



Typification of names in *Pachira aquatica* Aubl. (Malvaceae, Bombacoideae) with a new combination and new status from the Brazilian Amazon forest

Vania Nobuko Yoshikawa^{1*} , Marília Cristina Duarte¹  and Carlos Daniel Miranda Ferreira² 

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ABSTRACT

A new combination and a new status, *Pachira manausensis*, is here proposed. After making field observations and analyzing type and herbarium specimens, we realized that *P. aquatica* var. *manausensis* should be treated as a species due to many morphological and distribution differences compared to the typical variety. We provide detailed descriptions and a distribution map, table, key, and plate to distinguish both species using morphological characteristics. Typifications and nomenclatural notes for related names were performed.

Keywords: Amazonian *Pachira* clade, Bombaceae, kapok, nomenclature, taxonomy

Introduction

Pachira is the richest genus of Bombacoideae (Malvaceae) and comprises ca. 60 species (Fernández-Alonso 1998; Carvalho-Sobrinho *et al.* 2014; Andino & Fernández-Alonso 2018; Carvalho-Sobrinho & Dorr 2020) distributed from southern North America to southern Brazil (Tropicos 2020). In Brazil, there are about 24 species, of which most (18 spp.) occur in Amazon forest (BFG 2021). Unarmed trees, flowers with a 7–35 cm long, persistent calyx and 150–1000 stamens, and striate seeds characterize this genus (Robyns 1963).

According to recent phylogenetic studies, *Pachira* is not monophyletic (Duarte *et al.* 2011; Carvalho-Sobrinho *et al.* 2016) because it emerged in two lineages: the Amazonian *Pachira* clade, with ca. 45 species (of which 11 were confirmed to be in this clade); and the extra-Amazonian *Pachira* clade, with ca. five species (*sensu* Carvalho-Sobrinho *et al.* 2016). The latter clade emerged as segregated from the Amazonian *Pachira* clade and a sister clade of *Eriotheca* species.

Both clades of *Pachira* are strongly supported in an analysis by Carvalho-Sobrinho *et al.* (2016), who mentioned some morphological traits as possible synapomorphies of the clades. However, these were not confirmed so additional phylogenetic and morphological studies about the genus

¹ Laboratório de Sistemática Vegetal, Núcleo de Ciências Ambientais, Programa de Pós-Graduação em Biotecnologia, Universidade de Mogi das Cruzes, 08780-911, Mogi das Cruzes, SP, Brazil

² Escola Nacional de Botânica Tropical, Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, 22460-036, Rio de Janeiro, RJ, Brazil

* Corresponding author: vania_nobuko@hotmail.com



are needed (Andino & Fernández-Alonso 2018; Macedo *et al.* 2018).

During a revision of the Amazonian *Pachira* clade (Yoshikawa in preparation), we realized that synonyms of *Pachira aquatica* need typifications, since the types were syntypes and *P. aquatica* var. *manausensis* is very different from the type variety (*P. aquatica* var. *aquatica*). Thus, we propose a new combination and status, *Pachira manausensis*, and provide a key, detailed descriptions (with an update of morphological traits for *P. aquatica*), taxonomic comments, a distribution map, the conservation status, a comparative figure and a table with morphological differences for *P. aquatica* and *P. manausensis*.

Materials and methods

The study involved a literature search and analysis of herbarium specimens at B, BM, CEN, CR, F, G, HAL, HUEFS, HUMC, IBGE, INPA, K, LINN, M, MBM, MEX, MG, NY, P, PAMG, R, RB, S, SP, TEPB, U, UFMG, US, and

UFMT (acronyms according to Thiers 2020, continuously updated) to write the descriptions of the species and obtain geographic distribution data. We also observed individuals cultivated in the arboretum at the Rio de Janeiro Botanical Garden (JBRJ) to analyze the species in vivo and obtain floral color data. The common names were obtained in the specimens labels.

The map was made with the software ArcGIS for Desktop v. 10.1 (ESRI 2013), data from labels of the analyzed material, and a shape file of the ecoregions proposed by Olson *et al.* (2001).

The typifications and nomenclatural notes follow the recommendations of the International Code of Nomenclature for Algae, Fungi, and Plants (ICN) (Turland *et al.* 2018) and interpretations of McNeill (2014). The conservation status of the species was determined according to the categories and criteria of the IUCN (2019), which provides guidelines for the protection of priority species. To obtain the area of occupancy (AAO) and extent of occurrence (EOO) values, the GeoCAT tool was used (Bachman *et al.* 2011).

Results

Taxonomic treatment

Key to *P. aquatica* and *P. manausensis*

1. Leaflets chartaceous or slightly coriaceous; petiolule not canaliculate; nectaries on receptacle whitish to cream; staminal tube whitish or cream; style whitish at the base and reddish at the apex; fruits brownish, 8–15-seeded; seeds trigonal, light brownish, 8–20-striate 1. *P. aquatica*
- 1'. Leaflets strongly coriaceous; petiolule canaliculate; nectaries on receptacle pink; staminal tube pinkish or purplish red; style entirely purplish red, pinkish or purple; fruits ferruginous, ca. 55-seeded; seeds ovoid, dark brownish, 2-striate 2. *P. manausensis*

1. *Pachira aquatica* Aubl., Hist. Pl. Guiane 2: 726, t. 291–292. 1775. *Carolinea princeps* L.f. Suppl. Pl. 314. 1781. nom. superfl. & illeg. *Bombax aquaticum* (Aubl.) K. Schum., in Engl. et Prantl. Nat. Pflanzenfam. 3 (6): 62. 1890. Type: FRENCH GUYANA, s.d., *Aublet s.n.* (holotype: BM000645671 [digital image!]). (Figs. 1A–H and 2).

Sophia carolina L., Pl. Surin. 11. 1775. Type: UNKNOWN, s.d., *s.col. s.n.* (lectotype designated by Barrie (in Jarvis *et al.* 1993): Herb. Linn. 865.1, LINN [digital image!]).

Pachira grandiflora Tussac, Fl. Antill. 4: 12, t. 3, 4. 1827. Type: lectotype, designated here: [illustration] tab 3 in Tussac (1827).

Carolinea macrocarpa Schldl. & Cham., Linnaea 6: 423. 1831. *Pachira macrocarpa* (Schldl. & Cham.) Walp., Repert. Bot. Syst. 1: 329. 1842. *Bombax macrocarpum* (Schldl. & Cham.) K. Schum., Nat. Pflanzenfam. 3(6): 62. 1895. Type: MEXICO, Papantla, February 1829. *C.J.W. Schiede & F. Deppe s.n.* (lectotype, designated here: HAL0128028 [2 sheets] [digital image!]; isolectotype: BM000645670 [digital

image!]; HAL0098398 [digital image!]; HAL0128027 [2 sheets] [digital image!]).

Pachira pustulifera Pitter, Repert. Spec. Nov. Regni Veg. 13: 315. 1914. Type: COSTA RICA, Sur le pont de Florencia, près Turrialba. November 1897, *A. Tonduz s.n.* (Holotype: CR11305 [digital image!]; isotype: US00901804 [digital image!]; US00901805 [digital image!]); Paratype: COSTA RICA, 01 April 1899, *A. Tonduz s.n.* (M0211674 [digital image!]).

Bombax rigidifolium Ducke, Arch. Jard. Bot. Rio de Janeiro 4: 127. 1925. Type: BRAZIL, Belém, Utinga. 30 October 1902, *R. Siqueira s.n.* (lectotype, designated here: RB00534501!; isolectotype: RB00537254; U0000782 [digital image!]).

Pachira aquatica var. *occidentalis* Cuatrec., Revista Acad. Colomb. Ci. Exact. 9: 169. 1954. Type: COLOMBIA, Costa del Pacífico, rio Yurumanguí, 02 February 1944, *J. Cuatrecasas 15885* (holotype: F [2 sheets] [digital image!]; isotype: US00901724 [digital image!]).



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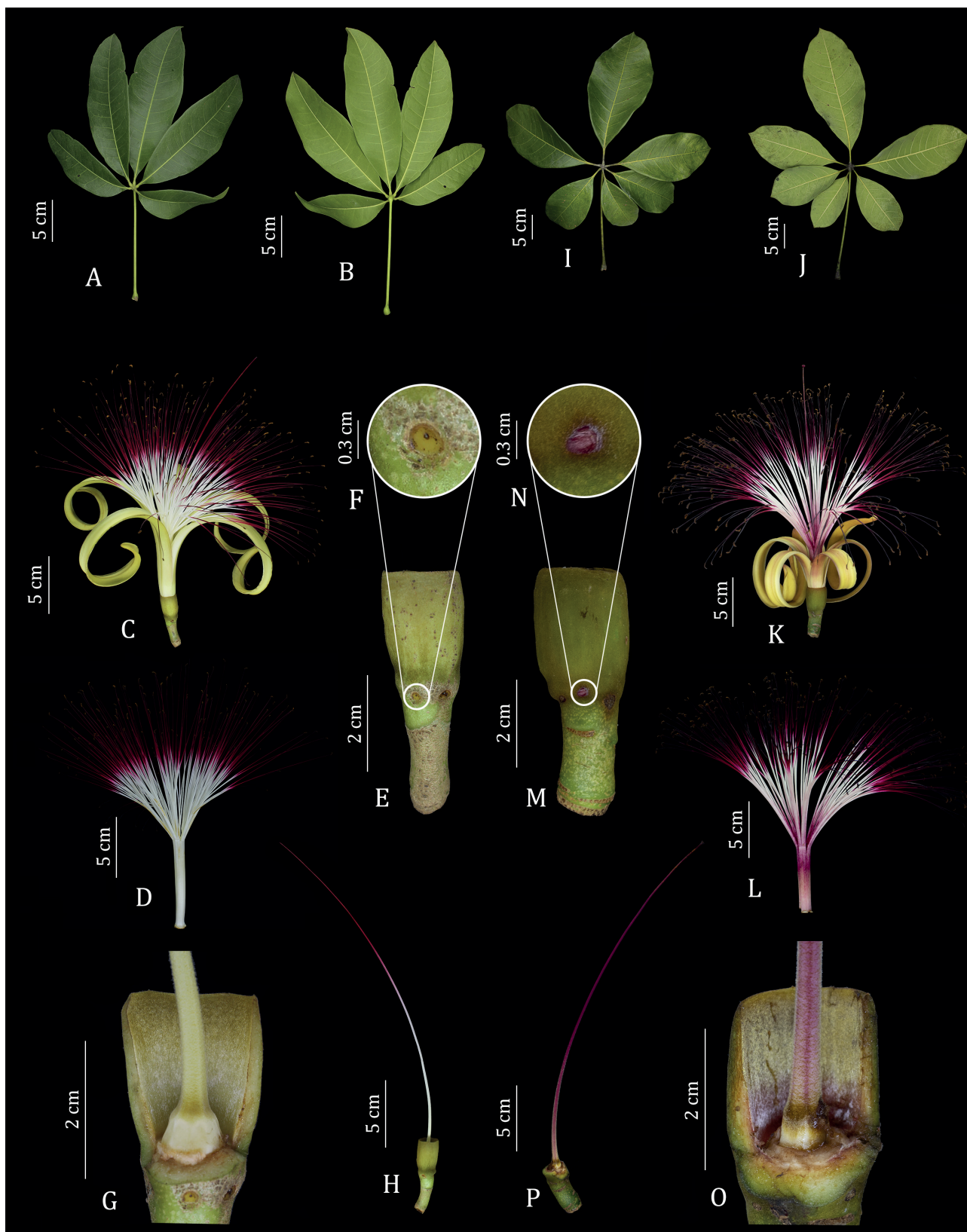


Figure 1. Morphology of vegetative and reproductive characteristics used to distinguish *P. aquatica* from *P. manausensis*. (A–H) *Pachira aquatica*. (A) Adaxial surface of the leaflets. (B) Abaxial surface of the leaflets. (C) Flower. (D). Androecium. (E) Calyx. (F) Detail of whitish nectary. (G) Ovary. (H). Style. (I–P) *Pachira manausensis*. (I) Adaxial surface of the leaflets. (J) Abaxial surface of the leaflets. (K) Flower. (L) Androecium. (M) Calyx. (N). Detail of pinkish nectary. (O). Ovary. (P). Style. Photos: C.D.M. Ferreira.



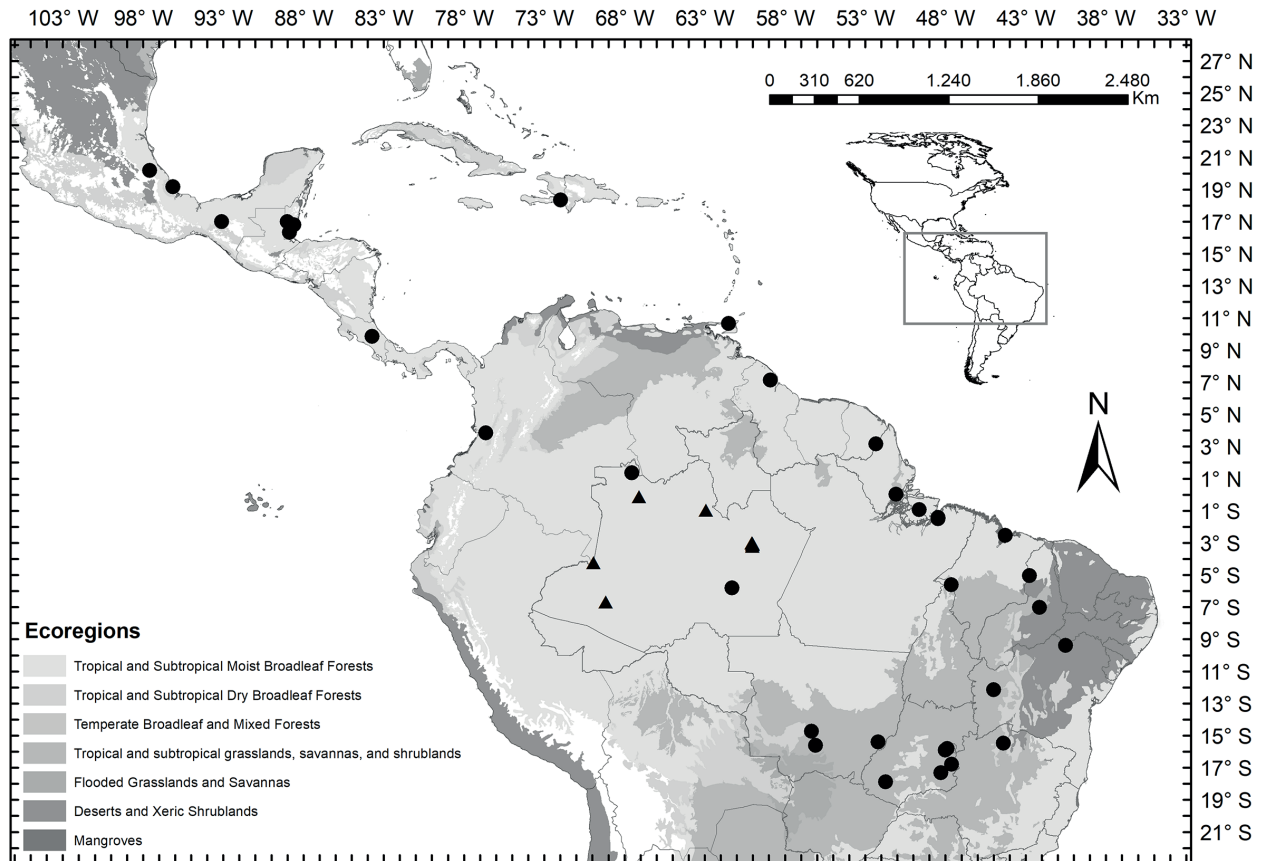


Figure 2. Geographical distribution of *P. aquatica* (circles) and *P. manausensis* (triangles). Ecoregions according to Olson *et al.* 2001.

Treelets to trees, (2–)3–15 m tall, evergreen. **Branches** 0.5–1.5 cm diam., with white lenticels. **Stipules** 0.3–0.5 × 0.2–0.3 cm, triangular, deciduous. **Petiole** 7–14(–16–17) × 0.2–0.4 cm, base slightly thickened, with a pair of nectaries elongated longitudinally from the base to the apex. **Leaves** with 5–6(–8–9) leaflets. **Petioliule** 0.3–1.5 × 0.2 cm, not canaliculate. **Leaflets** 9.5–23 × 2.5–11 cm, generally slightly elliptical, rarely elliptical or oblong, chartaceous or slightly coriaceous, base generally decurrent, rarely acute or cuneate, apex cuspidate, rounded, acute or rounded-cuspidate, margin entire, slightly revolute or non-revolute, veins brochidodromous, secondary veins 6–13, surfaces generally concolored, rarely discolored, adaxial surface shiny green, glabrous, abaxial surface light green, opaque, generally glabrous, rarely lepidote. **Inflorescence** 1–5-flowered, apical or subapical. **Flowers** 16–36 cm long. **Pedicels** 1–4 × 0.3–0.7 cm, rounded, without constriction. **Flower buds** (1.5–)2–22 × 0.5–2 cm, oblongoid or linear, apex cuspidate. **Receptacle** with 5 nectaries, rarely absent, nectaries globose, whitish to cream. **Calyx** 1–3 × 1–2 cm, campanulate or subtubular, apex generally truncate, rarely 5-apiculate, chartaceous, externally brownish or yellowish, indumentum generally pubescent, rarely glandular or floccose, trichomes stellate, hyaline or brownish, internally

velutinous, trichomes simple, hyaline. **Petals** 13–25(–32) × 0.5–1.5 cm, linear, base truncate, apex rounded or acute, generally yellowish, rarely cream, both surfaces pubescent, trichomes stellate. **Staminal tube** (3–)3.5–13 × 0.4–1 cm, whitish or cream, glabrous or pubescent at the base, trichomes stellate. **Filaments** 150–200 units, 8.5–19 cm long, whitish at the basal portion, reddish at the apex, glabrous, organized into 15 phalanges. **Anthers** 0.2–0.5 cm long, linear, yellowish, glabrous. **Style** 8.5–31 cm long, whitish at the base, reddish at the apex, pubescent, trichomes stellate. **Stigma** 5-lobed, reddish. **Ovary** 0.5 × 0.5 cm, pentagonal, pubescent at the apex, trichomes stellate. **Fruits** 9.5–30 × 6–15 cm, fusiform, apex cuspidate, brownish, 8–15-seeded. **Kapok** scarce. Seeds 3–5 × 2–4 cm, trigonal, light brownish, 8–20-striate.

Distribution and Habitat — *Pachira aquatica* occurs in Central and South America. It inhabits flooded areas in Belize, Brazil, Costa Rica, Mexico, French Guyana, Guyana, and Trinidad and Tobago. In Brazil, *P. aquatica* is more frequently found in Amazon forest (Amapá, Amazonas, Maranhão, Mato Grosso, Pará, and Tocantins states) but small populations also occur in Cerrado vegetation (the Distrito Federal and the states of Bahia and Piauí) (Fig. 2). This species is used as an ornamental in several countries because of its small size and attractive flowers.

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Common names — Castanheiro-do-Maranhão, mamorana, munguba, mandrana.

Phenology — Flowers seen from February–June and August–December. Fruits seen from February–April and in August and October.

Conservation Status — Least Concern (LC). This species is widely distributed in tropical rain forests and dry forests. In Brazil, *P. aquatica* occurs in three biomes, Amazon forest, Caatinga and Cerrado. There are some gaps between the Mexican and Brazilian populations (Fig. 2). The low number of specimens from humid forests is because it is difficult to work in this vegetation. It is possible that with a larger sampling of herbaria, the number of known populations would increase. However, even based on the current sampling data, the EOO surpasses 20,000 km² and the AOO surpasses 5,000 km². In addition, two populations are in protected areas (Área de Proteção Ambiental Ilha do Combu, Reserva Florestal do Savacan).

Comments — *Pachira aquatica* is morphologically similar to *P. manausensis*. To distinguish these species, see the notes under *P. manausensis*.

Aublet (1775) published *Pachira aquatica*, (see Art. 31.1, ICN) on June 10, 1775 (Stafleu & Cowan 1983). Linnaeus (1775) also described *Sophia carolina* L. in 1775, which was published on 23 June (Stafleu & Cowan 1983). In Jarvis *et al.* 1993, Barrie typified *S. carolina* with the specimen LINN-865.1. After analyzing this specimen, we confirmed it is *P. aquatica*. Thus, these names are synonyms and *P. aquatica* has priority over *S. carolina* (see Art.11.4, ICN).

Linnaeus' son (1781) described *Carolinea princeps* L.f. in honor of Caroline Louise de Hesse-Darmstadt (Lanjouw & Uttien 1935). In the protologue, Linnaeus indicated *P. aquatica* as the basionym. Since *P. aquatica* is a validly published name, *C. princeps* is a superfluous and illegitimate name (see Art. 52.1 ICN).

In his *Flore des Antilles*, Tussac (1827) described *P. grandiflora* and differentiated it from *P. aquatica* by the apical position of the flower and absence of nectaries on the receptacle. However, both characteristics used by Tussac are variable and a single specimen can exhibit this variation. The material collected by Tussac is mostly unknown. The few known specimens are at the herbaria P and G (Stafleu & Cowan 1983). After searching several herbaria (including P and G), we found no specimens related to the protologue. Therefore, in accordance with Art. 9.3 of the ICN, we select an illustration in the protologue as the lectotype of this name. Thus, we here select plate 3 as the lectotype. The choice of plate 3 (flowering branch) over plate 4 (fruiting branch) is because floral characteristics are more important in the circumscription of the name, as noted by Tussac.

Schlechtendal & Chamisso (1831) used the collections of Schiede and Deppe to describe *Carolinea macrocarpa*, which were from Mexico and archived at the B and HAL herbaria (Stafleu & Cowan 1983). The collection at B was destroyed and the only remaining information about it is Macbride's

photo of the collection (negative no. F9537) (see Grimé & Plowman 1986). We found duplicates of the collection at BM and HAL. Therefore, the specimen HAL0128028 is here designated as the lectotype, since it is the most complete duplicate.

In the protologue of *Bombax rigidifolium*, Ducke (1925) mentions only one collection (*R. Siqueira s.n.*) deposited at RB. However, there are two specimens in this herbarium that correspond to this collection. Thus, Ducke's indication represents syntypes (see Art. 40, Note 1, ICN), so we here designate one of these duplicates (the most complete one, with a flower and leaf) as a lectotype (RB00534501).

Selected specimens — **BELIZE.** Cayo: Ix Chel Farm, 20 January 1991, J.L. Brown 15 (NY). **Stann Creek:** Cut-off along road to Placentia, 17 March 1993, M.J. Balick 3661 (NY). **Toledo,** 28 January 1990, A. Reed 1 (NY). **BRAZIL.** **Amapá:** Macapá, 17 June 2001, L.A. Pereira 490 (INPA). **Amazonas:** Manicoré, 21 August 2012, G.P. Viana & J.A.S. Siqueira 221 (INPA). *Ibid.* Rio Oiapoque, 15 October 1950, R.L. Fróes 26629 (SP). *ibid.* Rio Xié, 08 May 1973, M.F. Silva *et al.* 1366 (INPA). **Bahia:** Barreiras, 24 October 2018, J.L. Passos 3 (HUEFS). *Ibid.* Feira de Santana, 25 May 2002, L.A.P. Miranda 72 (HUEFS). **Distrito Federal:** Brasília, 07 March 1934, C. Lages 185 (RB). **Goiás:** Jataí, 20 September 1974, G. Hatschbach & R. Kummrow 34984 (MBM). *Ibid.* Pires do Rio, 27 November 1976, G.J. Shephered *et al.* 3664 (MBM). **Maranhão:** São Luis, 18 August 1992, F.H. Muniz 153 (RB). **Mato Grosso:** Cuiabá, 14 July 1991, *s.col.* 2096 (UFMT). *Ibid.* Nobres, 19 November 2017, V.N. Yoshikawa & F.S. Petrongari 100 (HUMC). *ibid.* by BR 158, Valle dos Sonhos, 07 October 1988, M.G.L. Wanderley *et al.* 1227 (MBM). **Minas Gerais:** Januária, 04 November 1978, L. Krieger *s.n.* (MBM328459). **Pará:** Área de Proteção Ambiental Ilha do Combu, 12 August 2016, R.G. Barbosa *et al.* 576 (RB). *Ibid.* Belém do Pará, 13 November 1926, A. Ducke *s.n.* (RB21006). *Ibid.* Ilha do Marajó, 23 October 1957, A. Tavares *et al.* 254 (INPA). **Piauí:** Oieiras, 26 May 2008, F.C.S. Oliveira *et al.* 169 (RB, TEPB). *Ibid.* Teresina, 27 September 1994, L.B. Teixeira *s.n.* (TEPB 8201). **Tocantins:** Sítio Novo do Tocantins, trilha Samaúma, 07 August 2000, J.P. Ribeiro 245 (HUEFS). **FRENCH GUYANA.** Cachoeira Camaraua, 02 October 1960, L.Y.T. Westra 48541 (NY). Tour de l'île river, 14 October 1991, S.A. Mori 22126 (NY). **GUYANA.** **Pomeroon:** Kabakaburi, 14 October 1991, S. Tiwari 380 (NY). **HAITI. Ouest: Massif de la Selle,** Petionville, 12 April 1928, E.L. Ekman 9854 (NY). **MEXICO. Chiapas:** Mpio, 11 May 1985, P. Tenorio *et al.* 8617 (MBM, MEX). **Santiago:** Tuxtla, 05 April 1983, M.H. Nee 26488 (NY). **TRINIDAD TOBAGO.** Port of Spain: Queen's Park savanna, 22 October 1903, W.E. Broadway 6092 (NY).

2. *Pachira manausensis* (A. Robyns) Yoshikawa & C.D.M. Ferreira **comb. & stat. nov.** *Pachira aquatica* var. *manausensis* A. Robyns, Bull. Jard. Bot. État Bruxelles 33 (1): 247. (1963). Type: BRAZIL, Amazonas: Manaus, Igarapé de Cachoeira



Grande, 07 December 1927 A. Ducke s.n. (lectotype, designated here: RB00537260!; isolectotypes: G00177529 [digital image!], MG190676 [3 Sheets], NY1085675, [digital image!], RB00534517!, RB00537261!, RB00537262!, S-R-11276 [2 sheets] [digital image!], SP412430 [digital image!], U0000783 [digital image!]). (Fig. 1I–P), (Fig. 2 and Video S1 in supplementary material).

Bombax rigidifolium Auct. non Ducke; Ducke, Arch. Jard. Bot. Rio de Janeiro. V. p. 161 (1930a).

Treelets to trees, 3–10 m tall, evergreen. **Branches** 2 cm diam., glabrous. **Stipules** 0.5–0.8 × 0.5 cm, triangular, deciduous. **Petiole** (15–)18–37 × 0.4–0.6 cm, base thickened, with a pair of nectaries elongated longitudinally from the base to the apex. **Leaves** with 5–8 leaflets. **Petiolule** 1–4.2 × 0.3 cm, canaliculate. **Leaflets** 16.5–43.5 × 7–19 cm, generally elliptical, rarely slightly elliptical or obovate, strongly coriaceous, base rounded or decurrent, apex rounded or rounded-cuspidate, margin entire, revolute, veins brochidodromous, secondary veins 6–10, surfaces discolored, glabrous, adaxial surface green, abaxial surface light green. **Inflorescence** 1–4(–5)-flowered, apical or subapical. **Flowers** 24–40 cm long. **Pedicels** (1–)1.5–3 × 0.5–0.8 cm, rounded, slightly constricted in the middle portion. **Flower buds** 7–13 × 1.5–3 cm, oblongoid or linear, apex cuspidate. **Receptacle** with 5 nectaries, nectaries globose, pinkish. **Calyx** 1.5–3.5 × 2–3 cm, campanulate, apex truncate, coriaceous, externally greenish to brownish, indumentum farinose, trichomes stellate, brownish, internally velutinous, trichomes simple, hyaline. **Petals** 22–32 × 0.7–1.5 cm, linear, base truncate, apex rounded or acute, generally yellowish to greenish, rarely pinkish, both surfaces pubescent, trichomes stellate. **Staminal tube** 5–9.5 × 0.7–1 cm, whitish to cream at basal portion, purplish red to purple at the apex, pubescent. **Filaments** 150–200 units, 14–22 cm long, whitish at the basal portion, purplish red to purple at the apex, glabrous, organized into 15 phalanges. **Anthers** 0.3–1 cm long, linear, purplish red or yellowish, glabrous. **Style** 22–32 cm long, whitish at the base, purplish red, pinkish or purple at the apex, pubescent, trichomes stellate. **Stigma** 5-lobed, purplish red or purple. **Ovary** 0.5 × 0.5 cm, pentagonal, pubescent at the apex, trichomes stellate. **Fruits** 13.5–24.5 × 7 cm, slightly obovoid, apex acuminate, 3 cm long, ferruginous, ca. 55-seeded. **Kapok** scarce. **Seeds** 3 × 2.5 cm, ovoid, dark brownish, 2-striate.

Distribution and Habitat — This species is endemic to Amazonas State (Fig. 2), in Brazil, and occurs in flooded areas and terra firme and capoeira vegetation.

Common names — Munguba, mungubarana.

Phenology — Flowers seen in January, February, April and from October–December. The supplemental material (Video S1 in supplementary material) shows the anthesis of the flowers, which occurs at 7 to 7:30 pm. Fruits seen in February, April, May, July, August and December.

Conservation Status — Endangered (EN), B2ab (i, ii, iii). The species has an AOO smaller than 500 km² and a distribution restricted to Amazonas State in the municipalities of Barcelos, Janauari, Manaus and São Gabriel da Cachoeira. To date, no populations are known to occur in protected areas and only five populations are known in nature. In addition, the arboretum at the Rio de Janeiro Botanical Garden (RBv756) has the only known cultivated individual (see comments in the Discussion).

Comments — For *P. aquatica* var. *manausensis*, Robyns (1963) used its endemism and some morphological characteristics (e.g., larger petiole, calyx and flower in var. *manausensis*) to differentiate it from *P. aquatica* var. *aquatica*.

However, we observed that the morphological boundaries between the two species are consistent throughout their populations and propose the new combination and status of *Pachira aquatica* var. *manausensis* to *Pachira manausensis*.

Therefore, *Pachira manausensis* can be distinguished from *P. aquatica* by the following features. *Pachira manausensis*: branches 2 cm diam.; petiole (15–)18–37 × 0.4–0.6 cm (Fig. 1I–J); petiolule canaliculate; leaflets strongly coriaceous, with revolute margin; nectaries on the receptacle pinkish; calyx coriaceous; staminal tube purplish red to purple (Fig. 1I–L, respectively); fruits brownish; and seeds ovoid, dark brownish, 2-striate. *Pachira aquatica*: branches 1–1.5 cm diam.; petiole 7–14(–16–17) × 0.2–0.4 cm (Fig. 1A–B); petiolule non-caliculate; leaflets chartaceous to slightly coriaceous, with non-revolute to slightly revolute margin; nectaries on the receptacle whitish to cream; calyx chartaceous; staminal tube whitish to cream (Fig. 1A–D, respectively); fruits ferruginous; and seeds trigonal, light brownish, 8–20-striate. Table 1 lists the differences between the two species more clearly.

In the protologue of *P. aquatica* var. *manausensis*, Robyns indicates that the holotype is at RB and there are isotypes at four other herbaria (i.e., G, K, S and U). Currently, in RB there are four specimens of the collection indicated by Robyns. Thus, according to Art. 8.1 of ICN, we here select a single specimen as the lectotype. We chose the most complete specimen, with a leaf and flower. Duplicates were also found in other herbaria (i.e., MG, NY and SP), in addition to what Robyns cited, which are listed above as isolectotypes. The isotypes indicated at K by Robyns were not found.

Selected specimens — **BRAZIL. Amazonas:** Barcelos, 26 July 1985, J.A. Silva 352 (INPA). Janauari, 23 June 1977, L. Coelho 640 (INPA). Estrada da Forquilha, 28 December 1960, W. Rodrigues & J. Chagas 2022 (INPA). Ibid. Igarapé da Cachoeira Alta do Tarumã, 11 December 1961, W. Rodrigues & J. Chagas 3845 (INPA). Ibid. Igarapé do Buião, 08 April 1958, L. Coelho s.n. (INPA6329). Ibid. Igarapé do Matrinchão, 12 April 1961, W. Rodrigues 2345 (INPA). Ibid. Km 9 da BR 17, 22 February 1956, D. Coelho s.n. (INPA 3484). Ibid. Parque 10, 24 November 1955, W. Rodrigues s.n. (RB2965). Ibid. Igarapé do Tabatinga, 24 April 1962, W. Rodrigues



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Table 1. Morphological differences between *Pachira aquatica* and *Pachira manausensis*.

Morphological traits	Species	
	<i>Pachira aquatica</i>	<i>Pachira manausensis</i>
Branch diameter	0.5–1.5 cm	2 cm
Stipule size	0.3–0.5 × 0.2–0.3 cm	0.5–0.8 × 0.5 cm
Petiole size	7–14(–16–17) × 0.2–0.4 cm	(15–)18–37 × 0.4–0.6 cm
Petiolule	Size	0.3–1.5 × 0.2 cm
	Canaliculate	No
Leaflets	Size	9.5–23 × 2.5–11 cm
	Margin	Plane to slightly revolute
	Texture	Chartaceous to slightly coriaceous
Pedicel	Without constriction	Slightly constricted in the middle portion
Nectary color	Whitish to cream	Pinkish
Calyx texture	Chartaceous	Coriaceous
Staminal tube	Size	(3–)3.5–13 × 0.4–1 cm
	Color	Whitish to cream
Filaments	Size	8.5–19 cm long
	Color	Reddish at the apex
Style color	Whitish at the base and reddish at the apex	Entirely purplish red
Fruit	Size	9.5–30 × 6–15 cm
	Color	Ferruginous
Seed	Quantity	8–15
	Color	Light brown
	Shape	Trigonal
	Striations	8–20

& J. Chagas 4412 (INPA). Ibid. Jardim Tarumãzinho, 11 February 1977, M.F. Silva et al. 2076 (INPA). Manaus, 07 December 1927, A. Ducke s.n. (RB21002). **Rio de Janeiro:** Rio de Janeiro, arboreto JBRJ, seção 3, cant. G (RBv755), 28 February 2015, C.D.M. Ferreira 26 (RB).

Discussion

For *P. manausensis*, we highlighted in the IUCN assessment that there are no known protected populations and that there is a single cultivated individual protected *ex situ* (RBv756) at the Rio de Janeiro Botanical Garden (JBRJ).

At the turn of the 19th century, Adolpho Ducke was the main provider of Amazonian specimens to the *in vivo* and dry collections at the JBRJ and RB herbarium (Ducke 1930b; Egler 1963; Bediaga & Drummond 2007), as well as one of the most important Brazilian naturalists and researchers of the Amazonian flora (Egler 1963; Miranda 1999; Florez & Scheiner 2016). He obtained the material RB21002 (the type material, barcode RB00537260) in Igarapé de Cachoeira Grande (municipality of Manaus, Amazonas State), which was cited as *Bombax rigidifolium* Ducke in his list of Amazonian plants (Ducke 1930a).

In 1963, Robyns synonymized *B. rigidifolium* under *P. aquatica*. In addition, he published *P. aquatica* var. *manausensis* using Ducke's collection as the type and referred to the original name of this material as an “*Auct. non*” (misapplied name, see recommendation 50D1, ICN).

For more information, see the synonym list under *P. manausensis*.

Therefore, we hypothesized that Ducke probably collected the specimen RBv756 from the same locality or the same population of the type of *P. manausensis*, when he went on an expedition in Amazon forest in Brazil, and then planted it at JBRJ. To confirm this hypothesis, we consult the list of *in vivo* specimens from JBRJ with the information that Ducke brought the individual RBv756 from the state of Amazonas and identified it as *B. rigidifolium*. However, a description about the municipality was lacking so we could not confirm if the specimen is from Manaus. Nevertheless, for some species we know that Ducke used acclimatization to successfully cultivate plants at JBRJ (Ducke 1930c). For this, he kept a good portion of his collections alive in the nurseries at the Emílio Goeldi Museum (Pará) until they were ready for transportation and planting at JBRJ (Ducke 1930b; Florez & Scheiner 2016). This would explain the time span of approximately 10 years between collecting RB21002 (7 December 1927) and planting the individual RBv756 (31 August 1937) in Rio de Janeiro. There is also the possibility that Ducke collected and tried to acclimate this species more than once.

Finally, since the publication by Robyns (1963), no other work has completely revised *Pachira*. The varieties of *P. aquatica* proposed by Robyns can be easily interpreted as species due to the differences that we observed. Possibly, Robyns did not observe both taxa *in situ*, lacked information about the color of structures, or did not have access to enough collections, since many collections we studied were



made after 1963. Therefore, everything indicates that, with more information, Robyns would have described *P. aquatica* var. *manausensis* at the species level.

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