; ovary globose with 8 ovules per loculus; style 1–2 mm, densely pilose. Mature and dehisced follicle 3·5–10 × 5–10 cm with wall 3–5 mm thick, internally densely stellate, the rim hirsute with simple hairs. Seeds ellipsoid, 1·5–2 cm, glabrous.

Distribution: *S. striata* has a wide-ranging distribution from Pará in the north, through NE and Central Brazil extending south to São Paulo state. However, most collections are from Central Brazil (Minas Gerais and Goiás) and there are relatively few specimens from the Amazonian region where virtually all other species of the genus occur (Fig. 2).

BAHIA: Santa Rita, x 1912, *Zehntner* 398 (R, RB); Bom Jesus da Lapa, 1963, *Santos & Castelhanos* 24341 (HB); Mina Bouqueira, morro Pelado, iv 1966, *Castelhanos* 25796 (HB).

CEARÁ: Quixadá, vii 1908, *Ducke* 1108 (R, MG); without precise locality, *Frei Alemão & Cysmeiro* 124 (R); without precise locality, viii 1860, *Frei Alemão* (R 78245).

FEDERAL DISTRICT: Brasília, rio Contagem, v 1966, *Irwin et al.* (MG 56218, HB 65477).

GOIÁS. S. Miguel, v 1950, *Pires & Black*, (INPA 4738); Natividade, vii 1955, *Macedo* 3864 (RB, SP); Caldas Novas, Pousada Quente, i 1969, *Barroso et al.* (RB 141475); Caldas Novas, Pousada Quente, i 1969, *Heringer* (UB 11761); Goiânia, iii 1969, *Rizzo* 3844 & *Barbosa* (UEC); Goiás, ix 1976, *Gibbs et al.* 2716 (UEC); Inventários Florestais, *collector unknown* (RB 120104).

MARANHÃO: Alcântara, ix 1903, *Ducke* 416 (RB, MG); Codó, vii 1907, *Ducke* 665 (RB, MG); Perdizes, vii 1954, *Black et al.* 54–16545 (R, RB, INPA); São Luiz, ix 1959, *Froés* 34762 (IAN); Loreto, vii 1962, *Eiten & Eiten* 4840 (SP); Carolina, rio Beirão, viii 1964, *Prance & N. T. Silva* 58581 (UB).

MATO GROSSO: Base Camp, 270 km from Xavantina, iv 1968, *Ratter et al.* (RB 153715); Xavantina, viii 1967, *Ratter & Ramos* 379 (UB); Serra Azul, 85 km from Xavantina, vii 1966, *Irwin et al.* 17348 (IAN, UB); Serra do Caximbo, xi 1976, *Nascimento* 510 (MG); Aripuanã, rio Juruema, Fontanilha, vii 1977, *M.G. Silva & Maria* 3211 (MG); Corumbá, iv 1903, *Regnell* 3602 (R); Corumbá, ii 1911, *Hoehne* 3451 (R, SP); Jauru, xi 1908, *Hoehne* (R 53600); without precise locality, *Aguiar* (RB 958).

MINAS GERAIS: Rio Arassuahy, i 1882, *Glaziou* 15841 (R): rio Paraúna, iii 1892, *Schwacke* 8332 (RB); Montes Claros, iii 1929, *Kuhlmann* 165 (RB); Montes Claros, i 1965, *Belem &*

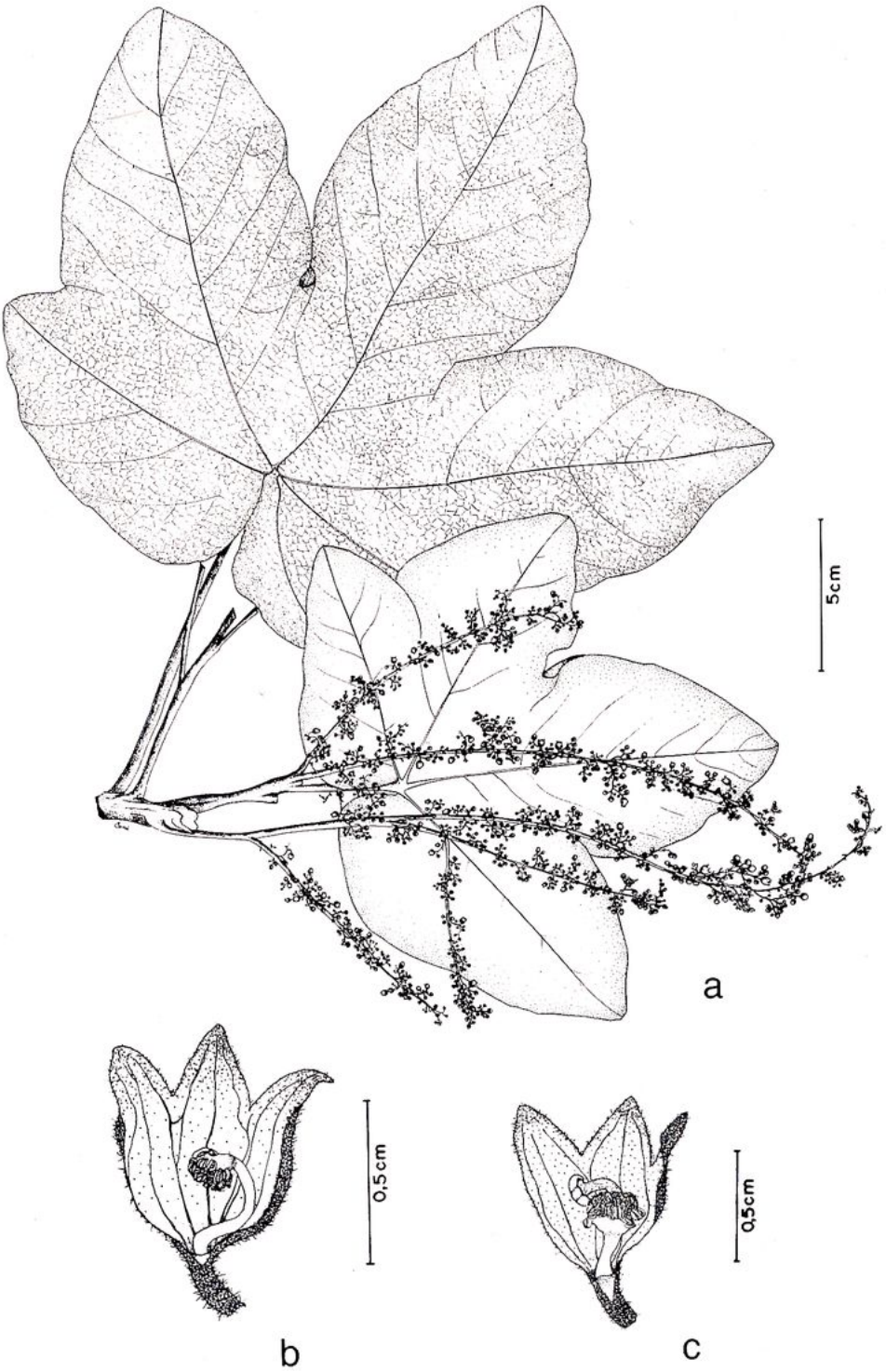

FIG. 4. *Sterculia striata* St Hil. & Naud.: a, flowering branchlet; b, staminate flower, partially dissected; c, pistillate flower, partially dissected. All from *Heringer* s.n. (UB 11761).

Mendes 393 (UB); Conselheiro Mota e Rodeador, vii 1934, *Ducke* 13452 (RB); Ituiutaba, fazenda Santa Terezinha, *collector unknown* (SP 53714); Paraopeba, iii 1956, *Heringer* (HB 5131); Paraopeba, fazenda do Funil, xii 1959, *Heringer* 7374 (RB, HB, SP, UB); without precise locality, *Glaziou* 10073 (MG).

PARÁ: Rodovia Estreito-Marabá, km 2, iv 1974, *Pinheiro & Carvelho* 675 (RB, IAN).

PIAUÍ: São Pedro de Alcântara, 1878, *Schwacke* 1166 (R); Coberta d'Olho D'Água e Gravata, 1878, *Schwacke* 1102 (R); without precise locality, 1883, *Netto* 10 (R); São Paulo: Campinas, cult. in the fazenda Santa Eliza (IAC), x 1975, *Taroda* 2187 (UEC); Sorocaba, cult. in the Estação Experimental, iii 1941, *collector unknown* (SP 48581).

4. S. excelsa Mart. in Flora 24(2), Beibl.: 40 (1841). Fig. 5.

Type: Brazil, without precise locality, *Martius* 506 (iso. P!).

Syn.: *S. speciosa* Schumann in Mart., Fl. Bras. 12(3):7 (1886). Type: Brazil, Amazonas, rio Amazonas, mouth of rio Negro, iii 1851, *Spruce* 1685 (K, E! MG!).

S. pilosa Ducke in Arch. Jard. Bot. Rio de Janeiro 3:213 (1922). Type: Brazil, Pará, Peixe boi between Belém & Bragança, viii 1907, *Goeldi* 8243 & *Siqueira* 8294 (R)!

Cataphylls 1–4 cm, triangular or lanceolate, externally densely pilose, internally glabrous. Stipules 8–14 mm, subulate, caducous or subpersistent, densely brownish-tomentose. Leaves (13–)15–25(–35) × (8–)12–20(–31) cm, coriaceous, entire, oblong or ovate, rarely slightly trilobate; base obtuse to rounded or sometimes slightly cordate; apex emarginate, mucronate, rarely acute; margin revolute; upper surface pilose, when young, becoming glabrous or sometimes with bullate areas, midrib and secondary veins somewhat evident; lower surface with the veins densely pilose, veins and veinlets prominent; petiole (3–)6–13(–20) cm, densely brownish-tomentose, when young.

Inflorescence 10–30 cm, lax to dense, main axis and side branchlets densely stellate-pilose. Bracts and bracteoles subpersistent, lanceolate to subulate, glabrous on the inner surface. Pedicel 2–5 mm, densely stellate-pilose. Calyx 5–20 mm, campanulate, densely stellate-pilose on outer surface with long hairs predominating at the base; lined internally with stellate hairs becoming thicker and apparently glandular below the appendage of each lobe and dense towards the base; lobes 4–16 × 1–3 mm at the base, lanceolate. Androphore 4–12 mm, with dilated base densely covered by apparently glandular hairs; ovary globose with 8 ovules per loculus; style 2–4 mm, brownish-tomentose. Mature and dehisced follicle 4–6 × 8–10 cm with the wall 3–5 mm thick. Seeds 15–20 mm, glabrous.

S. excelsa shows considerable variation in leaf morphology and the size and pilosity of the flowers. Thus, although in most specimens the leaves are entire with a smooth upper surface, in others they are slightly trilobed with the upper surface somewhat bullate. The size of the flowers also varies from 5–20 mm, and the stellate hairs covering the exterior surface may have either long or short rays.

As a consequence of this variability, the name *S. speciosa* Schumann has been a source of nomenclatural confusion because *S. excelsa* was originally based upon rather extreme forms of the morphological range (with flowers less than 10 mm) whereas *S. speciosa* was described from a more common form with larger flowers. Most specimens of *S. excelsa* have therefore been identified as *S. speciosa* and the situation is further complicated by the fact that Ducke (1922) described the small-flowered

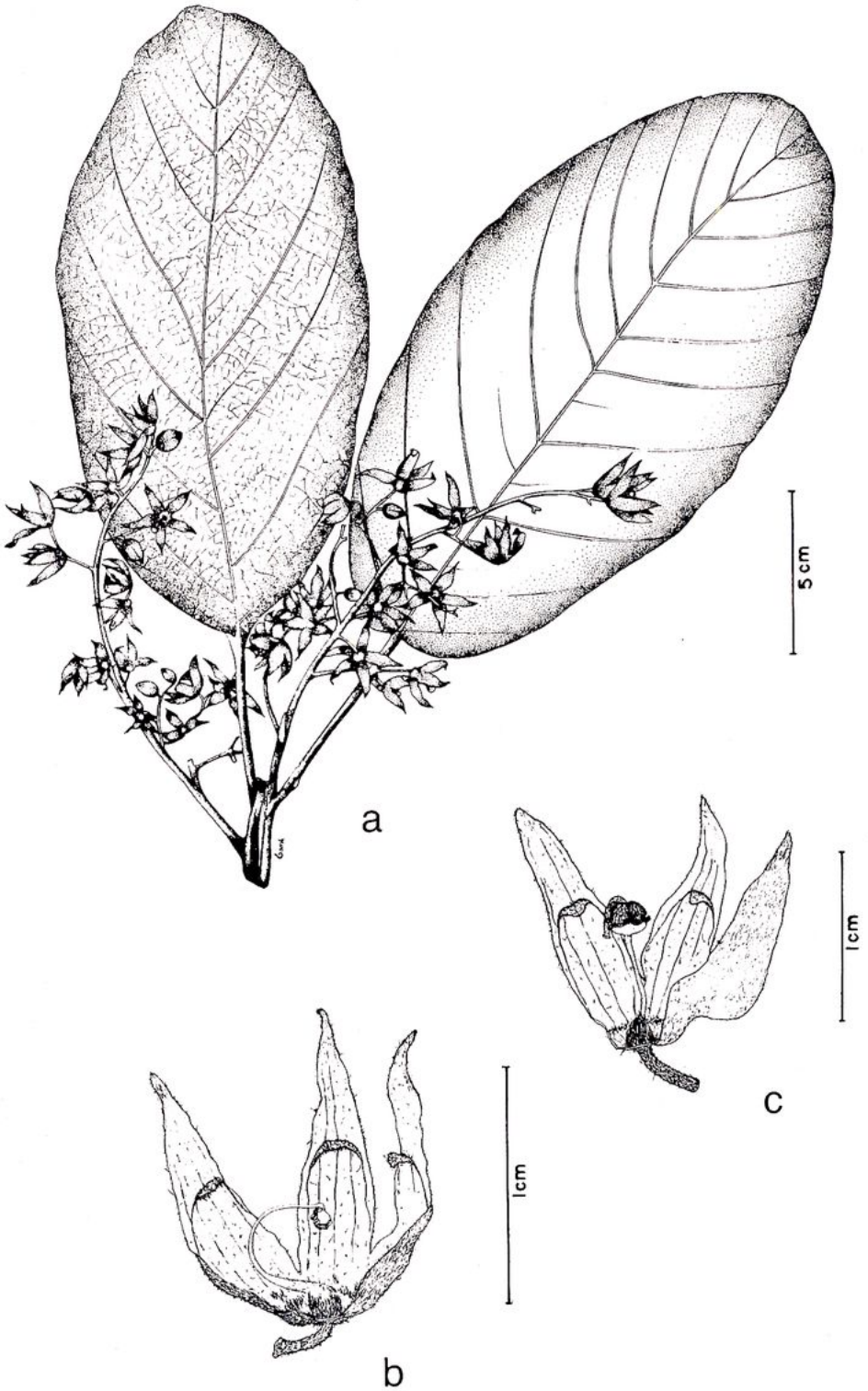

FIG. 5. *Sterculia excelsa* Mart.: a, flowering branchlet; b, staminate flower, partially dissected; c, pistillate flower, partially dissected. All from *Spruce* 1685 (K).

plants (*S. excelsa* s. str.) as *S. pilosa*. The type specimen of *S. excelsa* in Paris is virtually identical in all details with that of *S. pilosa,* whilst comparison of these with the type of *S. speciosa* and other specimens show a continuous range of variability in flower-size and leaf-form which does not justify the recognition of separate species. *S. speciosa* and *S. pilosa* have, therefore, been treated as synonyms of *S. excelsa*.

Recently, Kostermans (1973) erected the genus *Xylosterculia* for two *Sterculia* species (*S. pilosa* and *S. rugosa*), basing it on the wood and apparently indehiscent fruits of these taxa. He also mentioned that their seeds are covered by pruinose hairs and the leaves are rugose-bullate. Tantra (1976) discussed at great length the characteristics of the fruits and the hairiness of the seeds of *Sterculia* in relation to the new genus proposed by Kostermans. Tantra pointed out that woody follicles occur in other *Sterculia* species and that hairiness of the seeds is likewise not a good taxonomic character since in species such as *S. rubiginosa* Vent. the seeds are covered with hairs at the point of attachment to the fruit-wall, whilst in *S. morobeensis* Tantra the inner surface of the follicles is completely covered by rigid hairs. Gentry (1976) also dismissed *Xylosterculia* suggesting, furthermore, that the fruits analysed by Kostermans were immature. Neither Gentry nor Tantra, referred to the bullate leaf mentioned by Kostermans, but this also must be rejected as a distinguishing character since a bullate leaf surface is also found in *S. apeibophylla* where this attribute is very pronounced, and also *S. stipulifera,* as well as some specimens of *S. excelsa*. In common with these authors, I therefore reject *Xylosterculia* as a genus separate from *Sterculia*.

Distribution: The species is predominantly Amazonian, occurring in the states of Acre, Amazonas, Pará and Rondônia, and Amapá and Roraima territories (Fig. 6).

ACRE: Cruzeiro do Sul, iii 1971, *Maas et al.* 12755 (MG).

AMAPÁ TERRITORY: Rio Araguari, vii 1951, *Froés & Black* 27553 (SP, IAN); Contagem, between Porto Platon e serra do Navio, x–xii 1976, *Rosa* 1294; Macapá, rio Carapanã, i 1977, *Oliveira* 6525, 6529 (MG).

AMAZONAS: Rio Purus, vii 1918, *Ducke* 17043 (R, RB, MG); rio Purus, ix 1919, *Ducke* (RB 14708); Parintins, lago Uaicurapa, i 1933, *Ducke* (RB 25098); rio Purus, vii 1940, *Ducke* 2157 (R, IAN); Manaus, viii 1942, *Ducke* 981 (R, MG); Manaus, vii 1948, *Ducke* 2146 (R, MG); estrada Manaus–Itacoatiara km 26, vii 1963, *Rodrigues* 5412 (INPA); Fonte Boa, rio Solimões, x 1968, *M. Silva* 2171 (MG); estrada Planalto A-Tingelim km 21, xi 1969, *N. T. Silva* (IAN 134673); estrada Planalto A-Tingelim, viii 1970, *N. T. Silva* (IAN 13620); estrada Manaus–Itacoatiara km 69, i 1971, *Coelho* (INPA 28422); rio Ituxi, boca do rio Curuquete, vii 1971, *Prance et al.* (MG 43701).

MATO GROSSO: Rio Juruema, vii 1977, *M. G. Silva & Maria* 3336, 3328 (MG).

PARÁ: Peixeboi, vii 1907, *Siqueira* 8294 (R); Gurupá, v 1916, *Ducke* 16164 (RB, MG); Belém, Igarapé do utinga, iv 1918, *Ducke* 17021 (RB, MG); Ilha de Breves, rio Mucujibim, i 1920, *Ducke* (RB); Gurupá, iii 1923, *Ducke* (RB 18101); Curuá, iii 1924, *collector unknown* (RB 18103); Ilha de Breves, v 1936, *Brade* (KB 29073); Belém, vii 1946, *Ducke* 2028 (R, MG, IAN, INPA); Belém, vii 1947, *N. T. Silva* 11 (R, RB, IAN); Belém, i 1948, *N. T. Silva* 100 (IAN); Belém, Horto do Museu, vii 1959, *Cavalcante* 1064 (MG); Santarém, km 35 da estrada do Palhão, ix 1969, *M. Silva* 2465 *& Souza* (MG); Região do Jari, estrada Planalto A-Tingelim km 16, vi 1969, *N. T. Silva* (IAN 134746); rio Itacaiuna alf. do Tocantins, serra Buritirama, viii 1970, *Pires & Belém* (IAN 128722); região do Jari, Santa Patricia, iii 1970, *N. T. Silva* (IAN 134808); rio Curua-Una, para planalto Santarém, viii 1954, *Froés* 31078 (IAN); Prainha, Distrito de Barreirinha, Projeto Curuá-Una, ix & x 1977, *unknown collectors* 0992, 0998, 1057, 1101 (INPA); Santarém, Distrito de Belterra, xi 1977, *unknown collectors* 0896 (INPA); serra de Almeirim, *Ducke* (RB 14724).

RONDÔNIA: Estrada Jaciparama–Porto Velho, vi 1968, *Prance et al.* 5334 (INPA, MG).

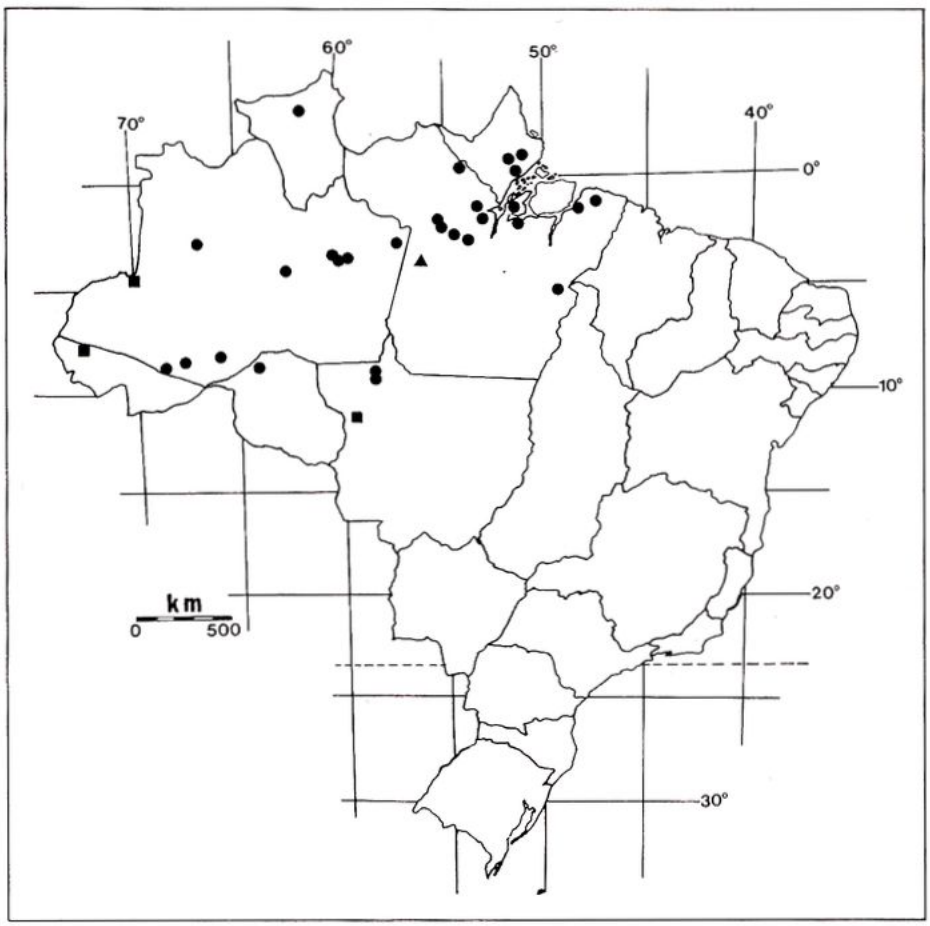

FIG. 6. Distribution of Brazilian Sterculias: ●, *S. excelsa;* ■, *S. apeibophylla;* ▲, *S. stipulifera.*

RORAIMA TERRITORY: Serra Tepequem, ii 1967, *Prance et al.* 4526 (MG).
RIO DE JANEIRO: Rio de Janeiro, cult, in the Jardim Botânico, xii 1932, *Rosa* (RB 957).
Without precise locality: vi 1911, *Ule* 9608 (MG).

5. S. apeibophylla Ducke in Bol. Técn. Inst. Agron. N. 4:16–17 (1945). Fig. 7.
Type: Brazil, Amazonas: Esperança, boca do Rio Javari, *Ducke* 1466, x 1943 (holo. RB!; iso. K!, IAN!, R!).

Cataphylls 6–10 mm, triangular, externally densely pilose, internally glabrous. Stipules 15–22 mm, lanceolate, densely pilose on the outer surface, glabrous on the inner surface. Leaves 9–22 × 5–11 cm, subcoriaceous, entire, elliptic or oblong; base obtuse to rounded or slightly cordate; apex acuminate or acute; margin revolute; upper surface strongly bullate, densely pilose mainly along the veins; midrib and secondary veins slightly evident; lower surface densely pilose, veins and veinlets very prominent; petiole 2–8 cm, densely stellate-hirsute.

Inflorescence 8–13 cm, lax, main axis and side branchlets very densely pilose. Bracts and bracteoles caducous, lanceolate to subulate, internally

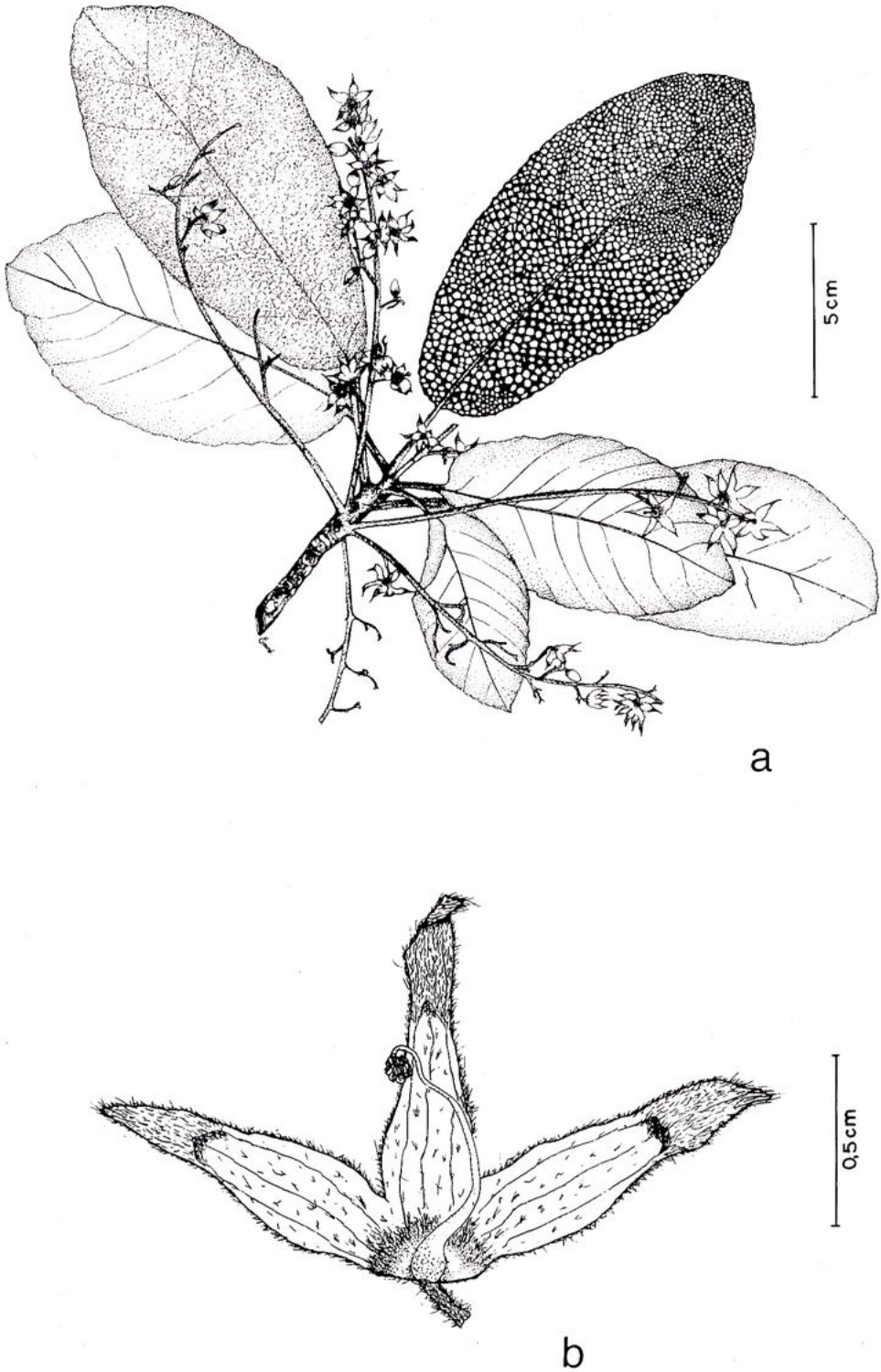

FIG. 7. *Sterculia apeibophylla* Ducke: a, flowering branchlet; b, staminate flower, partially dissected. From *Ducke* 1466 (RB, holo.).

glabrous. Pedicel 5–10 mm very densely pilose. Calyx 0·9–1·1 cm, campanulate, very densely stellate-pilose externally, longer hairs at the base and apex of the lobes; lined with stellate hairs internally which become thicker and apparently glandular below the appendage of each lobe and gradually increase in density towards the base; lobes 8·9 × 2 mm at the base, lanceolate. Androphore 7 mm, dilated and covered with apparently glandular hairs at the base; staminal tube glabrous; anthers 10. Pistillate flowers, fruits and seeds unknown.

According to Ducke (1945) this species resembles *S. pilosa* which is here treated as a synonym of *S. excelsa*. In fact, *S. apeibophylla* shows similarities to *S. excelsa* in having leaves with the veinlets prominent on the lower surface which gives the upper surface a bullate appearance. However, this bullate pattern is much more pronounced in *S. apeibophylla* which also differs from *S. excelsa* in having a pilose rather than glabrous upper surface to the leaf.

Distribution: Known only from a few collections from the states of Amazonas, Acre and Mato Grosso (Fig. 6).

ACRE: Cruzeiro do Sul, rio Moa, iv 1971, *Prance et al.* 12475 (MG).

MATO GROSSO: Rio Juruema, estrada para Aripuanã km 5, vii 1977, *M. G. Silva & Maria* 3303 (MG).

6. S. stipulifera Ducke in Arch. Jard. Bot. Rio de Janeiro 4:128 (1925). Fig. 8.

Type: Brazil, Pará: Pimental, Rio Tapajós, vii 1923, *Ducke* (holo. RB!, iso. RB!).

Cataphylls 7–10 mm, triangular, externally densely pilose, internally glabrous. Stipules 20–25 mm, lanceolate, externally tomentose, internally glabrous, subpersistent. Leaves 10–23 × 5–16 cm, coriaceous, entire, oblong to elliptic; base rounded or truncate; apex cuspidate, laterally rounded; margin revolute; upper surface glabrous and slightly bullate, glaucous; lower surface sparsely pilose, veins and veinlets prominent; petiole 4–13 cm, glabrescent.

Inflorescence 11–19 cm, lax; main axis and side branchlets densely pilose. Bracts and bracteoles persistent, lanceolate, glabrous on the inner surface. Pedicel 10–15 mm, densely pilose. Calyx 14–20 mm, campanulate, externally densely stellate-pilose, internally stellate-pilose on the apex of the lobes; lobes 10–20 × 4 mm at the base, lanceolate; nectariferous glands densely disposed within the base of the calyx. Androphore 10–13 mm, glabrous, with the base very much dilated; staminal tube glabrous; anthers 10. Pistillate flowers, fruits and seeds unknown.

S. stipulifera resembles *S. excelsa* but differs in having larger stipules, exceeding 2 cm, a virtually glabrous inner surface to the calyx, and a totally glabrous androphore and gynophore.

Distribution: Known only from the type specimen (Fig. 6).

7. S. frondosa Rich. in Act. Soc. Hist. Nat. Par. 1:2 (1792). Fig. 9.

Type: 'in Sylvis Guyanne', *Richard* (iso. P!).

Syn.: *S. roseiflora* Ducke in Arq. Inst. Biol. Veg. 2:58 (1935). Type: Brazil, Amazonas, Manaus, cachoeria Tarumã, vii 1931, *Ducke* (RB! 25107).

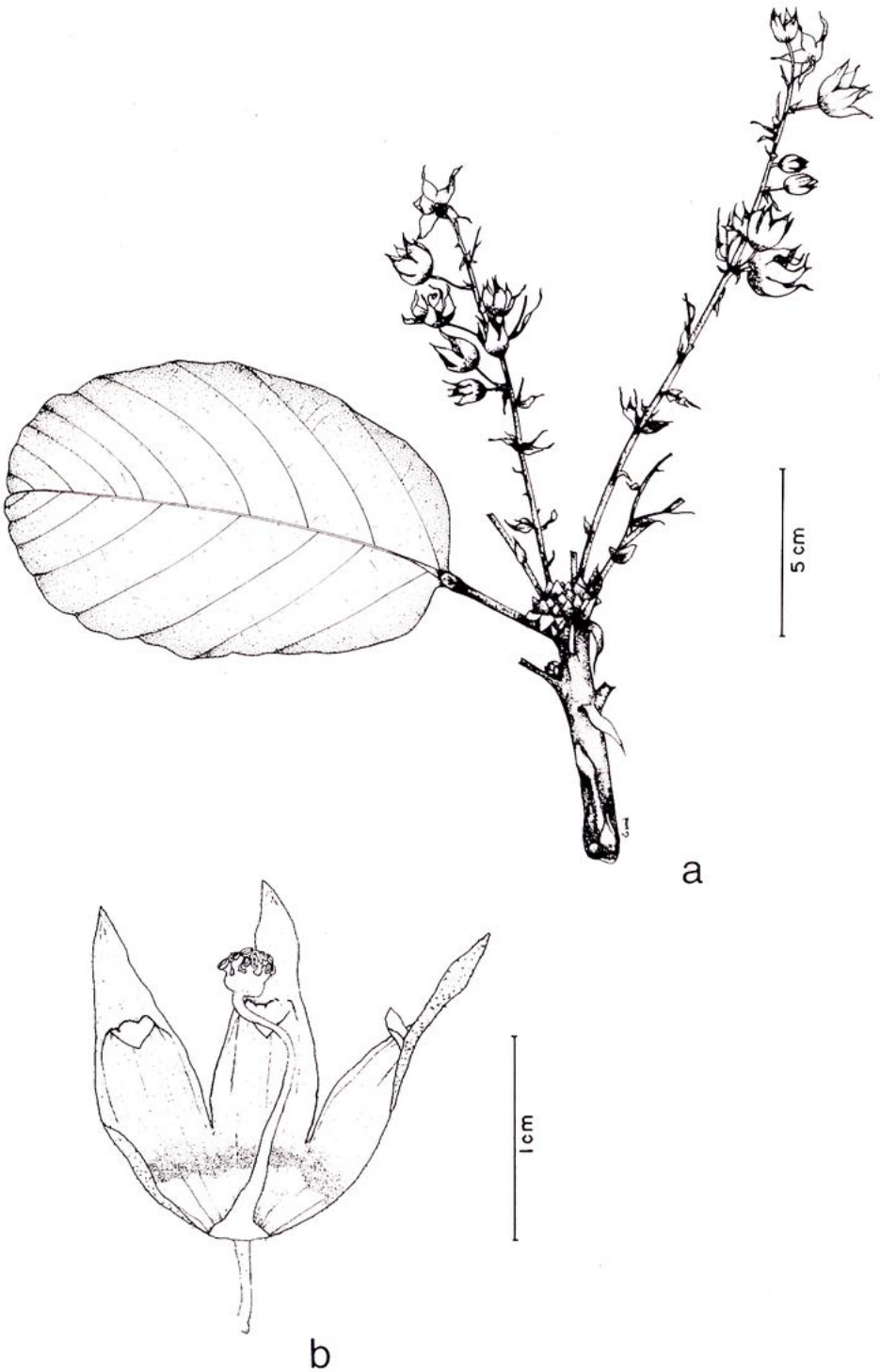

FIG. 8. *Sterculia stipulifera* Ducke: a, flowering branchlet; b, staminate flower, partially dissected. From *Ducke* s.n. (RB 14723, holo.).

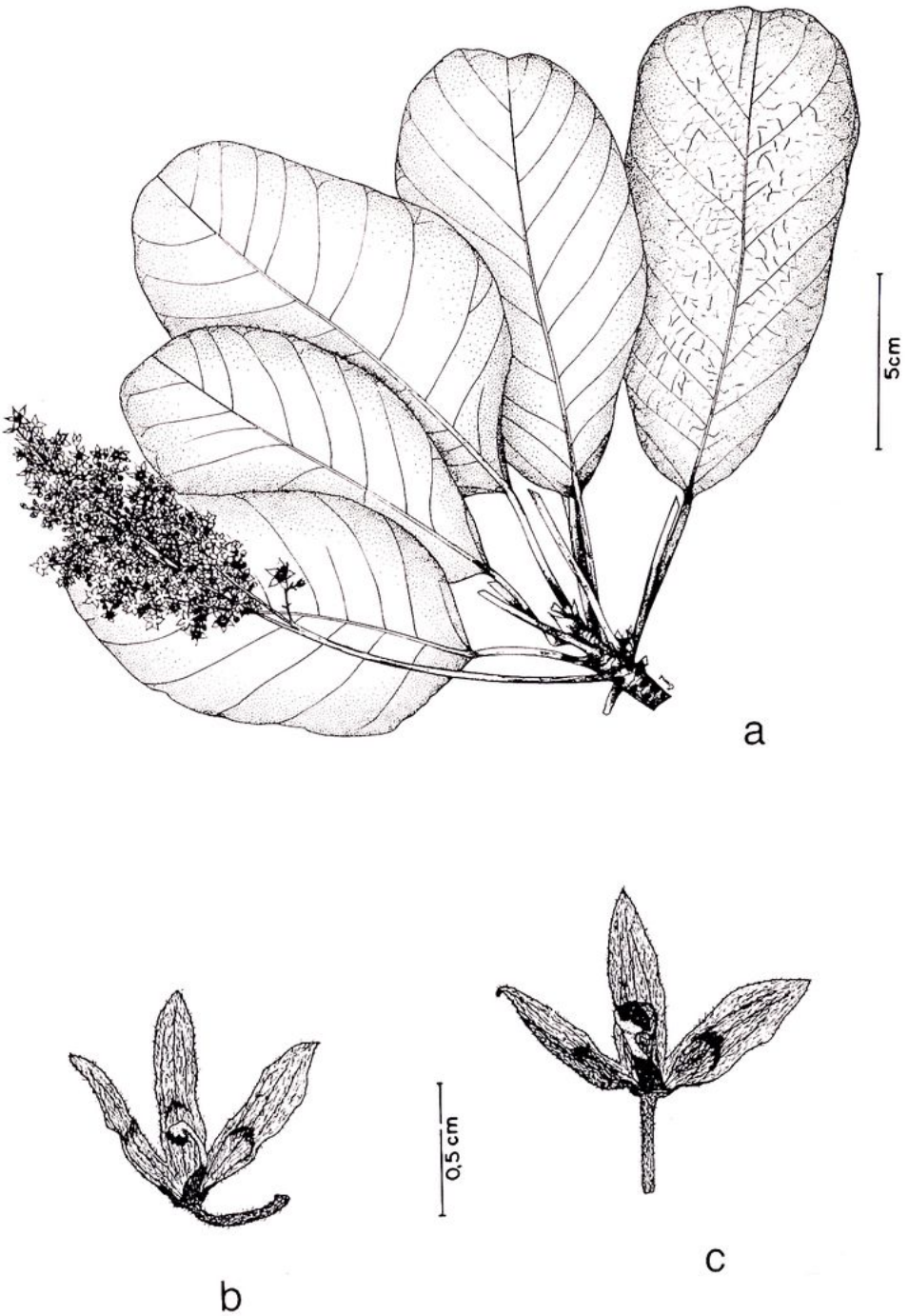

FIG. 9. *Sterculia frondosa* Rich.: a, flowering branchlet; b, staminate flower, partially dissected; c, pistillate flower, partially dissected. All from *Ducke* 998 (R).

Cataphylls 10–20 mm, subulate, glabrous on both surface. Leaves (9·5–) 12–15(–23) × (4·6–)6–8(–12) cm, coriaceous, entire, usually obovate or spatulate, rarely oblong-elliptic; base generally cuneate, rarely obtuse; apex obtuse, rounded or emarginate and mucronate; margin plane; upper surface glabrous, generally shiny, midrib and secondary veins somewhat evident; lower surface opaque, glabrous or sparsely minute stellate, midrib and secondary veins prominent, veinlets immersed; petiole (2·5–)3·5–4(–7·5) cm, glabrous.

Inflorescence 15–20 cm, lax, erect; main axis and side branchlets densely stellate-pilose. Bracts and bracteoles subpersistent, pilose to tomentose on the inner surface. Pedicel 4–6 mm densely stellate-pilose. Calyx 6–7 mm, short campanulate; outer surface densely stellate pilose; internally densely lined with stellate hairs becoming thicker and apparently glandular below the appendage of each lobe and at the base; lobes 4–6 × 1–2 mm at the base, lanceolate. Androphore 3–4 mm, base dilated and densely covered with apparently glandular hairs; staminal tube glabrous; anthers 10. Gynophore 2–3 mm, base dilated and densely covered with apparently glandular hairs; ovary globose with 2 ovules per loculus; style 1–2 mm, pilose. Mature and dehisced follicle c.3·5 × 8 cm, with wall 7 mm thick, internally covered with hirsute hairs. Seeds unknown.

S. frondosa shows affinities to *S. rigidifolia* and *S. albidiflora*. These three species have leaves with the veinlets immersed in the lower surface and small (less than 10 mm) campanulate flowers. However, the inflorescence in *S. rigidifolia* is produced on a subterminal branchlet which bears leaves morphologically different from those of the vegetative branch. This feature does not occur in any other species of the genus in Brazil.

S. frondosa differs from *S. albidiflora* in having the leaf apex commonly emarginate and the base cuneate, whereas leaves in *S. albidiflora* have the apex and the base generally obtuse or rounded. The cataphylls also differ in these species: in *S. frondosa* they are completely glabrous and rigid-coriaceous whilst in *S. albidiflora* they are pilose on both surfaces and chartaceous in texture.

Ducke (loc. cit.) described *S. roseiflora* but the type and several other collections have been studied and these specimens cannot be distinguished from the type and other material of *S. frondosa*.

Distribution: The species has been largely collected in Amazonas state with a few records from Acre and from Amapá territory (Fig. 10).

ACRE: Cruzeiro do Sul, rio Juruá-Mirim, v 1971, *Maas et al.* (MG).

AMAPÁ TERRITORY: Clevelândia, vii 1960, *Irwin et al.* 47410 (UNB).

AMAZONAS: Manaus, cachoeira Tarumã, viii 1931, *Ducke* (RB 25107); São Paulo do Olivença, x 1931, *Ducke* (RB 25108); Borba, rio Madeira, viii 1942, *Ducke* 998 (R, INPA, MG); Br. 17, km 55, viii 1961, *Rodrigues & Lima* 3184 (INPA); estrada Manaus–Itacoatiara, km 26, Reserva Florestal Ducke, vii 1963, *Rodrigues* 5324 (INPA); ibid., vii 1964, *Rodrigues & Loureiro* 5965 (INPA); ibid., ii 1968, *Rodrigues* 8474 (INPA); estrada Manaus–Itacoatiara, vii 1964, *Rogrigues & Loureiro* 5964 (INPA); ibid., km 69–70, ix 1973, *Prance et al.* 17535 (MG); ibid., km 29, ix 1974, *Prance & Ehrendorfer* 22727 (MG).

8. S. albidiflora Ducke in Arch. Jard. Bot. Rio de Janeiro 4:129 (1925). Fig. 11.

Type: Brazil, Pará, Rio Tapajós, *Ducke,* viii 1923 (holo. RB!; iso. K!, RB!).

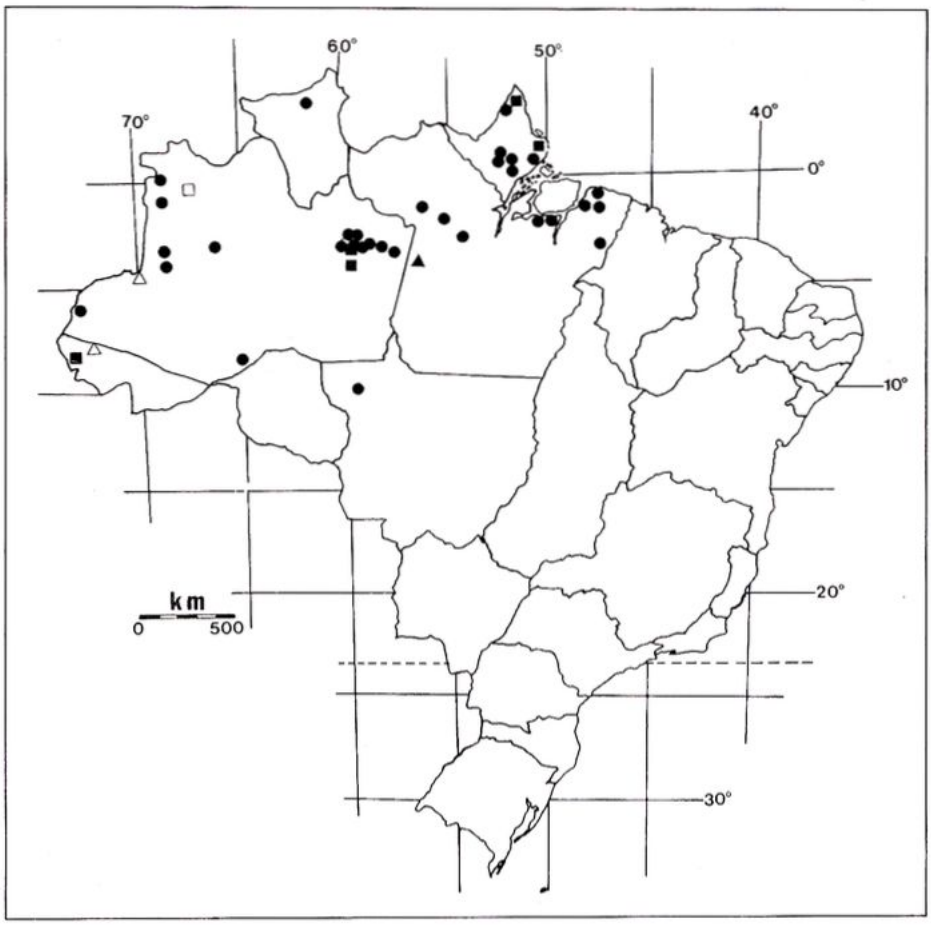

FIG. 10. Distribution of Brazilian Sterculias: ■, *S. frondosa;* ▲, *S. albidiflora;* □, *S. rigidifolia;* △, *S. pendula;* ●, *S. pruriens.*

Cataphylls 5–7 mm, triangular, externally densely pilose, internally tomentose. Stipules 3–4 mm, lanceolate to subulate, densely pilose on both surface. Leaves 9–13 × 3·5–6 cm, chartaceous to sub-coriaceous, entire, oblong or elliptic; base obtuse or rounded; apex obtuse to rounded; margin plane; upper surface minutely and sparsely pilose, densely pilose along the veins, midrib and secondary veins somewhat evident; lower surfaces. Leaves 9–13 × 3·5–6 cm, chartaceous to sub-coriaceous, entire, mersed; petiole 2–5 cm, densely pilose.

Inflorescence 9–13 cm, lax; main and side branchlets very densely stellate-pilose. Bracts and bracteoles caducous, internally puberulent. Pedicel 3–5 mm, densely stellate-pilose. Calyx 8–9 mm, short campanulate; externally densely stellate-pilose; internally tomentose; lobes 5–6 × 2–3 mm at the base; nectariferous glands scattered all over the inner surface. Androphore 3–4 mm; base dilated, covered with glands and densely pilose; staminal tube glabrous; anthers 10. Gynophore 2–4 mm, base dilated, glandular and densely pilose; ovary globose with 2 ovules per loculus; style 1–2 mm, pilose. Fruits and seeds unknown.

Distribution: known only from the type (Fig. 10).

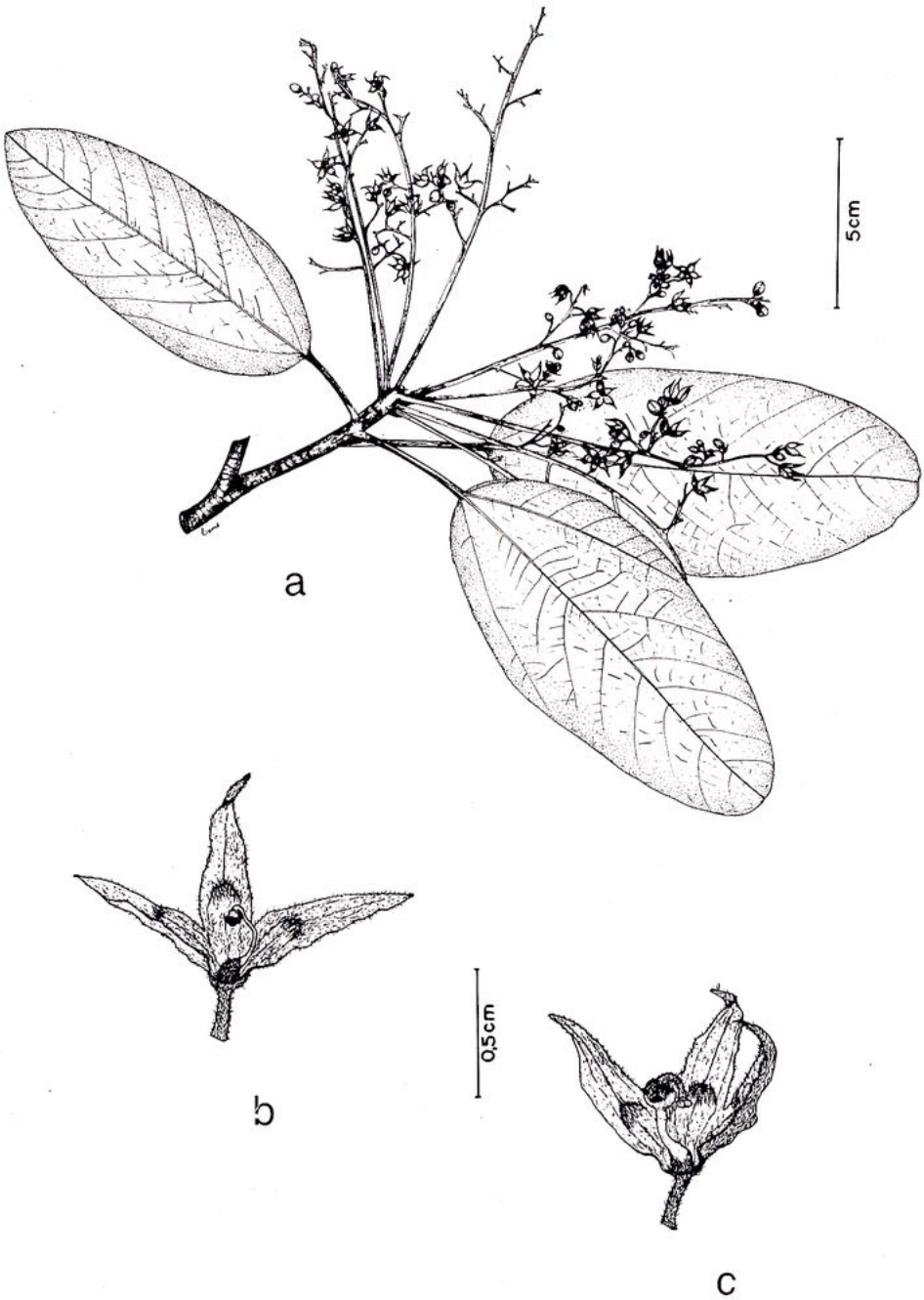

FIG. 11. *Sterculia albidiflora* Ducke: a, flowering branchlet; b, staminate flower, partially dissected; c, pistillate flower, partially dissected. All from *Ducke* s.n. (RB 18105, holo.).

9. S. rigidifolia Ducke in Arq. Inst. Biol. Veg. 2:57 (1935). Fig. 12.
Type: Brazil, Amazonas: Rio Negro superior, desembocadura do rio Curiacuriary, xi 1929, *Ducke* (holo. RB!, iso. RB!).

Cataphylls c.15 mm, lanceolate, glabrous on both surface. Stipules rapidly caducous. Leaves 17–23 × 8–13 cm, coriaceous, entire, obovate or spatulate; base acute; apex emarginate, laterally rounded; margin plane; upper surface glabrous, midrib and secondary veins somewhat evident; lower surface densely pilose; midrib and secondary veins prominent, veinlets immersed; petiole 4–8 cm, glabrous.

Inflorescence 12–25 cm, lax, produced on a subterminal branchlet bearing small leaves 5–11 × 2–4·5 cm, base obtuse, apex short-acuminate. Main and side branchlets of the inflorescence densely stellate-pilose. Bracts and bracteoles caducous, internally densely pilose. Pedicel 4–6 mm long, densely stellate-pilose. Calyx 6–8 mm, shortly campanulate, internally stellate-tomentose; lobes 5–6 × 1–2 mm at the base, lanceolate; nectariferous glands scattered all over the inner surface. Androphore 3–4 mm, base dilated, glandular and pilose; staminal tube glabrous; anthers 10. Pistillate flowers, fruits and seeds unknown.
Distribution: known only from the type specimen (Fig. 10).

10. S. pruriens (Aublet) Schumann in Mart., Fl. Bras. 12(3):8 (1886). Fig. 13.
Type: 'Cayenne', *Aublet* 1775 (holo. BM!).
Syn.: *Ivira pruriens* Aublet, Hist. Pl. Guiane 2:695, t. 279 (1775).
S. pruriens var. *grandiflora* Ducke in Arch. Jard. Bot. Rio de Janeiro 4:130 (1925). Type: Brazil, Pará, near Rio Jahuruzienhu region of Bieres, 12 vii 1923, *Ducke* (RB! 18102).
S. pruriens var. *parviflora* Ducke in Arch. Jard. Bot. Rio de Janeiro 4:130 (1925). Type: Brazil, Pará, near Bela Vista, 31 v 1923, *Ducke* (RB! 10104).

Cataphylls 5–7 mm, triangular, externally densely pilose; internally tomentose. Stipules 4–6 mm, lanceolate, both surfaces densely pilose. Leaves (8–)12–17(–24) × (4–)6–8(–12) cm, subcoriaceous, entire, oblong or elliptic, base obtuse or truncate, sometimes slightly cordate, apex acute or acuminate; margin slightly revolute, rarely plane; upper surface densely pilose, when young, becoming glabrous, midrib and secondary veins somewhat evident; lower surface densely pilose, midrib and secondary veins prominent, veinlets immersed; petiole (3–)5–8(–15) cm, glabrescent.

Inflorescence 6–24 cm, lax or sometimes dense; main axes and side branchlets very densely stellate-pilose, somewhat pruinose. Bracts and bracteoles caducous, sometimes subpersistent, lanceolate or subulate, externally densely pilose, internally glabrous. Pedicel 4–7 mm, densely stellate-pilose. Calyx 6–15 mm, shortly campanulate; densely stellate-pilose externally; densely lined internally with stellate hairs which become sparsely disposed, larger and apparently glandular below the appendage of each lobe; lobes 5–9 × 2–3 mm at the base, lanceolate. Androphore 4–9 mm, dilated and glandular at the base; staminal tube glabrous; anthers 10. Gynophore 4–8 mm, dilated and glandular at the base; ovary globose with 4 ovules per loculus, 2–3 mm, pilose. Mature and dehisced follicle

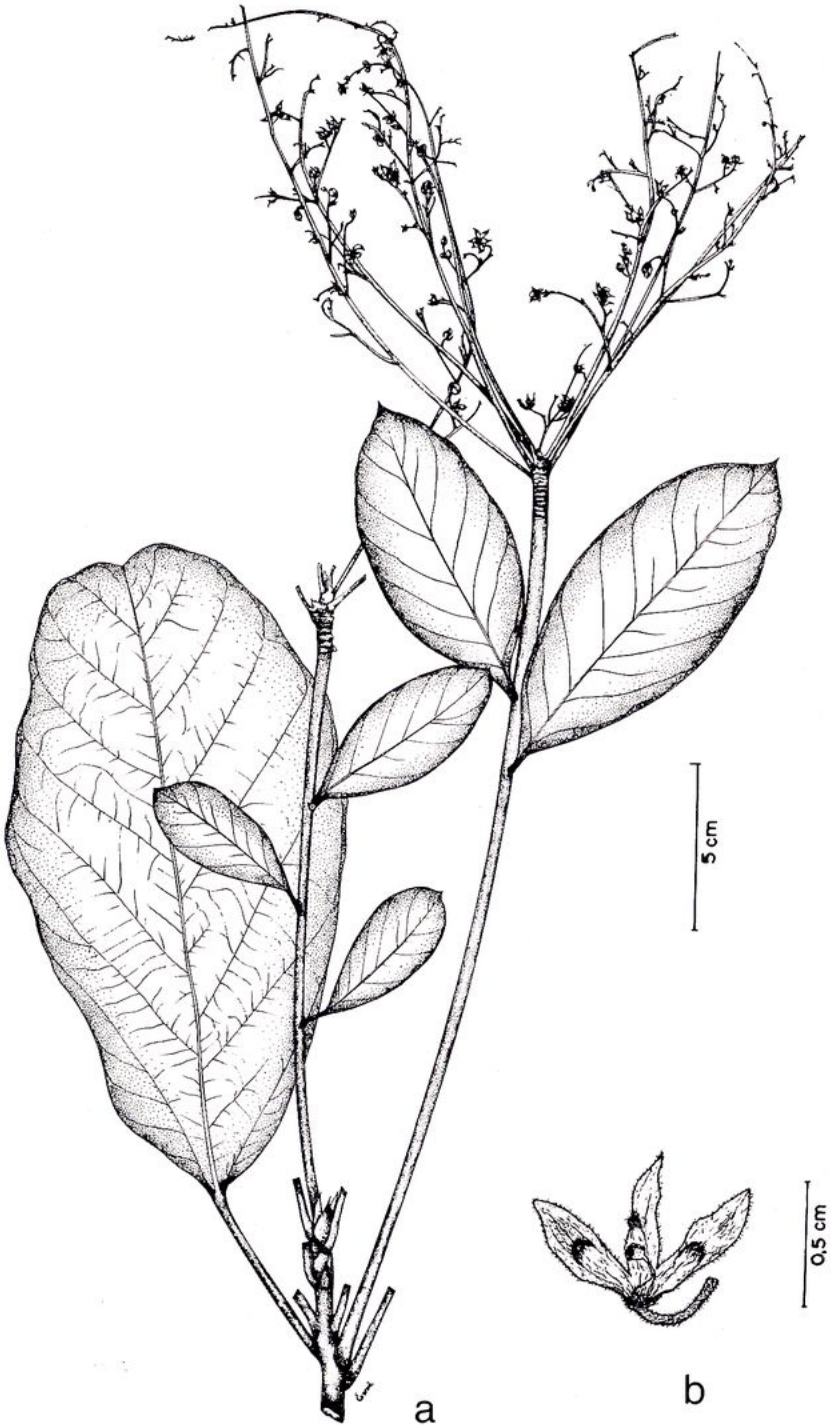

FIG. 12. *Sterculia rigidifolia* Ducke: a, flowering branchlet; b, staminate flower, partially dissected. From *Ducke* s.n. (RB 25100, holo.).

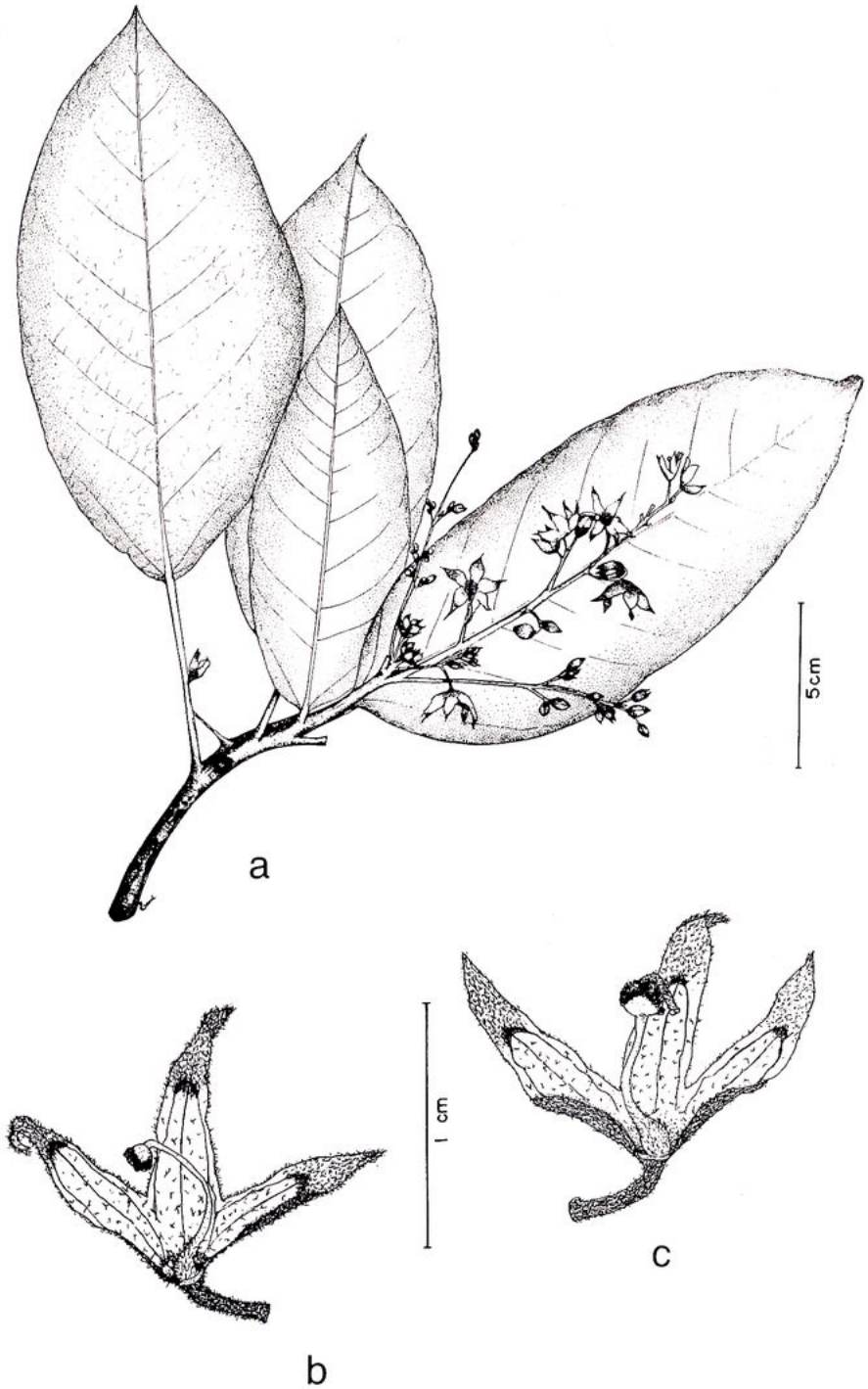

FIG. 13. *Sterculia pruriens* (Aubl.) Schum.: a, flowering branchlet; b, staminate flower, partially dissected; c, pistillate flower, partially dissected. All from *Pires & N. T. Silva* 11185 (IAN).

c.4·5 × c.6·5 cm with wall c.5 mm thick; internally glabrous. Seeds unknown.

Ducke (loc. cit.) described under this species two varieties, var. *grandiflora* and var. *parviflora*, based on the size of the flowers and the length of the petiole. A study of the types of both varieties together with the extensive collections now available for this species showed a continuous range in flower and petiole size such that these infraspecific taxa cannot be maintained.

Distribution: The species occurs predominantly in the Amazon hylaea. It has been largely collected in Amazon and Pará states and Amapá territory but also has been recorded in Northern Mato Grosso state and Roraima territory (Fig. 10).

ACRE: without precise locality, viii 1933, *Krukoff* 5321 (SP).

AMAPÁ TERRITORY: Rio Oiapoque, iii 1950, *Froés* 25914 (IAN, IAC); without precise locality, 1956, *Bastos* 2169 (RB); estrada Oiapoque–Clevelândia, vii 1960, *Egler & Pires* 47193 (R, UB, IAN); Serra do Navio, 1961, *Rodrigues* (INPA 10371); ibid., 1961, *Rodrigues* 3012 (INPA); ibid., rio Ampari, viii 1961, *Pires et al.* 50306 (MG); rio Araguari, ix 1961, *Pires et al.* 50731 (MG); ibid., *Pires et al.* 50737 (MG, IAN); rio Ampari, x 1961, *Pires et al.* (IAN 114080, MG 28778).

AMAZONAS: Entre Jucurapa e Puruê, viii 1929, *Ducke* (RB); Manaus, estrada do Aleixo km 5, iv 1937, *Ducke* 448 (RB, R); São Paulo de Olivença, iv 1944, *Ducke* 1526 (R, RB, MG); fóz do rio Uaupés, iv 1925, *Froés* 282445 (IAN); fóz do rio Caiari, ix 1952, *Froés & Addison* 28619 (SP, INPA); São Felipe, rio Negro, ix 1952, *Froés* 28703 (IAN); Manaus, Reserva Florestal Ducke, i 1957, *Ferreira* (INPA 5089); rio Maués-Mirim, vi 1957, *Oliveira* 97 (IAN); estrada Manaus–Itacoatiara, ix 1960, *Rodrigues & Coelho* 1777 (INPA, RB); ibid., km 40, x 1961, *Rodrigues & Coelho* 3519 (INPA); ibid., km 70–75, x 1963, *Oliveira* 2710 (UB, IAN); ibid., km 26, iv 1965, *Rodrigues & Osmarino* 6906 (INPA); ibid., vi 1969, *Rodrigues & Osmarino* 6949 (INPA); ibid., viii 1966, *Rodrigues & Osmarino* 8215 (INPA); ibid., km 26, ix & x 1966, *Prance et al.* 2198, 2599 (MG, INPA, R); ibid., km 178, vi 1973, *Rodrigues et al.* 9096 (INPA); estrada Manaus-Caracarai, ix 1961, *Rodrigues & Coelho* 3307 (INPA); ibid., km 135, xii 1973, *Steward & Ramos* 19687 (MG); Manaus, Reserva Florestal Ducke, v 1962, *Rodrigues & Coelho* 4454 (INPA); ibid., vi 1966, *Rodrigues & Osmarino* 7885 (INPA); ibid., *Aluisio* 136 (INPA); rio Purus, vi 1971, *Prance et al.* 13982 (MG); estrada Manaus–Porto Velho, rio Castanho, vii 1972, *M. F. Silva et al.* 342 (INPA); rio Javari, estirão do Equador, viii 1973, *Lleras et al.* 17274 (MG).

MATO GROSSO: Aripuanã, Nucleo Pioneiro de Humboldt, x 1973, *Berg et al.* 19812 (MG).

PARÁ: Belém, ix 1898, *Guedes* (RB 14717); Belém, x 1906, *Goeldi* 7735 (RB, MG); Peixeboi, x 1907, *Siqueira* 8826 (RB, MG); Santa Isabel, x 1908, *Ducke* 9742 (MG); Obidos, rio Branco, ix 1919, *Ducke* (RB 147714); Belém, viii 1922, *Ducke* (RB 18100); Bragança, i 1923, *Ducke* (RB 18099); Belém, Campo Lira, viii 1941, *Ducke* 784 (R, MG, IAN); Belém, próximo à Providência, ix 1942, *M. B. Silva* 111 (IAN); Belém, São Joaquim, xi 1942, *M. B. Silva* 169 (IAN); Belém Bosque Municipal, viii 1948, *N. T. Silva* 129 (IAN); Região do Gato, rio Curuá-Una, viii 1954, *Froés* 31065 (IAN); rio Curuá-Una, Planalto Santarém, vii 1955, *Froés* 32012 (IAN); Cia Pirelli, faz Uriboco, viii 1958, *Pires* 7078 (IAN); Rod. Belém–Brasília km 92, ix 1959, *Kuhlmann & Jimbo* 288 (UB, INPA, SP, MG); Belém, cult., viii 1964, *Prance & N. T. Silva* 58740 (RB, UB); estrada entre Paragominas e Gurupi, Rod. Belém–Brasília km 161–250, viii 1964, *Prance & N. T. Silva* 58839 (UB, RB); rio Piritoro, xi 1965, *Prance & Pennington* 1977 (UB, IAN); Belém, Reserva Mocambo, viii 1967, *J. M. Silva & N. T. Silva* 10660 (IAN); Belém, Reserva APEG, viii 1967, *Pires & N. T. Silva* 10707 (IAN); Belém, ix 1967, *Pires & N. T. Silva* 11016 (IAN); Belém, Reserva Aura, x 1967, *Pires & N. T. Silva* 11185 (IAN); Belém, Agua Preta, xi 1967, *Pires & N. T. Silva* 11193 (IAN); Belém, bosque Rodrigues Alves, 1977, *Secco* 13, 20 (MG); ibid., iii 1977, *Joana D'Arc* 10 (MG).

RORAIMA TERRITORY: Base de serra Tepequem, ii 1967, *Prance et al.* 4332 (R, INPA, MG).

11. S. pendula Ducke in Bol. Técn. Inst. Agron. N. 19:18–19 (1950). Fig. 14.

Type: Brazil, Amazonas Esperança, boca do Rio Javari, x 1945, *Ducke* 2237 (holo. RB!; iso. IAN!, IAC!).

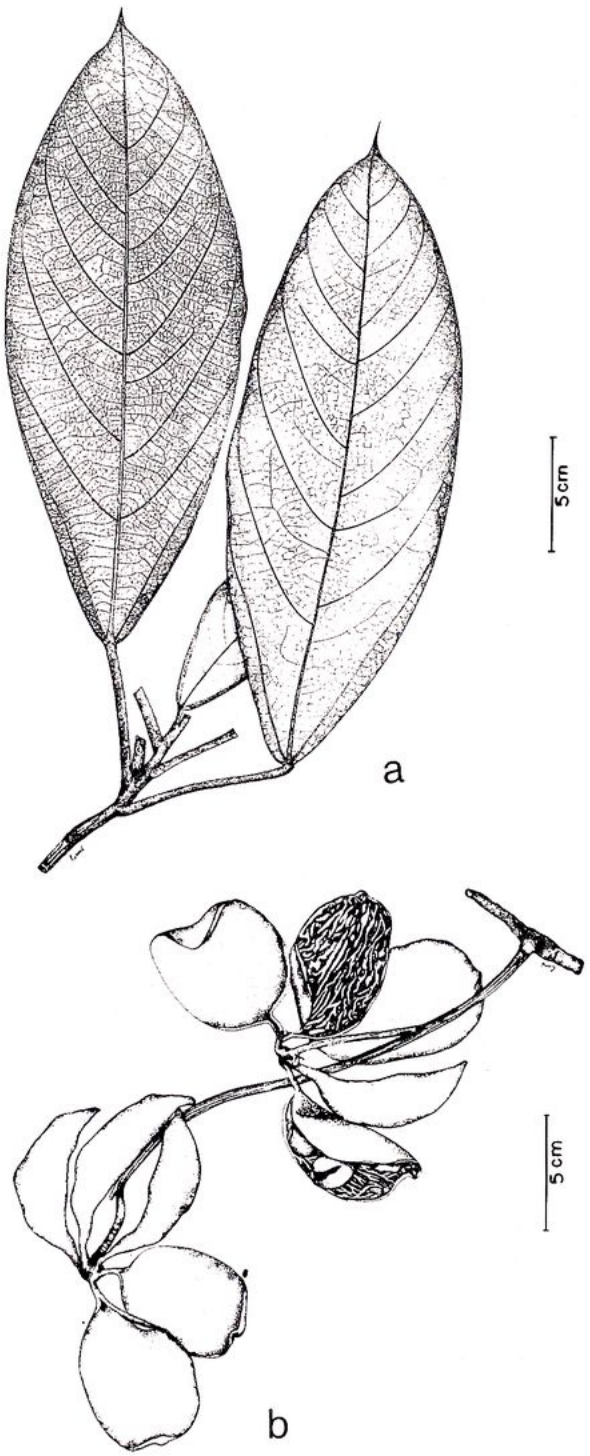

FIG. 14. *Sterculia pendula* Ducke: a, leafy branchlet; b, follicles. From *Ducke* 2237 (RB).

Cataphylls c.10 mm, lanceolate, externally densely pilose. Stipules, not observed, rapidly caducous. Leaves 11–20 × 3·5–10 cm, subcoriaceous, entire, elliptic or oblong-lanceolate; base cuneate or obtuse; apex acuminate to caudate; upper surface glabrous, except for the veins which are pilose; midrib, secondary and tertiary veins somewhat evident; lower surface pilose, midrib and secondary veins prominent, veinlets immersed.

Staminate and pistillate flowers not observed. Mature and dehisced follicle 6–8 × 4–5·5 cm with wall c.2 mm thick; internally sparsely stellate-pilose, hirsute. Seeds 2–2·5 cm, brownish. Only known from two collections, both of fruiting material.

Distribution: Amazonas and Acre states (Fig. 10).

ACRE: Cruzeiro do Sul, Projeto Radam, ii 1976. *Marinho* 261 (IAN).

Sterculia foetida L.

Stipules ensiform, caducous. Leaves compound digitate; leaflets c.15 × 5 cm, pubescent when young; petiole c.20 cm.

Panicles multiflowered. Bracteole minute. Calyx 1–1·5 cm diam., dull orange-coloured, campanulate, deeply 5-parted; lobes oblong-lanceolate, spreading villous within, much longer than the tube. Anthers 12–15. Ovary downy, style curved. Follicles woody, oblong, boat-shaped, shortly beaked, nearly glabrous. Seeds 10–15, black, smooth.

An introduced species cultivated as ornamental.

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