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A revision of neotropical *Diospyros* (Ebenaceae): part 13

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Abstract

In the course of a revision of the New World Ebenaceae for "Flora Neotropica" and some regional floras, specimens from ca. 100 herbaria have been studied. *Diospyros impia* B.Walln. is described as a new species from Espirito Santo in Brazil. *D. apeibacarpos* Raddi (synonyms: *D. janeirensis* Sandwith, *D. weddellii* Hiern, *Maba hilairei* Hiern), and *D. brasiliensis* Mart. ex Miq. both from Southeastern Brazil, and *D. tetrandra* Hiern from Brazil, Suriname, and French Guiana (Guyane Française) are here described in detail. Figures, distribution maps, vernacular names, information on habitat, lists of specimens, and an identification key are included.

Key words: Ebenaceae, *Diospyros apeibacarpos*, *brasiliensis*, *hilairei*, *impia*, *janeirensis*, *tetrandra*, *weddellii*, *Maba hilairei*, revision, taxonomy, distribution map, Flora of South America.

Zusammenfassung

Im Rahmen einer Revision der neuweltlichen Ebenaceae für "Flora Neotropica" und einige Regionalfloren konnten Herbarbelege aus ca. 100 Herbarien studiert werden. *Diospyros impia* B.Walln. wird als neue Arte aus Espirito Santo in Brasilien beschrieben. Die beiden südost-brasilianischen Arten *D. apeibacarpos* Raddi (Synonyme: *D. janeirensis* Sandwith, *D. weddellii* Hiern, *Maba hilairei* Hiern) und *D. brasiliensis* Mart. ex Miq., sowie *D. tetrandra* Hiern aus Brasilien, Suriname und Französisch-Guayana (Guyane Française) werden eingehend beschrieben. Abbildungen, Verbreitungskarten, Volksnamen, Angaben zum Habitat, Listen der gesehenen Herbarbelege, sowie ein Bestimmungsschlüssel werden präsentiert.

Introduction

In the Americas, the Ebenaceae are represented by the genera *Diospyros* with about 100–130 species, and *Lissocarpa* with eight species. In the course of the ongoing revision of the Ebenaceae for "Flora Neotropica", the following contributions have already been published: Wallnöfer 1999, 2000, 2001a, 2001b, 2003, 2004a, 2004b, 2004c, 2005, 2007–2019, 2008a, 2008b, 2010a, 2010b, 2010c, 2012, 2015a, 2015b, Wallnöfer & Mori 2002, Estrada & Wallnöfer 2007 and Wallnöfer & Chávez 2014 (see also Duangjai et al. 2006, 2009).

In the course of the ongoing revision the species are published in single installments. At the time a special focus is given to the species occurring in Southeastern Brazil. Work shall continue afterwards with the Amazonian species. The Amazonian *D. tetrandra* is already included here because it seems to be the closest relative of *D. brasiliensis*. Due to the size and complexity of the genus *Diospyros* any discussion about relationships, infrageneric arrangement and biogeography in the Neotropics is still premature and needs thus to await completion of the revision.

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Fig. 1: Lectotype of *Diospyros apeibacarpos* RADDI [FI] (see also Fig. 4e).

Terminology: The terminology which is used in the descriptions is in accordance with STEARN (1992). The term "patent" means spreading at an angle of 90° (this definition is also given by BEENTJE et al. 2003, and BEENTJE & WILLIAMSON 2010). As in part 1–12 of the current revision, the term "spreading" is used for all intermediate positions of the hairs between appressed and patent. Where necessary, any further specifications are added, e. g. "slightly spreading". The term "lanceolate" is traditionally used in different ways in the English- and German-speaking countries (for further details see STEARN 1992: 438, fig. 21). Here it is used as follows: "a shape broadest at the middle and tapering at each end" (the equivalent term in the English-speaking countries is "narrowly elliptic"). An indumentum is called "medium dense" when the surface (epidermis) of the organ in question is still visible between the crowded hairs; it is defined as "dense" when the surface is not visible.

Note: Additions are given in brackets; coordinates given in brackets were determined during this revision; acronyms of herbaria according to THIERS (2019); data from herbarium labels are cited here in a standardized way; – abbreviations: defl = deflorate; fl = flowering; flbuds = with flower buds; fr = fruiting; st = sterile; yfr = with young fruits; carp = fruit in the carpological collection; n.s. = not seen; s.n. = without number; s.d. = without date; s.coll. = without collector; s.lat. = sensu lato; s.str. = sensu stricto; 2× = 2 sheets.

***Diospyros apeibacarpos* RADDI**, Quar. piant. nuov. Bras. 12–13 (1820) [preprint of RADDI (1821)]; – [Fig. 1–5].

Protologue: "Specie rarissima da me trovata una sol [sola] volta sulle montagne d'Estrella nel mese d'Aprile, nella quale epoca aveva i frutti maturi" [translation from Italian: A very rare species which I found only once in the Estrela mountains during the month of April, at a time in which it was bearing mature fruits].

Typus: Brasil, Rio de Janeiro, "sulle montagne d'Estrella" (ex protologue; = Serra da Estrela), [ca. 22°34' S, 43°10' W], (fr), Apr. 1818, **G. Raddi s.n.** [lectotype (here designated): FI (Fig. 1, 4e); isotype: PI (except for one leaf in the capsule; see Fig. 1 in WALLNÖFER 2005)].

Note: A further herbarium specimen was found in 2009 in FI, requiring now a lectotypification. As this specimen is more complete, it is selected here as the lectotype. The location of the "Serra da Estrela" is indicated on the maps in BALDINI & GUGLIELMONE (2012), and in BALDINI & PIGNOTTI (2018). According to STAFLEU & COWAN (1983), the journal containing RADDI's article was published in January 1821, whereas the preprint was issued and distributed already in 1820. For further notes see WALLNÖFER (2005: 242).

= *Diospyros weddellii* [*"weddelii"*] HIERN, Trans. Cambridge Philos. Soc. 12 (1): 253–254 (1873).
Typus: Brasil, Rio de Janeiro, "environs de Rio-Janeiro", [ca. 22°58' S, 43°13' W], (fr), 1843, H.A. Weddell 577 [lectotype (here designated): P (Fig. 2; photo F 38614 at F, GH, US); isotypes: F (fragm. ex P), G, MG n.s. (dig. photo, fragm. ex P)].
Note: see the note in WALLNÖFER (2005: 243).

Fig. 2: Lectotype of *Diospyros weddellii* Hiern [P].

Fig. 3: Lectotype of *Maba* (*Diospyros*) *hilairei* HIERN [P].

= *Maba hilairei* Hiern, Trans. Cambridge Philos. Soc. 12 (1): 143 (1873).

≡ *Diospyros hilairei* (Hiern) Cavalcante, Bol. Mus. Paraense Emilio Goeldi, N. S., Bot., 21: 10 (1963).
Typus: Brasil, Espirito Santo, "Province de Espir. Santo", [collected in the area along the lower Rio Doce, near Linhares, ca. 19°23' S, 40°05' W], (fl female), Oct. 1818 [according to Urban 1906], **A.F.C.P. de Saint-Hilaire "Catal. B 375"** [lectotype (designated by Wallnöfer 2005): P (Fig. 3; photo F 38611 at F, GH, US); isotypes: F (fragm. ex P), P 2×].
Note: see the note in Wallnöfer (2005: 244).

= *Diospyros janeirensis* Sandwith, Kew Bull. 1949 (4): 487–488 (1950).
Typus: Brasil, Rio de Janeiro, ad urbem loco Mundo Novo, [ca. 22°57' S, 43°11' W], (K: fl male, G, S, U: fl female, P: sterile), 10 Nov. 1920, **J.G. Kuhlmann 507** [holotype: K; isotypes: G, P, S, U]; "arbor parva".
Note: see the note in Wallnöfer (2005: 244). – The separate fruit in K is probably not part of the type collection. The specimen kept in MG (dig. photo seen in 2018) bears the date "11 Nov. 1921" and does therefore not represent a type. The status of the fragment in F (ex B) is uncertain because it is without date. The non-type material of Kuhlmann 507 is listed under the "specimens examined".

Treelet or tree up to 17 (–27) m tall, dbh up to 25 cm, already flowering when 2.5 m tall, evergreen; outer bark grayish and smooth (Marquete et al. 1151) or black (Scarponi et al. 97); living bark yellow (Scarponi et al. 97); twig apices and leaf primordia densely covered with appressed to slightly spreading, ± straight, light brown hairs; young twigs terete, scattered, medium densely or densely covered with appressed, spreading or ± patent, ca. 1 mm long, ± straight hairs and often also with much shorter or minute hairs in-between, ± glabrescent when older; – **leaves** alternate; petioles (3–) 5–8 (–10) mm long, ca. 1 mm thick, hairy, ± canaliculate adaxially, laterally winged; leaf lamina narrowly to broadly lanceolate or elliptic, (1–) 6–13.5 cm long, (0.6–) 2–4 (–5) cm wide, (2–) 2.3–4.4 times as long as wide, widest ± at or slightly below the middle, firmly chartaceous, dull, ± verrucose or wrinkled on both sides when dry, adaxially glabrous (except on the midvein), dark green when alive (discolorous), brown to blackish when dry, abaxially glabrous (northern populations) or with scattered, ± appressed, straight hairs of different length, and glabrescent when old (southern populations), dark brown when dry; leaf apex acute or acuminate, often with a short drip-tip, rarely obtuse; base of the lamina cuneate, tapering into the petiole; leaf margins entire, densely covered with slightly spreading, straight or ± flexuose, light hairs (pointing forwards) especially when young, ± glabrescent when old, strongly revolute proximally; flachnectaria few or up to 30, round, minute, sometimes barely discernible (their embossments often better visible adaxially), arranged abaxially near the midvein especially proximally but sometimes also up to the leaf-apices, missing on many leaves; midvein on the adaxial side ± sunken, ± flat distally, densely covered with straight or ± flexuose, spreading or ± patent hairs when young, on the abaxial side markedly prominent and scattered to medium densely covered with ± appressed or spreading hairs, ± glabrescent on both sides when old; secondary veins 10–12 per side, ± flat on both sides or slightly raised abaxially, often hardly visible; higher order venation not or only barely visible; – **inflorescences**: cymes placed in the axil of caducous bracts proximally and in the axil of adult leaves up to the distal parts of new shoots; scales at the base of the inflorescences and cymes 1–2 mm long and

Fig. 4: *Diospyros apeibacarpos*: a: male inflorescences (from Pinheiro & Santos 2315 [FHO]); – b: male flowers (from Silva 120 [W]); – c: female inflorescences (from Kuhlmann 507, isotype [U]); – d: female flowers (from Pinheiro & Santos 2269 [FHO]); – e: same fruit as seen from different angles (from Raddi s.n., lectotype [FI]); – f: fruits (from Folli 3055 [W]); – scale = 1 cm, except in b: 0.5 cm.

wide, densely hairy abaxially, glabrous adaxially; male cymes 1–3-flowered, at the base often with additional cymes (thus inflorescences condensed, up to 2 cm long and with up to ca. 30 flowers; Fig. 4a); female cymes 1 (–3)-flowered, at the base often with additional cymes (thus inflorescences up to 1.5 cm long and with up to 5 flowers; Fig. 4c); male stalks (peduncles and pedicels) up to 4 mm long, the female ones 4–7 mm long, 0.8–1.5 mm thick, densely covered with ± spreading hairs; lateral pedicels 1.5–3 mm long, ca. 0.5–1 mm thick; bracteoles of both sexes 2–3 mm long, 0.8–2 mm wide, lanceolate to obovate, medium densely covered with appressed hairs abaxially, glabrous adaxially; – **flowers** 5–6 (–7)-merous, perfumed; **male flowers** (Pinheiro & Santos 2315, Mello-Silva et al. 1545, Silva 120, 353, Kuhlmann 507; Fig. 4a–b) 6–7 mm long at anthesis (pedicels excluded, and when corolla lobes reflexed); calyx 3–4 mm long and wide, undivided in the proximal 2–2.5 mm, green or light green when alive, on the

outside medium densely covered with ± appressed, straight or slightly flexuose hairs of different length, undivided part on the inside ± glabrous (except at the base); calyx lobes (1–) 1.5–2.5 mm long, 1.5–2 mm wide, triangular, medium densely covered with minute, appressed hairs adaxially; sinuses between the calyx lobes inconspicuous; corolla 6–7 mm long at anthesis, white or cream when alive; corolla tube ca. 1 mm long, glabrous on both sides; corolla lobes 5–6 mm long, 3–3.5 mm wide, widest in the distal half, obtuse or rounded, adaxially glabrous, abaxially along the median line medium densely to densely covered with ± appressed, straight to slightly flexuose hairs of different length; stamens exserted, white or cream when alive, 29–87 per flower (in 5-merous flowers: Mello-Silva et al 1545 with 29, Silva 120 with 34, Silva 353, Pinheiro & Santos 2315 with 40; a 6-merous flower of Kuhlmann 507 with 87); the outer stamens paired, the inner ones apparently single, 3.5–5 mm long; filaments ca. 1.5 mm long, attached near the base of the corolla tube, glabrous; the outer anthers 1.5, the inner ones 2.5 mm long, ca. 0.2 mm wide, ± filiform; connectives on both or only on one side with ± straight, slightly spreading hairs (which overtop usually the apex of the stamens), tapering into a 0.5–1 mm long apical mucro; rudiment of the ovary consisting of a lump of hairs or missing; **female flowers** (Saint-Hilaire 375, Kuhlmann 507, Allemão s.n., Pinheiro & Santos 2269; Fig. 4c–d) ca. 8 mm long at anthesis (when corolla lobes reflexed and with pedicels excluded); calyx 5–9 mm long and up to 12 mm wide, undivided in the proximal 2–4 mm, green or greenish when alive, on the outside ± verrucose, medium densely to densely covered with ± spreading, ± slightly flexuose hairs of different length, on the inside densely covered with small hairs proximally and with ± straight, longer hairs along the median line of the lobes and with curled smaller hairs towards the margins; calyx lobes 4–7 mm long, 2–3.5 mm wide, acute, triangular, slightly revolute, proximally often ± undulate; sinuses between the calyx lobes slightly expanded and protruding outwards; corolla ca. 7 mm long at anthesis (when lobes reflexed), white, light yellow or yellow when alive; corolla tube ca. 1 mm long, glabrous on both sides; corolla lobes 8–10 mm long, ca. 5 mm wide, rounded, widest in the distal half, adaxially glabrous, abaxially along the median line ± densely covered with ± appressed, straight to slightly flexuose hairs of different length and less densely with ± straight, longer bristles (but sometimes only with such bristles), ± glabrous or with minute hairs towards the margins and apices; staminodia 6 to ca. 30 (a 5-merous flower bud of Pinheiro & Santos 2269 with 6; Saint-Hilaire 375 with 9–10; a damaged, 6-merous bud of Kuhlmann 507 "21-XII-1920" with ca. 30; Hiern 1873 reported 11–13 staminodia for his *D. hilairei*); staminodia 3–5 mm long, increasing very much in size at anthesis and then overtopping the ovary, free, filiform, some paired, attached to the base of the corolla tube, ± densely covered with long, straight hairs; ovary ca. 3 mm long, ca. 2 mm wide (including the indumentum 5 mm wide), very densely covered with straight, erect and then spreading or ± patent, long, light brown hairs with ferruginous apices; stylodia 3, 4–5 mm long, free ± up to their bases or fused together over most of their length and forming a style (one anthetic flower of Saint-Hilaire "Catal. B 375"), densely hairy proximally, with more scattered, appressed hairs distally; stigmata up to ca. 1.5 mm long, bilobed and widened distally; – stalk of the **fruits** (3–) 4–12 mm long and 1.5–2 mm thick, densely covered with indumentum; fruits (Fig. 4e–f) ± oblate, less frequently globose, up to 3–4 cm in diameter, often with an obconical large apex when young, covered with ± prominent, densely hairy tubercles especially when young; tubercles ± densely covered with short or minute, patent hairs and with a ca. 2 mm long, ± straight, patent thick bristle at

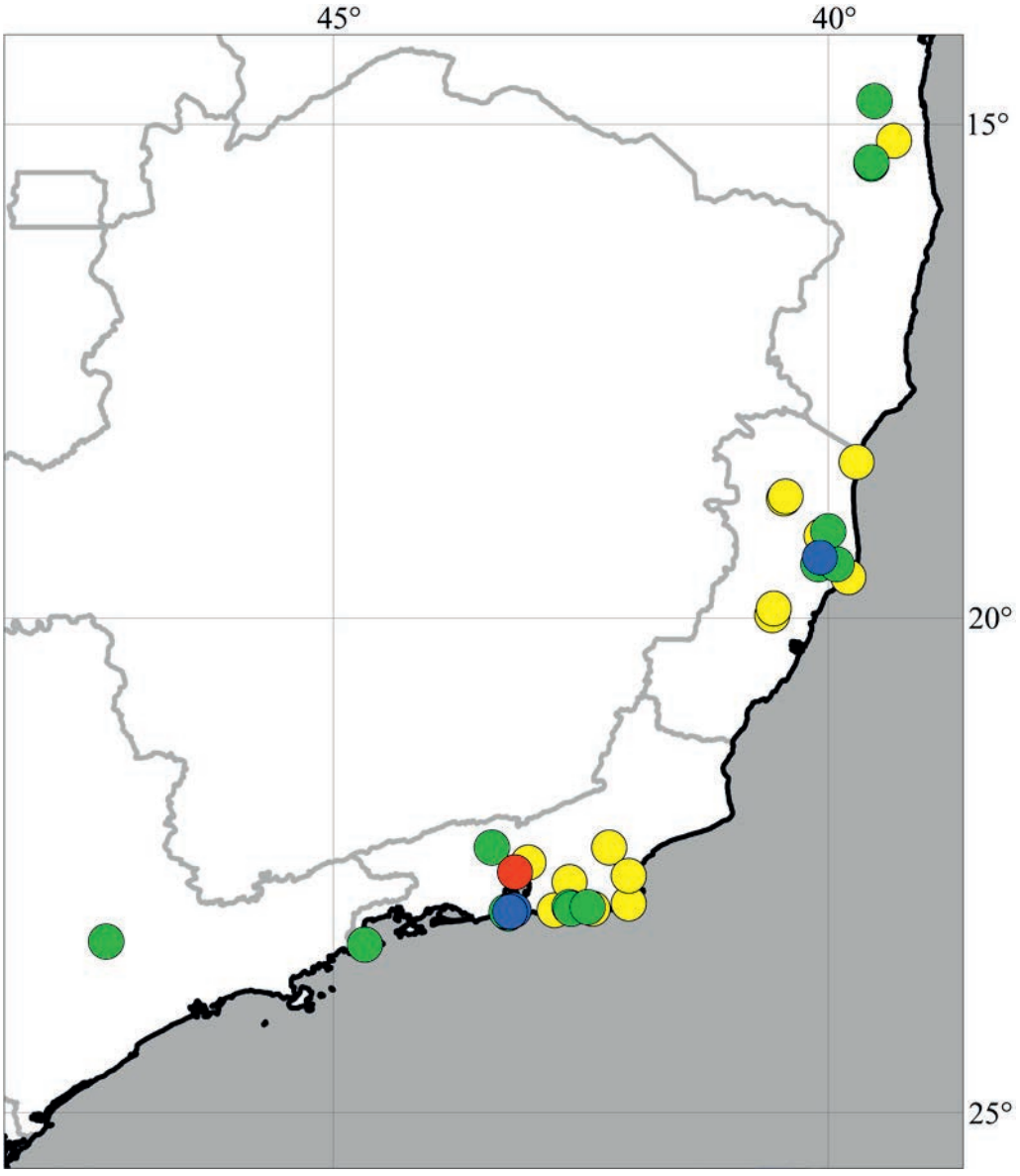

Fig. 5: Distribution of *Diospyros apeibacarpos* (●; type locality: ●; type localities of *D. hilairei* in Espirito Santo, and of *D. weddellii* and *D. janeirensis* in Rio de Janeiro: ●; only digital photos of specimens seen: ●).

the top; the tubercles flatten and finally ± disappear when fruits ripen; older fruits ± glabrescent and smooth (especially in the northern populations), detaching with the calyx; living fruits green, covered with a golden indumentum, later brown when unripe, yellow, yellowish-orange or orange when ripe (according to Araujo & Peixoto 777 black, but probably when old); fruit wall ca. 0.5 mm thick, with tightly adhering epidermis when dry; fruit pulp sweetish; calyx on fruits up to ca. 1.5 cm in diameter, undivided in the

proximal 2 mm, ± covered with withered indumentum; lobes 5–9 mm long, 4–6 mm wide, ± curved downwards, obtuse or ± rounded, with ± revolute margins; area around the sinuses between the calyx lobes inconspicuous; seeds dark brown to brownish-black, shaped like the segments of an orange or rarely like a coffee-bean, 15 mm long, 8 mm wide and 6–7 mm thick.

Note: The species is quite variable: the leaves of the Bahian populations are smaller than those of the southern populations. No specimens with anthetic flowers are available from Bahia (Borges et al. 346 is the only one with young flower buds). Lopes (1999) reported the presence of more than 100 stamens per flower, and Sandwith (1950) noted: "stamina plus quam 100 (an semper?)". More material with flowers is needed for further investigation. – Although morphologically quite similar, *D. apeibacarpos* and *D. capreifolia* can easily be distinguished due to the fact that only the latter displays on abaxial leaf surfaces a layer of characteristic, minute epidermal papillae. Unfortunately, this feature cannot be seen on photos of herbarium sheets (close-up photos are required for this purpose). Leaves with papillae tend, however, to show a slight gray appearance which can be seen on photos of good quality. Unfortunately, the resolution of some photos was quite low, thus slight doubts concerning the identity of a few specimens remained.

Figures: leaves, twigs, flowers, fruits and seeds (Lopes 1999: fig. 1c, 5).

Distribution: The species is known from the Brazilian federal states Espirito Santo, and Rio de Janeiro, as well as from a restricted area in the southeastern part of Bahia (Fig. 5). In the state São Paulo it was collected only once, allegedly near Itú in 1834 (Riedel & Lund 1971). As Santos & Sano (2007) did not report this species for this federal state, its occurrence needs to be confirmed.

Habitat: In Bahia it was collected in the "floresta ombrófila densa montana" (Atlantic forest) at 835–1000 m elevation. – In Espirito Santo it was reported from the "mata ciliar" (Folli 2197, Silva 120), "várzea periodicamente inundável" (Folli 3055, Silva 120, Rolim et al. 2016), "mata atlântica aluvial, mata de cabruca" (Gomes & Valadares 4047), "mata de tabuleiro" (Mello-Silva et al. 1545, 3278, Silva 353, Rolim et al. 2016) and from the "floresta estacional semidecidual" (Fontana et al. 5249, Forzza et al. 5103). – In Rio de Janeiro it occurs in the "floresta pluvial atlântica" (Matheus & Assunção s.n., Lopes 1999, 2001), the "floresta ombrófila densa montana e submontana" (Scarponi et al. 97, Marquete et al. 1151), "floresta de restinga" (Sá & Araujo 2009, Araújo 8611, Lopes 2001), "restinga arbustiva" (Araujo & Peixoto 777), in the "sandy cord plant formation" of the restinga (Matallana et al. 2005), on fixed dunes of the restinga (Lopes 1999) and in the "formação florestal não inundável" of the restinga (Araujo et al. 2009).

Phenology: In Bahia it was collected with very young flower buds in December, and with fruits in January, March, June, August, September and in December. – In Espirito Santo it was found in flower in February and from October to December, and in fruit in January, February, from April to June, August and in October. – In Rio de Janeiro it was reported to be flowering from October to December, and to have fruits from January to April, and from June to September.

Vernacular names: In Espirito Santo it is called "caquí da mata" and "caquí peludo" (Folli 2197), "ébano" (Folli 3055, 5572, Mello-Silva et al. 1545, Silva 120, 353), and in Rio de Janeiro "bacupari-cascudo" (Campos et al. 107, Costa & Costa s.n., Pessoal do

Horto Florestal 206), and "canella limão" (Nunez EFCB 58) [cited as "canela de limão" in CAVALCANTE 1963].

Literature: The specimens Borges et al. 702, Ferreira et al. 1382, and Fiaschi et al. 1826 are cited in AMORIM et al. (2009), and the latter also in COELHO & AMORIM (2014). The species is apparently rare in Bahia: ROCHA & AMORIM (2012) reported only one individual from their five vegetation plots of 0.1 hectare each. – SÁ & ARAUJO (2009) found in vegetation plots in a restinga near Saquarema (state of Rio de Janeiro) only two individuals with a dbh ≥ 5 cm (both with a height of 6–7 m and a diameter of 6.7–8 cm). FERNANDES (2005) listed in 20 plots of 2 × 50 m in the dry restinga forest of Cabo Frio (same state) 12 individuals of *D. janeirensis* with a dbh ≥ 2.5 cm (absolute density: 60 individuals per hectare).

Specimens examined: **Brasil**, Bahia, Barro Preto, Serra da Pedra Lascada, 13,7 km de Barro Preto na estrada que passa pela Fazenda São Miguel e sobe até o acesso à serra, caminhada ao topo da serra, 14°46'13" S, 39°32'10" W, (st, defl. female), 2 Nov. 2003, **P. Fiaschi et al. 1826** [CEPEC n.s. (dig. photo), NY n.s., SPF n.s. (dig. photo), W], "árvore ca. 15 m; frutos amarelos, com sementes envoltas por polpa adocicada"; – Arataca, Serra do Peito-de-Moça/Serra das Lontras, estrada Arataca/Una, ramal 22,4 km de Arataca, assentamento Sto. Antônio, RPPN "Caminho das Pedras", trilha para o pico, após casa do Sr. "Mormaço", 1000 m, 15°10'25" S, 39°20'30" W, floresta ombrófila densa montana, (fr), 22 Sep. 2007, **F.M. Ferreira et al. 1382** [CEPEC n.s. (dig. photo)], "árvore ca. 7 m; folhas levemente discolores; frutos verdes"; – Camacan (= Camacã), RPPN Serra Bonita, 9,7 km de Camacan na estrada para Jacarecí, daí 6 km SW na estrada para a RPPN e Torre da Embratel, 900–1000 m, 15°23'30" S, 39°33'55" W, floresta ombrófila densa montana; interior da mata, (flbuds female, fr), 9 Dec. 2006, **R.A.X. Borges et al. 346** [CEPEC n.s. (dig. photo), HUEFS n.s. (dig. photo), NY n.s., RB n.s. (dig. photo), W], "árvore 12 m; folhas levem discolores; frutos amarelos; sementes de testa marrom"; – same data, except: 835 m, (fr), 23 Jan. 2007, **702** [CEPEC n.s. (dig. photo), NY], "árvore ca. 15 m; folhas discolores, acastanhadas abaxialmente; frutos amarelo-alaranjados"; – same data and coordinates: 850 m, beira da estrada, (fr), 5 Jun. 2006, **M.M.M. Lopes & L.C. de J. Gomes 787** [CEPEC n.s. (dig. photo), NY, SPF n.s. (dig. photo)], "árvore ca. 15 m; folhas membranáceas, discolores; frutos imaturos verde-escuros"; – same area: Trilha do Mirante, 850 m, (fr), 11 Aug. 2006, **M.M.M. Lopes et al. 1032** [CEPEC n.s. (dig. photo), NY (+ carp.), HUEFS n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore ca. 15 m; folhas levemente discolores; frutos imaturos verde-escuros"; – same area: 10 km W [NW!] de Camacan na estrada para Jacarecí, 6 km SW na estrada para a RPPN e Torre de transmissão, trilha de acesso à RPPN, 850 m, 15°23'35" S, 39°33'53" W, floresta ombrófila densa montana, (fr), 25 Mar. 2007, **A.M. Amorim et al. 6959** [CEPEC n.s. (dig. photo), NY, RB n.s. (dig. photo)], "arvoreta ca. 6 m; frutos verdes".

Espirito Santo, Conceição da Barra, Itaúnas, área atrás da fazenda Jequitaia, [ca. 18°25' S, 39°43' W], mata de restinga sobre cordão arenoso próximo de uma área entre cordões dominada por *Montrichardia*, (fr), 5 Feb. 2010, **A.G. Oliveira et al. 757** [SAMES n.s. (dig. photo), VIES n.s.], "árvore 8 m"; – Nova Venécia, Serra de Baixo, Área de Proteção Ambiental da Pedra do Elefante, 313 m, 18°46'37" S, 40°26'38" W, floresta estacional semidecidual, (fr), 19 Feb. 2008, **R.C. Forzza et al. 5103** [CEPEC n.s., MBM n.s. (dig. photo), MBML n.s. (dig. photo), RB n.s. (dig. photo), SP n.s., UPCB n.s.], "árvore ca. 8 m; frutos verdes com tricomas dourados"; – same area: estrada para Pedra do Elefante, 329 m, 18°46' S, 40°26' W, floresta estacional semidecidual, (fr), 10 May 2008, **A.P. Fontana et al. 5249** [CEPEC n.s., MBM n.s. (dig. photo), MBML n.s. (dig. photo), RB n.s. (dig. photo), UPCB n.s. (dig. photo)], "árvore ca. 6 m; frutos verdes"; – Linhares, Reserva Natural Vale (Reserva Natural da CVRD [= Companhia Vale do Rio Doce]), estrada Aceiro com Bragato, ao lado do aceiro, Córrego Tamanduá, [ca. 19°7' S, 40°0' W], mata ciliar, (fr), 31 Jan. 1994, **D.A. Folli 2197** [CVRD n.s. (dig. photo), W 3×], "arbor 4 m; fuste 2 m, cilíndrico; CAP do fuste 32 cm; diâmetro da copa 3 m; casca áspera; descamação ausente; exsudação: seiva, incolor; fruto imaturo verde escuro, maduro amarelo"; – same area and coordinates: estrada Peroba Amarela, km 0,8, várzea periodicamente inundável, (fr), 17 Jun. 1997, **D.A. Folli 3055** [CVRD n.s. (dig. photo), W 2×], "árvore 6 m; fuste 4 m, cilíndrico; CAP do fuste 45 cm; diâmetro da copa 3 m; casca áspera; descamação ausente; exsudação: seiva, incolor; fruto imaturo verde, maduro amarelo"; – same area: estrada Flamengo, km 0,4, área plantada, (fr), 9 May 2007, **D.A. Folli 5572** [CVRD n.s., SPF n.s. (dig. photo), W], "árvore 6 m; fuste 2 m, cilíndrico; CAP fuste 40 cm; diâmetro da copa 3 m; casca áspera; exsudação: seiva, incolor; fruto imaturo

verde, maduro amarelo"; – same area: estrada Farinha Seca, km 1,1, na mata de tabuleiro, (fl male), 9 Feb. 1999, **R. Mello-Silva et al. 1545** [CVRD n.s. (dig. photo), K n.s., RB n.s. (dig. photo), SP n.s., SPF n.s. (dig. photo), W 2×], "arvoreta ca. 7 m, flexuosa; DAP 10 cm, CAP 19 cm; fuste 3 m, cilíndrico; diâmetro da copa 1,5 m; folhas discolores, verde-escuro na face adaxial; botão verde; cálice verde; corola alva e androceu creme; flor odorífera"; – same area: estrada Farinha Seca, ant. 221, km 4,604, lado direito, floresta alta; mata de tabuleiro, (fl male), 20 Oct. 1982, **I.A. Silva 353** [FHO 2×, MG n.s. (dig. photo), SPF n.s. (dig. photo), W], "árvore 7 m; fuste 5 m, cilíndrico; CAP fuste 28,27 cm; DAP 9 cm; diâmetro da copa 3 m; casca áspera; descamação em placas; exsudação: seiva, incolor; botão verde; flor branca"; – same area: estrada Jacarandá, ant. 232, km 3,050, lado direito, ao lado de um Genipapo do brejo no centro da várzea, mata ciliar, (fl male), 19 Nov. 1979, **I.A. Silva 120 [120/79]** [CVRD n.s., MG, SPF n.s. (dig. photo), W], "árvore 7 m; fuste 4 m, cilíndrico; CAP fuste 40,8 cm; DAP 13 cm; diâmetro da copa 5 m; casca áspera; descamação em placas; exsudação: seiva, incolor; botão e flor creme"; – Linhares, Reserva Natural Vale, 48 m, 19°9'43.6" S, 40°4'23.2" W, na orla da mata de tabuleiro, (fl male), 2 Dec. 2010, **R. Mello-Silva et al. 3278** [CEPEC n.s., RB n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore ca. 7 m; folhas dísticas, discolores, verde-escuro na face adaxial; flor perfumada; cálice verde-claro; corola e androceu alvos"; – Mun. de Linhares, km 15 da rodovia Linhares para Povoação, [19°27' S, 39°55' W], mata, (fl male), 27 Nov. 1973, **R.S. Pinheiro & T.S. dos Santos 2315** [CEPEC n.s. (dig. photo), FHO, MG], "árvore 5 m; flores brancas, perfumadas, com cálices verdes"; – km 8 da rodovia Linhares/Vitória, [19°27' S, 40°6' W], (fl female), 23 Nov. 1973, **R.S. Pinheiro & T.S. dos Santos 2269** [CEPEC n.s. (dig. photo), FHO, MG], "árvore 10 m × 20 cm; flores brancas, perfumadas, com cálices verdes"; – Delta do Rio Doce, [ca. 19°35' S, 39°48' W], mata atlântica aluvial, mata de cabruca, (fr), 14 Apr. 2014, **J.M.L. Gomes & R.T. Valadares 4047** [VIES n.s. (dig. photo)], "planta 6 m"; – Município de Santa Teresa, Nova Lombardia, Reserva Biológica Augusto Ruschi, 850 m, [19°54' S, 40°33' W], meia encosta; dossel 15 m, (fr), 1 Oct. 2002, **R.R. Vervloet et al. 1111** [MBML n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore 15 m; sépalas de cor verde; frutos redondos de cor verde com pétalas amarelas"; – Mun. Santa Teresa, Valsugana Velha, propriedade Ebi José Bringhenth, [19°58' S, 40°34' W], interior de mata, (fr), 8 Aug. 2000, **V. Demuner et al. 1355** [MBML n.s. (dig. photo)], "árvore 17 m, DAP 25 cm; fuste 9 m; frutos imaturos pilosos de cor verde".

Rio de Janeiro, Avelar, mata do Dr. Antonio V. de Avellar, [22°19' S, 43°24' W], (flbuds), 1931, **G.M. Nunez EFCB 58** [MG n.s. (dig. photo), R]; – Serra dos Orgãos próximo ao Morro Garrafão, 600 m, [22°28' S, 43°2' W], mata primaria; loco úmido, (fr), Sep. 1974, **P. Occhioni 6097** [RFA 2× n.s. (dig. photos)], "arvoreta; fruto maduro"; – Macaé, Conglomerado 202-1-2-14, Conglomerado situado na localidade do Sana/São Bento, 700 m, UTM 23K, 787416mE, 7529093mN [ca. 22°19' S, 42°13' W], floresta ombrófila densa montana, secundária; mata perturbada com presença de cultivos de banana, café e limão; relevo montanhoso; solo argiloso, (fr), 20 Aug. 2014, **T.M. Scarponi et al. 97** [RB n.s. (dig. photo)], "árvore 7,2 m; casca internamente amarela com borda laranja, externamente preta e verde, fina, áspera; base reta; fruto imaturo, arredondado; polpa branca; semente amarela, externamente verde"; – Município de Rio Bonito, Reserva Botânica das Aguas Claras, Rio Bonito, ca. 70 m, [ca. 22°40' S, 42°37' W], (fr), 23 Mar. 1992, **D. Sucre & G. Guala 11420** [RB n.s. (dig. photo)], "árvore umbrófila ca. 4,5 m; frutos ainda verdes"; – Município de Cabo Frio, Segundo Distrito (Tamoios), Parque Ecológico Municipal do Mico Leão Dourado, 22°36'21" S, 42°1'3" W, floresta de restinga, (st), 17 Aug. 2003, **D. Fernandes et al. 960** [RB n.s. (dig. photo)], "árvore 6 m, DAP 4 cm" [see Fernandes 2005]; – same data: (fl male), 23 Oct. 2003, **797** [RB n.s. (dig. photo)], "árvore; folhas verdes escuras discolores; botões com cálice com pelos pardacentos e corola com pelos alvos"; – same area: floresta secundária de restinga, impactada por loteamentos e mineração de areia, (fl male), 28 Nov. 2003, **D. da S. Fernandes et al. 806** [K n.s., MBM n.s., RB n.s. (dig. photo), SP n.s.], "folhas verdes escuras discolores; flores pardas [old?]"; – Mata dos Paineiros [=Paineiras]/Corcovado/Río, [ca. 22°57' S, 43°13' W], (fl female), 17 Nov. 1927, **Pessoal do Horto Florestal (Anterior) 206** [RB n.s. (dig. photo)], "árvore 10–12 m; flores amarelada, odorífera"; – Mundo Novo, Botafogo, [ca. 22°57' S, 43°11' W], (fl female, fr, st), 13 Oct. 1920, 11 Nov. 1920, 21 Dec. 1920, 11 Nov. 1921, **J.G. Kuhlmann 507** [B (destroyed), F (fragm. ex B), MG n.s. (dig. photo), NY, RB 4×, carp. at U]; – Município de Rio de Janeiro (antiga Guanabara), Vista Chinesa, [22°58' S, 43°15' W], matas, (fr), 14 Feb. 1954, **A.P. Duarte & C. de Almeida 3670** [FHO (fragm.), MG n.s. (dig. photo), RB 2× n.s. (dig. photos), W]; – Arboreto do Jardim Botânico do Rio de Janeiro, seção IX, canteiro D, [22°58' S, 43°13' W], cultivada, (fr), 4 Jun. 1999, **M.D. Campos et al. 107** [RB n.s. (+ carp., dig. photos)], "árvore; folhas cartáceas, discolores, verdes; frutos imaturos marrons, indeiscentes, pilosos"; – same place: seção IX, cant. D, pia: 4, (fl female, yfr), 18 Dec. 1984, **I.R.C. & R.C.C. [= I.R. Costa & R.C. Costa] s.n.** [RB n.s. (dig. photo)], "árvore; flor amarela; fruto verde"; – same place: canteiro 9E, cultivada, (fl female, yfr), 18 Nov. 1999, **M.D. Campos et al. 165**

[RB n.s. (dig. photo)], "árvore; folhas cartáceas, discolores, verdes; cálice esverdeado; pétalas amarelo-pálido"; – same place: cult., (fr), 17 Jan. 1942, **J.G. Kuhlmann carp. 3238** [RB n.s. (dig. photo)]; – Rio de Janeiro, Horto Florestal [now part of the Jardim Botânico], rumo vertentes do morro, [22°58' S, 43°13' W], (fl male), 1 Nov. 1927, **Pessoal do Horto Florestal 207** [RB 2× n.s. (dig. photo), W], "árvore 5–8 m; flor alva odorífera"; – same place: (fr), 1963, **N. dos Santos s.n. (RB carp. 3103)** [RB n.s. (dig. photo)]; – Mun. Rio de Janeiro, Gávea, parque da cidade, [22°59' S, 43°14' W], floresta pluvial atlântica, (fr), Jul. 2002, **R. Matheus & J.M. Assunção s.n.** [RB n.s. (dig. photo)]; – Dois Irmãos [= Pico Dois Irmãos], [22°59' S, 43°14' W], (st), 26 Sep. 1946, **A.P. Duarte 328** [RB 2×]; – "environs of Rio Janeiro", (fl male), 1878–1879, **A.F.M. Glaziou 10227** [paratypes of *D. janeirensis*: C (pro parte), K], [GLAZIOU (1905–1913) specifies for this collection number: "Barbacena, Queluz, Serra do Cipó, Minas"; compare WURDACK 1970]; – same area: (fl female), 1882, **A.F.M. Glaziou 14058 (leg. F. Allemão s.n.)** [paratypes of *D. janeirensis*: C, K, P], [an additional label on the specimen in P is obviously from Allemão and says: "*Diospyros penduliflora* n.; arbor alta, fructus echinatus, non edulis"]; – on the label in BM: "arbre des forêts de Rio Janeiro", (fl female, yfr), 1860, **F. Allemão s.n.** [paratypes of *D. janeirensis*: BM, G-DC, RB n.s. (dig. photo)], [the label in G-DC says: "*Diospyros penduliflorum* (n.), arbor primarium sylvarum: materies alba inusitata, fructus orbicularis echinatus, non edulis"]; – perto de Maricá, Lagoa do Padre, [22°57' S, 42°46' W], restinga arbustiva, (galled), 8 Sep. 1975, **D. Araujo & A.L. Peixoto 777** [RB n.s. (dig. photo)], "arbusto de caule muito ramificado, semi-umbrófilo; frutos pretos"; – Município de Saquarema, Jaconé, Sambaqui de Jaconé, [ca. 22°55' S, 42°37' W], floresta de restinga; na sub-mata, (fr), 5 Apr. 2000, **C. Farney [= C.F.C. de Sá] & B.C. Kurtz 4043** [RB n.s. (dig. photo), W], "arvoreta 4 m; folhas verdes, discolores; frutos imaturos verdes"; – Saquarema, ARIE Formigueiro do Litoral e adjacências, restinga de Jaconé, 22°55'54" S, 42°36'10" W, cresc. no interior da ARIE, porção norte; solo areno-argiloso, (fr), 30 Jul. 2016, **C.D.M. Ferreira & T.B.S. Patusco 306** [RB n.s. (dig. photo), W], "arvoreta 4 m, semi-heliófila; folhas discolores; frutos de coloração laranja, com 6 sementes de testa de coloração negra"; – Reserva Ecológica Estadual de Jacarepiá, Restinga de Ipitangas, [22°55' S, 42°26' W], mata de restinga, (fr), 25 Jun. 1992 (RB-label: "25 /IV/1992"), **C. Farney [= C.F.C. de Sá] & J. Caruso Gomes 3141** [F n.s., MBM, K n.s., R, RB n.s. (dig. photo)], "arvoreta 5 m; folhas verdes discolores; frutos imaturos verdes", [cited in ARAUJO et al. 2009]; – same area: 22°7' S, 42°3' W [correct is 22°55' S, 42°26' W], mata de restinga, (st), 23 Jul. 1990, **C. Farney [= C.F.C. de Sá] 3195** [RB n.s. (dig. photo)], "árvore 7 m; CAP 25; CAS 18", [cited in SÁ & ARAUJO 2009]; – Mun. Saquarema, Comoros da Lagoa Vermelha, [22°56' S, 42°23' W], mata de restinga, (flbuds male), 20 Oct. 1988, **D. Araujo 8611** [GUA n.s., RB n.s. (dig. photo)], "arbusto ca. 2,5 m, umbrófilo; botões ainda imaturos"; – Restinga de Cabo Frio, [22°53' S, 42°1' W], (flbuds), 19 Sep. 1968, **D. Sucre 3728** [RB n.s. (dig. photo)], "árvore ca. 5 m"; – Paraty [= Parati], Área de Proteção Ambiental do Cairuçu, Morro do Carrapato, atrás do Sitio da D. Nadú, acesso pela Rio-Santos, lado direito em direção à São Paulo, 165 m, [ca. 23°18' S, 44°41' W], (fr), 17 Mar. 1993, **E.A. Filho et al. 144** [RB 2× n.s. (dig. photos), W], "árvore 27 m; folhas verdes, discolores; fruto imaturo ferrugíneo"; – ca. 16 km do Trevo de Parati, entrada a direita da Rio-Santos antes da ponte na mata próxima ao córrego dos Micos, 320 m, [ca. 23°18' S, 44°41' W], floresta ombrófila densa submontana; solo argiloso-arenoso; relevo íngreme, (fr), 1 Jul. 1993, **R. Marquete et al. 1151** [CEPEC n.s. (dig. photo), MBM n.s. (dig. photo), MG n.s. (dig. photo), RB 3× n.s. (+ carp., dig. photos)], "árvore ca. 18 m, heliófila; troncos com casca lisa e de cor acinzentada; frutos carnosos, indeiscentes, jovens de cor verde"; – illegible, (fr), 1844, **Mendanha s.n.** [R].

São Paulo, opp. Itú (mun. São Paulo), [23°16' S, 47°18' W], (st), Feb. 1834, **L. Riedel & P.W. Lund 1971** [NY].

Key for the *Diospyros brasiliensis* group

1 Corolla tube of male and female flowers on the outside medium densely to densely covered with at first white and then grayish-brown or light brown, appressed hairs nearly to the base; enlarged sinuses between the calyx lobes on female flowers and fruits ± densely covered with ± patent, at first white and then light brown or brown hairs inside; occurring in Espirito Santo and in the southern part of Bahia ..... *D. impia*

1* Corolla tube of male and female flowers with a different indumentum (see below); enlarged sinuses between the calyx lobes on female flowers and fruits glabrous or scattered hairy inside (hairs if present then always light brown) 2

2 Corolla tube on the outside glabrous except for small clusters of small, appressed hairs distally near the median line of the lobes; sinuses between the calyx lobes on female flowers and fruits markedly expanded, ± scattered hairy inside; stalks of the male flowers 6–7 mm long (Fig. 7a); stalks of the female flowers and fruits (5–) 6–8 (–10) mm long; ripening fruits clearly stalked (Fig. 7c–f); occurring in Rio de Janeiro and São Paulo ..... *D. brasiliensis*

2* Corolla tube on the outside medium densely covered with hairs distally, ± scattered hairy at the middle and glabrous proximally; sinuses between the calyx lobes on female flowers and fruits strongly bloated, glabrous inside; stalks of the male flowers usually less than ca. 3 mm long (Fig. 11a); stalks of the female flowers and fruits usually less than 3 (–4) mm long; ripening fruits ± sessile (Fig. 11e, 13a–b); occurring in Suriname, French Guiana, and from Rondônia to Amapá in Brazil ..... *D. tetrandra*

***Diospyros brasiliensis* Mart. ex Miq.**, Fl. Bras. (Martius) 7 (17): 5, tab. 2, fig. 2 (1856); – [Fig. 6–8].

Protologue: "crescit in mediterraneis Brasiliae: Pohl".

Typus: Brasil, without full data, (fl female), s.d. (1817–1821), **J.B.E. Pohl 4568** [holotype: M (Fig. 6), isotypes: G 2×, OXF, W 2×].

Note: One of the two isotypes in W was later erroneously attributed to the collector Schott.

– *"Diospyros ebenaster"* pro parte, sensu Hiern (1873), Cavalcante (1963), and Lopes (1999).
Note: The illegitimate name *D. ebenaster* Retz. had been applied by Hiern (1873) to four species: the Sri Lankan *D. ebenum* J.König ex Retz., the Central American *D. nigra* (J.F.Gmel.) Perr. [= *D. digyna* Jacq., regarding this name change see Turner 2013], the Antillean *D. revoluta*, and the Brazilian *D. brasiliensis* Mart. ex Miq. Scott (1915) discussed all the existing literature concerning *"D. ebenaster"*, but he did not become aware of the confusion of species. He came to the conclusion that *"D. ebenaster"* is a native plant of the West Indies. It was, however, Howard (1961) who realized the mix-up of species and who disentangled at least the first three of them. In a later paper he made important typifications (Howard & Norlindh 1962).

Treelet or tree up to 15 m tall, with a diameter up to ca. 20 cm, already flowering when ca. 3 m tall, evergreen; dead bark dark gray, brownish or blackish, smooth or with superficial fissures and living bark cream or greenish-yellow (Farias et al. 311, Marquete 1610, Marquete et al. 967, Reis et al. 128); twig apices and leaf primordia densely covered with ± appressed, ± straight, light hairs of different length; young twigs terete, smooth, soon glabrescent, green when alive; older twigs with ± elliptic or longitudinal lenticels often resembling short cracks and with raised scars of petioles; – **leaves** alternate; petioles 8–14 mm long, 1–2 mm thick, glabrous, ± canaliculate adaxially; leaf lamina elliptic or broadly lanceolate, rarely ± oblong, (2.5–) 10–20 (–26.5) cm long, (1–) 5–10 cm wide, (1.6–) 2–3.2 times as long as wide, widest ± at or slightly below or above the middle, chartaceous to firmly chartaceous; adaxial leaf surface glabrous (also when very young), gray to greenish-gray and slightly shiny when dry, dark green when alive; abaxial leaf surface glabrous (scattered and appressed hairy when very young), gray to

Fig. 6: Holotype of *Diospyros brasiliensis* MART. ex MIQ. [M].

brown and dull when dry (very young leaves drying black), lighter green when alive; leaf apex acute, less frequently obtuse or acuminate, sometimes rounded; base of the lamina cuneate or rarely ± rounded; leaf margins entire, with a slightly thickened but flattened border, slightly revolute especially at the base; flachnectaria on the abaxial leaf surface up to 5 (–15), round or oval, up to 0.6 mm in diameter, arranged especially on the proximal third of the leaves; midvein on the adaxial side proximally sunken but well visible, flat distally, on abaxial side markedly prominent; secondary veins 8–10 per side, slightly raised and not much thicker than the higher order veins adaxially, prominent abaxially; veins of higher order ± prominent on both sides, but those of fourth and fifth order often hardly visible abaxially; – **inflorescences**: cymes placed in the axil of new mature leaves up to the apex of the twigs (rarely in the axil of caducous bracts or small leaves proximally); male cymes 1–3-flowered, at the base often with additional cymes (thus inflorescences with up to 10 or more flowers; Fig. 7a); stalks (peduncles and pedicels) up to 6–7 mm long and 0.8 mm thick, ± scattered hairy; pedicels of the lateral flowers up to 5 mm long, 0.8 mm thick; female cymes 1-flowered, sometimes at the base with up to 4, additional (lateral) cymes (Fig. 7c); stalks (peduncles and pedicels) (5–) 6–8 (–10) mm long and 1.5–2 mm thick, much enlarged distally, scattered to medium densely covered with ± appressed, straight to slightly flexuose hairs of different length; pedicels up to 5 mm long; bracteoles up to 1.5–2 mm long and 1–2 mm wide, ± triangular, acute or obtuse, medium densely hairy abaxially, glabrous adaxially; – **flowers** usually 4-merous (one male flower bud with 3, a few more with 5 calyx lobes); **male flowers** (Wittig in Herb. Glaziou 7746 and Glaziou 16243, Fig. 7a–b) 7–8 mm long at anthesis (pedicels excluded, and when corolla lobes reflexed); calyx 3–4 mm long, 5–6 mm wide, undivided in the proximal 1.5–2 mm, on the adaxial side glabrous, on the abaxial side with ± scattered, appressed, ± straight, short hairs; calyx lobes 1.5–2.8 mm long, 2.5–4 mm wide, triangular, with a tuft of hairs at the apex; sinuses between the calyx lobes inconspicuous or slightly expanded (Wittig in Herb. Glaziou 7746) and forming a narrow, brim-like, slightly hairy step which tapers into the apices of the lobes; corolla 6–7 mm long at anthesis (when lobes reflexed), green or greenish-cream when alive; corolla tube ca. 6–7 mm long, widest below the middle and there ca. 3 mm in diameter, glabrous on the outside except for clusters of small, appressed hairs distally near the median line of the lobes, glabrous inside; throat narrowed into a ca. 1 mm wide pore; corolla lobes 3 mm long and 3–4 mm wide, widest ± at the middle, broadly rounded distally, glabrous on both sides; stamens 13 (Wittig in Herb. Glaziou 7746) or 16 (Glaziou 16243) per flower, a few ± paired, up to 3.5 mm long in bud; filaments up to 1 mm long, glabrous, adnate to the corolla tube near its base; anthers 1.5–2.5 mm long, at the base 0.3–0.5 mm wide; connectives on both sides densely hairy or less densely or glabrous adaxially, with conical, glabrous, ca. 0.2 mm long apices; rudiment of the ovary ± globose, ca. 1.5 mm in diameter, densely covered with spreading hairs; **female flowers** (Pohl 4568, Giordano et al. 1822, Fig. 7c–d) 8–9 mm long at anthesis (when corolla lobes reflexed and with pedicels excluded); calyx 7 mm long and 13 mm wide, undivided in the proximal 4 mm, on the outside at the base medium densely to densely covered with ± appressed, straight or slightly flexuose hairs of different length, scattered hairy around the median line of lobes, ± glabrous on the other parts, on the inside medium densely hairy at the base and around the median line of the lobes and scattered hairy elsewhere (same sort of hairs); calyx lobes 6 mm long, ca. 10 mm wide near the base, ± acute; sinuses between the calyx lobes markedly expanded and bloated out- and downwards, scattered hairy inside;

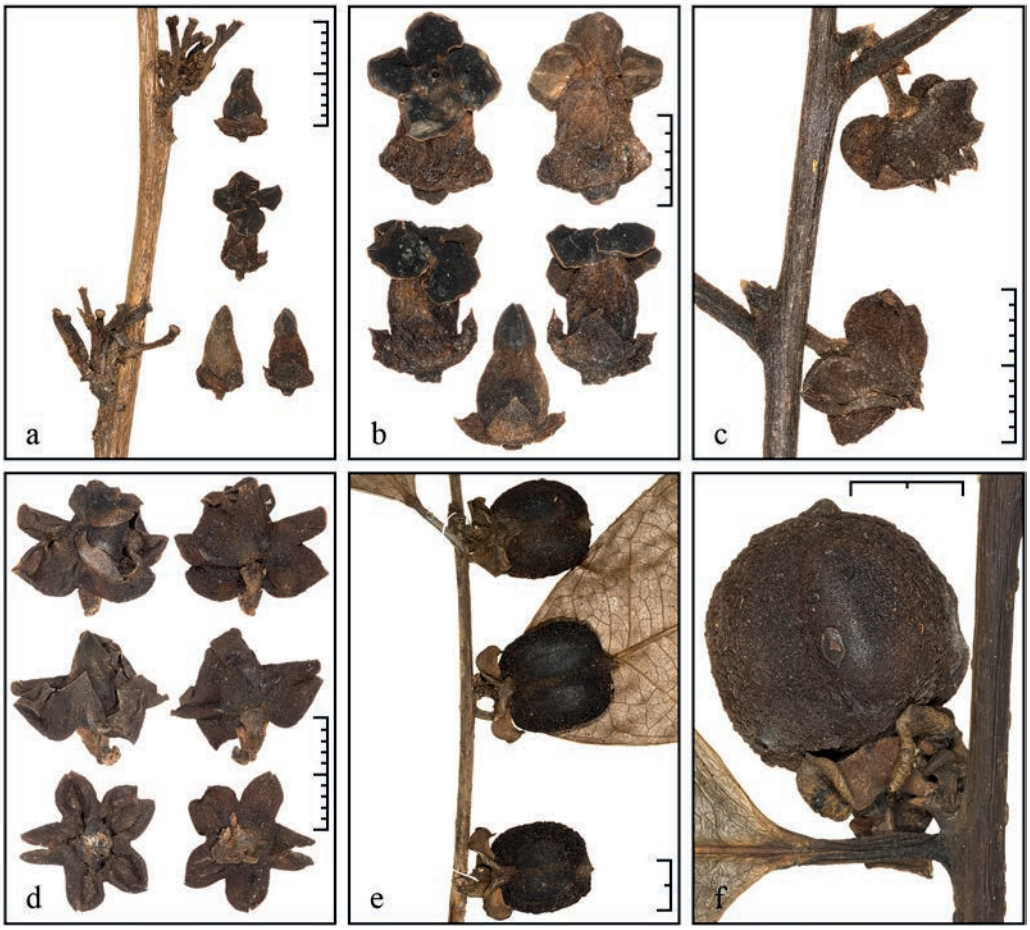

Fig. 7: *Diospyros brasiliensis*: a: male inflorescences (from Glaziou 7746 [P]); – b: male flowers (from Glaziou 7746 [C]); – c: female inflorescences (from Pohl 4568, isotype [W]); – d: female flowers (from Giordano et al. 1822 [RB]); – e: fruits (from Marquete et al. 967 [RB]); – f: fruit (from Marquete 1610 [RB]); – scale = 1 cm, except in b: 0.5 cm.

corolla ca. 8 mm long, green, light green or white when alive; corolla tube ca. 4 mm long, 4–5 mm wide, glabrous on the outside except for clusters of small, appressed hairs distally near the median line of the lobes, glabrous inside; throat narrowed into a ca. 1 mm wide pore; corolla lobes 4 mm long, 4 mm wide, obtuse or rounded, glabrous on both sides; staminodia 8 (in both collections), 3.5–4 mm long, glabrous, adnate to the corolla tube ca. 1 mm above its base; filaments 2–2.5 mm long, ca. 0.2 mm wide; antherodes narrowly triangular or lanceolate, 1.5–2 mm long, ca. 0.3 mm wide, acute, with light margins; connectives glabrous; ovary 4-carpellate and 8-locular, 5 mm long (including stylodia), 3 mm wide, gradually narrowed into the stylodia, densely covered with appressed to slightly spreading, long hairs; stylodia 4, ca. 2 mm long, fused together near the base, densely hairy abaxially; stigmata widened distally, glabrous adaxially and distally; – stalk of the **fruits** (5–) 6–8 (–10) mm long, 2 mm thick, distally enlarged,

scattered to medium densely hairy; fruits (Fig. 7e–f) usually up to 8-seeded, ± globose, up to 3 cm in diameter, with remnants of indumentum especially around the apex and base when young, glabrescent when mature, with tightly adhering epidermis when dry, detaching with the calyx; living fruits green or light green when young, black and very soft when mature (as can be seen on Giordano et al. 1648); fruit wall ca. 1 mm thick, very hard when immature, consisting of stone cells; fruit pulp sweetish and dark yellow (Ribeiro & al. 295); calyx on the fruits up to ca. 2 cm in diameter and 0.7–1 cm in height, green when alive, covered with remnants of indumentum on both sides (see female flower); lobes ± acute, with markedly expanded margins; area around the sinuses between the calyx lobes markedly expanded and bloated out- and downwards, up to ca. 1 cm deep; seeds (Glaziou 16243 in C) brown, bean-shaped, 2.1 cm long, 1 cm wide and 0.7 cm thick (those of Giordano et al. 1648 are slightly smaller but not well visible in the squashed mature fruits), finely striate and uneven (similar to Fig. 11f).

Note: The species is closely related to *D. tetrandra*. During the current study only the two collections Glaziou 7746 and Glaziou 16243 with male flowers were physically available for study. From the other collections with male flowers (see "specimens examined") I have seen only digital photos. Especially the collection Neto & Silva 304 displays fine flowers and inflorescences. – Lopes (1999) treated the species under the invalid name *"D. ebenaster"* and gave a wrong interpretation of the inflorescences. Due to the fact that no specimens with male flowers were available to her for study, she misinterpreted the staminodia of the female flowers. As the antherodes of the staminodia are quite large and possess a light border, they can be confused with stamens. This is the reason why she assumed the flowers of this species to be monoclinous (hermaphroditic).

Many reports in literature are based on obvious misidentifications, and stem often from areas where *D. brasiliensis* does not occur. Several of them seem to apply to the variable and widespread *D. lasiocalyx* (= *D. hispida*). Only those which are plausible or documented with vouchers are mentioned here.

Figures: twig with female flowers (Miquel 1856); twig, leaf venation, female flowers, fruit, seeds (Lopes 1999: 90, figure 1a, 94, figure 3); twig with fruits, male flower bud, color photo of a fruit (Santos & Sano 2007: 197, prancha 1A–B, 12C). – The color photo of *"D. brasiliensis"* shown in Lorenzi (1998, 2002) is based on a misidentification and represents *D. lasiocalyx*, an error which apparently led to wrong identifications in many subsequent floristic studies.

Distribution: The species is only known from the states Rio de Janeiro, and São Paulo in southeastern Brazil (Fig. 8). It was found from near sea level up to an elevation of 330 m. – According to Santos & Sano (2007), it occurs in the coastal area of Rio de Janeiro, São Paulo and Paraná. However, no collection is known to me from the latter state.

Phenology: The species was collected in flower in April and from August to October, and in fruit from October to April. According to Santos & Sano (2007), it was found in São Paulo in flower from October to January and in May, and with fruits from January to August.

Habitat: *D. brasiliensis* was collected in Atlantic rainforests on slopes with sandy-loamy soil, in riverine forests, on humid places with muddy soil (with a high content of organic matter), in the coastal restinga forests, and sometimes also in deteriorated or secondary forests. Several collectors found it in the understory of forests. Oliveira et al. 3672

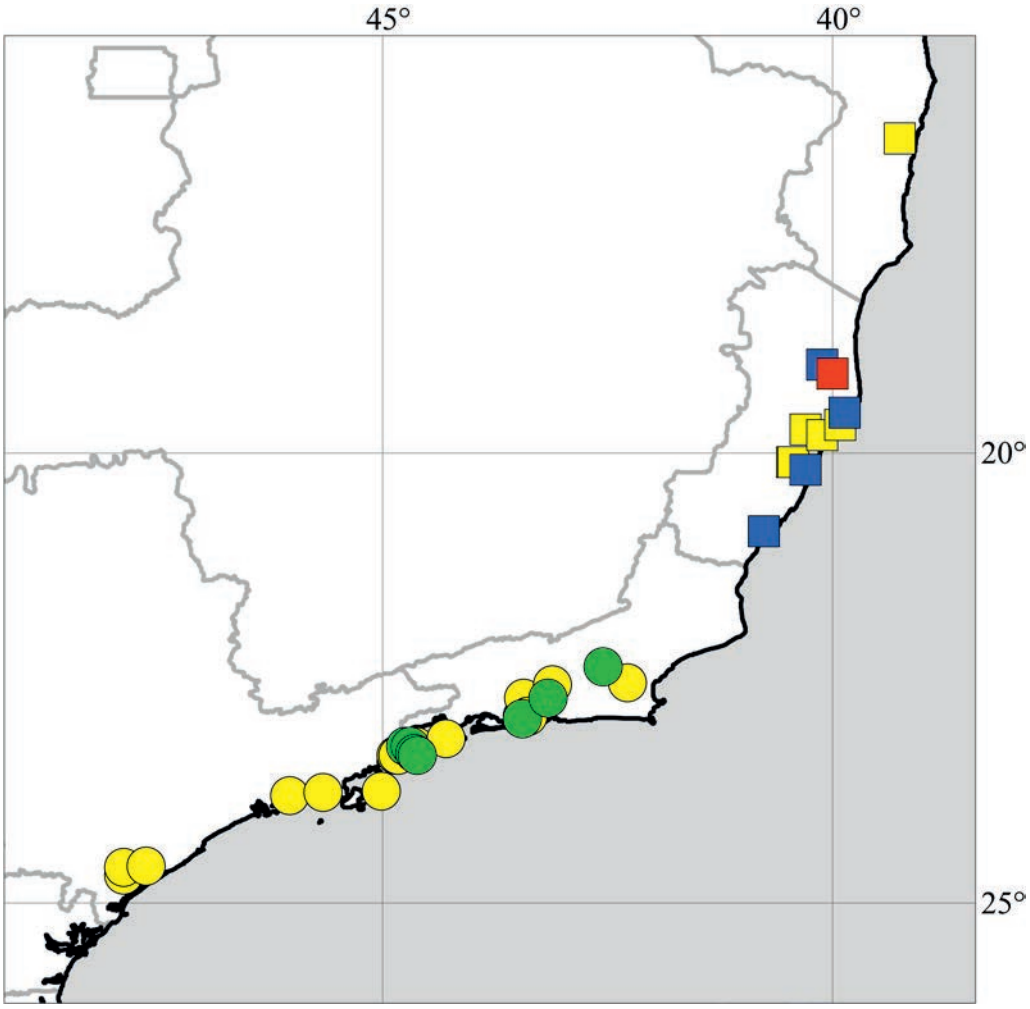

Fig. 8: Distribution of *Diospyros brasiliensis* (●; only digital photos of specimens seen: ●); – *D. impia* (■; type locality: ■; only digital photos of specimens seen: ■).

reported it from the "caixetal", a pioneer formation which occurs in temporarily or permanently flooded areas (várzeas) and which is dominated by the caixeta tree (*Tabebuia cassinoides*, Bignoniaceae).

According to SANTOS & SANO (2007), it grows in São Paulo state in lower-montane and riparian forests of the mata atlântica and in the coastal restinga. It is a member of the biome "floresta ombrófila densa/aberta" (SANTOS & SANO 2009, BARBOSA & MARTINS ca. 2006).

In the restinga near Bertioga (São Paulo) it is a component of the sub-canopy and grows in depressions which are flooded during the rainy season (MARTINS et al. 2008). It was reported (PANSONATO et al. 2019) to be the most abundant species in a periodically flooded restinga forest fragment on the sandy coastal plain of Caraguatatuba (São

Paulo). An average of 573.44 individuals per hectare (13.80 % of all individuals) with a dbh ≥ 1 cm were registered in the study site. 309.38 (19.13 %) of them had a dbh ≥ 4.8 cm, and 188.75 (23.82 %) a dbh ≥ 10 cm. The dispersal of the seeds was studied by Zimback (2017) in the same forest fragment.

Vernacular names: In São Paulo it is called "caqui-do-mato" (Barbosa & Martins ca. 2006), and "louro" due to its resemblance with some Lauraceae (Catharino & Jaramilho 340).

Biology and seed dispersal: According to Dietz et al. (1997), the fruits of *D. hispida* (= *D. lasiocalyx*) are eaten in the "Reserva Biológica Poço das Antas" (Rio de Janeiro state) by the Golden Lion Tamarins (*Leontopithecus rosalia*). As *D. lasiocalyx* was neither reported from nor collected in the area, the species could represent in reality *D. brasiliensis* which does occur there (see "specimens examined"). As the mature fruits are black, bats could be the main seed dispersers, but this needs to be confirmed (see for this topic Lobova et al. 2009). – An unknown Curculionidae (beetle) was observed to cause thickened involutions on the leaves in the restinga near Bertioga in São Paulo state (Maia et al. 2008, 2014; Maia 2013).

Specimens examined: **Brasil**, Rio de Janeiro, Serra de Nova Friburgo à Boca do Matto, [ca. 22°22' S, 42°33' W], sous-bois, (fl male), 7 Nov. 1885, **A.F.M. Glaziou 16243** [BR, C, G 2×, LE n.s., NY, P 2×], "petit arbre; fl. verdâtres"; – Município de Silva Jardim, Reserva Biológica Poço das Antas, estrada do Aristides, após a 2a porteira, área FP006, 22°30–33' S, 42°15–19' W, (fr), 1 Sep. 1994, **D.S. Farias et al. 311** [RB n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore ca. 13 m, 59 cm de CAP e 6 m de fuste; ritidoma pardo-acinz., áspero, com fissuras muito superficiais; casca viva creme, tornando-se parda ao ar.; fruto grande, esférico, imaturo verde"; – same area and coordinates: Rebio Poço das Antas, Trilha do Oco Data Pod., (fr), 25 Jul. 1994, **C. Luchiari et al. 466** [RB n.s. (dig. photo)], "árvore 15 m, semi-sombreada; folha discolor, face superior verde escuro, face inferior verde; fruto imaturo verde"; – Município de Magé, Distrito de Piabetá, estrada do Matão, 280 m, 22°34'8" S, 43°7'18" W, mata ciliar sobre solo arenoso/argiloso, (fr), 14 Jan. 2001, **A. Quinet 27/64** [RFA 2× n.s. (dig. photos)], "árvore 2 m, 27 [?] cm de DAP, comum no local; folha discolor verde; fruto imaturos verdes com cálice verde"; – Nova Iguaçu, estrada para Boa Esperança, [22°43' S, 43°26' W], (fl male), 5 Oct. 1993, **S.J.S. Neto & W. da Silva 304** [CEPEC n.s. (dig. photo), NY n.s. (dig. photo), RB 2× n.s. (dig. photos), RBR n.s.], "arbusto ca. 4 m, tombado, ciófilo; folhas breve discolores subcoriáceas; frutos imaturos verde-claros"; – Mauá, [22°43' S, 43°10' W], (fl male), 15 Nov. 1874, **Wittig in Herb. A.F.M. Glaziou 7746** [C, K, P 2×], (according to Glaziou 1905–1913: "arbre; flores verdâtres"); – Município do Rio de Janeiro, Jacarépagua/Santa Maria, caminho do Rio Pequeno, 150 m, 22°55'22" S, 43°26'62" W [22°55' S, 43°27' W], mata de encosta sobre solo argiloso/arenoso, (fr), 1 Apr. 2001, **A. Quinet 13/83** [RFA 2× n.s. (dig. photos)], "árvore 2,5 m, 34 [?] cm de DAP, comum no local; folha discolor verde; fruto imaturo verde"; – Estr. Pau da Fome, Jacarepaguá, Maciço da Pedra Branca, Reserva I.B.D.F., Flr. R. Grande, [22°55' S, 43°27' W], (fr), 29 Aug. 1977, **I.A. Rodrigues et al. 122** [RB n.s. (dig. photo)], "árvore de pequeno porte; frutos maduros negros"; – Taquara Jacarepaguá, 150 m, 22°55'21" S, 43°22'60" W [22°55' S, 43°23' W], mata de encosta sobre solo arenoso/argiloso, (fr), 3 Jul. 2000, **A. Quinet 350 (26/18)** [RFA 2× n.s. (dig. photos)], "arbusto 3 m, DAP 12 [?] cm, comum no local; folha discolor verde; fruto imaturo verde"; – Jacarepaguà, represa do Camorin [= Camorim], [22°57' S, 43°27' W], floresta atlântica de encosta, (st: female), 19 Jan. 1987, **A. Peixoto et al. 3987** [MO], "árvore DAP 9,5, transect 1"; – Município de Angra dos Reis, matas de encosta, [ca. 23°10' S, 44°18' W], (st), 2002, **M.A. Louzada et al. 1** [RFA n.s. (dig. photo)]; – Mun. de Paraty [= Parati], Morro do Corisco, subindo o Rio Corisco, 330 m, [23°15' S, 44°45' W], floresta ombrófila densa submontana degradada, ripária em ambiente úmido; relevo íngreme, (fr), 29 Apr. 1993, **R. Marquete et al. 967** [K n.s., R, RB 2×], "árvore ca. 12 m, ciófila; tronco com casca lisa; ramos verdes; folhas coriáceas, discolores verdes; frutos de cor verde clara com cálice verde"; – Mun. de Parati, nas redondezas da ponte do Rio dos Meros, APA [= Área de Proteção Ambiental] Cairuçu, 50 m, [23°15' S, 44°42' W], veg. riparia em terreno rochoso, (fr), 11 Jun. 1994, **L.C. Giordano et al. 1648** [K n.s., F n.s., R, RB 2×], "árvore ca. 6 m, semi-heliófila; caule direcionado para um dos lados; folhas cartáceas, discolores; frutos imaturos verde-escuros e maduros nigrescentes; exsudato vinoso-nigrescente; cálice verde-claro" (this, and some of the following collections are cited in Marques 1997); – same area: nas proximidades da ponte, 70

m, [23°15' S, 44°42' W], em rochedo, (fl female), 29 Nov. 1994, **L.C. Giordano et al. 1822** [K n.s., F n.s., MBM n.s., MG n.s. (dig. photo), R, RB 2×], "arvoreta heliófila, com tronco tombado para um lado; folhas cartáceas, discolores; flores verde-claras"; – some locality: em afloramento rochoso; margem da queda d'água, (fl female), 5 Dec. 1995, **L.C. Giordano et al. 2091** [CEPEC n.s. (dig. photo), F n.s., K n.s., MBM n.s. (dig. photo), RB n.s. (dig. photo), W], "arvoreta inclinada para o lado da cascata, semi-ciófila a heliófila; folhas cartáceas, discolores; flores alvas"; – same area: (defl female), 30 Aug. 1994, **L.C. Giordano s.n.** [K n.s., R, RB 2× n.s. (dig. photos)]; – Município de Parati, Paratymirim, picada da costeira em direção a Mamanguá, 30 m, 23°14'35" S, 44°38'4" W, (fr), 23 May 2001, **G. Martinelli & M. Nadruz 15949** [RB n.s. (dig. photo)], "arvoreta 5 m, ciófila; folhas concolores; frutos imaturos de cor verde; cálice de cor verde"; – Município de Parati, Área de Proteção Ambiental do Cairuçu, Laranjeiras, entre o primeiro e o segundo portão, rumo a Praia do Sono, [23°20' S, 44°39' W], na mata, (fr), 18 Oct. 1990, **K.C.F. Frutuoso et al. 100** [K n.s., RB n.s. (dig. photo), W], "árvore ca. 8 m; folhas coriáceas; frutos amarronzados, cilíndricos"; – same area: caminho para a Praia do Sono (após a 1º porteira), 200 m, [ca. 23°20' S, 44°39' W], mata secundária; relevo plano, (fr), 11 Apr. 1991, **L.C. Giordano et al. 1029** [RB n.s. (dig. photo)], "árvore ca. 8 m, heliófila; folhas coriáceas, verdes discolores; frutos verdes"; – caminho para a praia do Sono, 80–100 m, [23°20' S, 44°39' W], mata; ambiente úmido, (fr), 12 May 1994, **R. Reis et al. 128** [F n.s., K n.s., MBM, R, RB 2× n.s. (dig. photos)], "árvore ca. 7 m, semi-ciófila; tronco com casca lisa; folhas coriáceas verdes discolores; cálice verde; fruto globoso verde"; – Mun. de Parati, APA-Cairuçu, Trilha Ponta Negra, Praia dos Antigos, [23°21' S, 44°37' W], (fr), 13 Apr. 1994, **R. Marquete 1610** [F n.s., K n.s., R, RB 2× (+ carp.)], "árvore ca. 8 m, semi-ciófila; tronco com casca lisa, amarronzada; córtex verde-amarelado; folhas coriáceas discolores verdes; frutos da cor verde"; – same area: Morro da Várzea, acesso pela praia Negra, ca. 150 m, [ca. 23°21' S, 44°37' W], mata, (fr), 24 Mar. 1992, **M.C. Marques et al. 298** [RB n.s. (dig. photo)], "arvoreta; folhas discolores, coriáceas; frutos verde-claros, globosos, lisos" (cited in MARQUES 1997).

São Paulo, Município de Ubatuba, Parque Estadual da Serra do Mar, Núcleo Picinguaba, trilha próxima ao alojamento de pesquisadores, 33 m, 23°21'0" S, 44°51'0" W, sub-bosque na borda da trilha, (fr), 5 Mar. 2012, **M.F. Santos et al. 838** [RB n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore 4 m; ramo verde; folha com domácias (pontos-escuros) na face abaxial; cálice e fruto imaturo verdes"; – same locality: trilha atrás do alojamento, (fl male), 4 Nov. 1988, **A. Furlan et al. 536** [HRCB n.s. (dig. photo), SPF n.s. (dig. photo)], "arvoreta 6 m; botões verdes com apice crema"; – same locality: restinga próximo da mata atlântica, (fr), 3 Jun. 1988, **J.E.L.S. Ribeiro et al. 295** [HRCB n.s. (dig. photo)], "árvore 8 m; frutos imaturos verde-claros e quando maduros verde oliva escuro com sépalas verdes; polpa adocicada e amarelo-escura; semente castanha"; – same area: Trilha Praia Brava, [ca. 23°21' S, 44°51' W], (yfr), 13 Jan. 1993, **M.A. de Assis 87** [HRCB n.s. (dig. photo)], "árvore 8 m; frutos imaturos verdes com cálice da mesma cor", (cited in ASSIS 1999); – same area: trilha das 3 Lagoas, [ca. 23°21' S, 44°51' W], (flbuds female), 6 Nov. 1988, **A. Furlan et al. 602** [HRCB n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore 12 m; flores jovens verdes"; – same area: trilha do Morro do Corsario, [23°21' S, 44°51' W], (fl male), 7 Nov. 1988, **A. Furlan et al. 640** [HRCB n.s. (dig. photo), SPF 2× n.s. (dig. photo)], "árvore 9 m; flores verdes"; – same area: trilha da Casa da Farinha, 23°21'0.95 S, 44°51'10.04 W, transição entre planície e encosta atlântica, (fr), 30 Jan. 1996, **H.F. Leitão Filho et al. 34714** [ESA n.s. (dig. photo), SP n.s. (dig. photo), UEC n.s. (dig. photo)], "árvore 3 m; frutos imaturos"; – same locality: (fl female), 10 Dec. 1989, **A. Furlan et al. 1106** [HRCB n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore 6 m; flores femininas verdes"; – same locality: restinga; em beira de córrego, (fr), 9 Apr. 1988, **A. Furlan et al. 419** [HRCB n.s. (dig. photo), SPF 2× n.s. (dig. photo)], "árvore 5 m; frutos verdes imaturos"; – same locality: (fl male), 11 Nov. 1989, **A. Furlan et al. 908** [HRCB n.s. (dig. photo), SPF 2× n.s. (dig. photo)], "arvoreta 4 m; flores verdes"; – same locality: (fl male), 3 Dec. 1988, **F.C.P. Garcia et al. 246** [HRCB n.s. (dig. photo), SPF 2× n.s. (dig. photos)], "arbusto 3 m; flores verdes com limbo branco"; – same area: trilha do Corisco, [23°21' S, 44°51' W], (fl male), 9 Nov. 1993, **M.T. Toniato et al. 29268** [SPF n.s. (dig. photo), UEC n.s. (dig. photo)], "árvore 4 m; flores masculinas esverdeadas"; – Núcleo de Picinguaba (sede), 23°21' S, 44°50' W, (fl male), 13 Nov. 1993, **E.C. Leite et al. 30169** [SP n.s. (dig. photo), UEC n.s. (dig. photo)], "árvore 4 m; flores esverdeadas"; – Ilha Vitória, litoral norte, [23°45' S, 45°1' W], mata de encosta, (fr), 30 Mar. 1965, **J.C. Gomes 2659** [SP n.s., SPF 2× n.s. (dig. photos)], "árvore ca. 5 m, pouco frequente"; – Município de São Sebastião, praia da Baleia, R. Olavo Pazzanesi, 100 m da antiga Rio-Santos, remanescente margeando loteamentos, 10 m, 23°46'27.7" S, 45°39'54.3" W, floresta de restinga; caixetal [a pioneer formation], com perturbação; interior da mata, (fl male), 23 Apr. 2000, **A.A. Oliveira et al. 3672** [ESA n.s. (dig. photo), SPSF n.s., UEC n.s. (dig. photo)], "árvore ca. 4 m"; – Município de Bertioga, São Lourenço, rod. SP-55, km 211,5, Fazenda da Família Pinto, [23°48' S, 46°2' W], floresta de restinga paludosa sobre solo turfoso alta, (fl male), 17 Nov. 1998, **L. Rossi et al. 2022** [SPF n.s. (dig. photo)], "arvoreta

5 m; flores creme-esverdeadas"; – same locality: sub-bosque; floresta de restinga paludosa turfosa, (fl male), 11 Nov. 1999, **S.E. Martins & P.S.P. Sampaio 584** [SPF n.s. (dig. photo)], "árvore 6 m; flores creme esverdeadas"; – same locality: floresta paludosa sobre substrato turfoso alta, (fr), 1 Jun. 2000, **P.S.P. Sampaio & S.E. Martins 488** [SPF n.s. (dig. photo)], "árvore 5 m; frutos negros maduros"; – Município de Iguape, Peropava, Fazenda Boa Vista, 24°34–36' S, 47°37–40' W, (fl male), 13 Jun. 1986, **E.L.M. Catharino 824** [ESA n.s. (dig. photo)], "árvore; flores verdes"; – same locality: (fr), 16 . 1985, **E.L.M. Catharino & C.B.J. Jaramilho 340** [ESA n.s. (dig. photo)], "árvore; frutos imaturos, verdes; polpa amarela com oxidação quase imediatos"; – Município de Pariquera-Açu, Estação Experimental do Instituto Agronômico, 24°36'30" S, 47°52'37" W, floresta atlântica, (st), 23 Nov. 1995, **N.M. Ivanauskas 908f** [ESA n.s. (dig. photo)], "árvore 8,5 m"; – propriedade de Antonio Povinski, 24°40'33" S, 47°52'37" W, floresta atlântica, (fl male), 22 Nov. 1995, **N.M. Ivanauskas 1102** [ESA 2× n.s. (dig. photos), FUEL n.s., HUEFS n.s. (dig. photo), MBM n.s. (dig. photo), PEL n.s., UEC n.s.], "árvore de 11 m"; – without locality, (fr), 1814–1817, **J. Bowie & A. Cunningham 24** [BM].

***Diospyros impia* B.Wallln., sp.n.**; – [Fig. 8–10].

Typus: Brasil, Espirito Santo, Linhares, Reserva Natural Vale, estrada Farinha Seca, km 4,2, RFL-001/80 E-1, [ca. 19°7' S, 40°0' W], mata de tabuleiro, (fl female), 6 Dec. 2004, **D.A. Folli 5000** [holotype: W (Fig. 9, 10c–d), isotypes: CVRD n.s. (dig. photo), RFA n.s. (dig. photo), SPF n.s. (dig. photo), W], "árvore 5 m; fuste 3 m, cilíndrico; CAP fuste 24 cm; casca áspera; diâmetro da copa 3 m; descamação ausente; exsudação: seiva, incolor; cor botão: marrom; cor flor: alaranjada" [flower bud brown, flower orange colored]; – the label in CVRD states however the contrary: "cor do botão: alaranjado; cor da flor: marrom"; vernacular name: pindaíba pião.

Treelet or tree up to 6 m tall, already flowering when 2.5 m tall, evergreen; twig apices and leaf primordia densely covered with appressed, ± straight, light hairs; young twigs terete, ± smooth, soon glabrescent; – **leaves** alternate; petioles 10–15 (–17) mm long, 1.5–2 (–3) mm thick, glabrous, canaliculate adaxially; leaf lamina oblong to broadly lanceolate, (9–) 15–23 cm long, (2.5–) 5–8 cm wide, 2.3–4.6 times as long as wide, widest ± at or slightly above the middle, chartaceous, glabrous, slightly shiny or dull on both sides when dry; adaxial leaf surface often greenish-gray when dry; leaf apex acute or obtuse; base of the lamina cuneate; leaf margins entire, with a slightly thickened but flattened border, slightly revolute especially proximally; flachnectaria few, round or elliptic, up to 0.5 mm in diameter, arranged especially on the proximal third and near the base on the abaxial leaf surface; midvein on the adaxial side proximally sunken but well visible, ± flat distally, on the abaxial side markedly prominent; secondary veins ca. 12 per side, slightly raised adaxially, prominent abaxially; veins of higher order slightly raised on both sides, but those of fourth and fifth order often hardly visible abaxially; – **inflorescences**: male cymes (Santos et al. 36) placed in the axil of caducous bracts near the base of new shoots, 1 (–3?)-flowered, at their base with additional cymes (thus inflorescences condensed and with several to many flowers; Fig. 10a); stalks (peduncles and pedicels) up to 1–2 mm long and ca. 0.8 mm thick, densely hairy; female cymes (Folli 5000) placed in the axil of mature leaves along new shoots, 1-flowered, often at the base with 2, additional (lateral) cymes (Fig. 10c); stalks (peduncles and pedicels) 2–3 mm long and ca. 1.5 mm thick, densely hairy; bracteoles of both sexes ca. 2 mm long and wide, ± triangular, ± obtuse, ± densely covered with appressed hairs abaxially, glabrous adaxially; – **flowers** (3–) 4 (–5)-merous; **male flower** buds 7 mm long (pedicels excluded, and

Fig. 9: Holotype of *Diospyros impia* B.WALLN. [W].

corolla lobes erect), green when alive (Santos et al. 36, Fig. 10a–b); calyx 4 mm long, 5 mm wide, undivided in the proximal ca. 2 mm, on the outside scattered to medium densely covered with appressed, ± straight hairs of different length, on the inside glabrous except at the base and the margins of the lobes; some calyces with longitudinal ridges running down from the sinuses abaxially when dry; calyx lobes 1.5–2 mm long, 3 mm wide, triangular, acute; sinuses between the calyx lobes slightly expanded and forming a narrow brim-like, densely hairy step which tapers into the apices of the lobes; corolla at anthesis not available; corolla tube ca. 4 mm long in bud, widest ± at the middle and there ca. 2 mm in diameter, covered with a dense layer of appressed, short, at first white and then grayish-brown or light brown hairs nearly to the base on the outside, glabrous inside; throat probably narrowed into a small pore (as on female flowers); corolla lobes glabrous on both sides; stamens 13, free, 2–2.5 mm long in bud; filaments ca. 0.5 mm long, adnate to the corolla tube near its base, glabrous; anthers ca. 1.5 mm long in bud; connectives with appressed hairs only abaxially or on both sides, sometimes completely glabrous, tapering into a 0.5 mm long, ± conical apex; rudiment of the ovary very small, densely covered with erect, light hairs; **female flowers** (Folli 5000, Fig. 10c–d) 9 mm long at anthesis (when lobes reflexed and with pedicels excluded); calyx 7 mm long and ca. 14 mm wide, undivided in the proximal ca. 3 mm, on the outside with ± scattered, ± straight, short hairs of different length (at the base and along the median line of the lobes denser hairy), on the inside (including the expanded sinuses) densely covered with at first white and then light brown, ± patent, ± flexuose hairs; calyx lobes broadly triangular or sometimes even slightly semicircular, 8 mm long, ca. 7 mm wide, acute, obtuse or sometimes nearly rounded; sinuses between the calyx lobes markedly expanded and bloated out- and downwards, 3.5 mm wide, tapering into the apex of the calyx lobes; corolla 8 mm long (when lobes reflexed), glabrous adaxially; flower bud or corolla orange colored (Folli 5000, see above under the type); corolla tube 7 mm long, ca. 5 mm wide, widest ± at the middle, densely covered with appressed, at first white and then grayish-brown or light brown, ± straight hairs nearly to the base on the outside; throat narrowed into a ca. 1 mm wide pore; corolla lobes 4 mm long, 4 mm wide, obtuse, glabrous on both sides; staminodia 8 (–10), 3–4 mm long, adnate to the corolla tube 0.5–0.8 mm above its base; filaments 2–3 mm long, ca. 0.2 mm wide, glabrous; antherodes narrowly triangular, 0.8–1 mm long, 0.3 mm wide, acute, with light margins; connectives with appressed hairs abaxially; ovary 5 mm long (including the stylodia), 2.5 mm wide, gradually narrowed into the stylodia, densely covered with appressed, long hairs; stylodia 4 (–5), 2 mm long, free nearly to their base, densely hairy abaxially, glabrous adaxially; stigmata widened distally; – stalk of the **fruits** up to 3 mm long, ca. 2 mm thick, distally enlarged, ± densely hairy; fruits (Fig. 10e–f) ± globose or oblate, up to 3 cm in diameter (Sucre 5653), with remnants of indumentum especially around the apex and the base when still immature, with tightly adhering epidermis when dry, detaching with the calyx; living fruits green when unripe, black or vine-red when mature (according to Sucre 5653 and Demuner et al. 2868, respectively); calyx on the fruits up to ca. 2 cm in diameter and ca. 1.4 cm in height, green when alive (Sucre 5653), on the outside with slightly raised veins and covered with remnants of indumentum, on the inside densely covered with light brown or brown, straight or slightly flexuose, ± spreading hairs of different length (see female flower); lobes ± acute, with markedly expanded margins; area around the sinuses between the calyx lobes markedly expanded and bloated out- and downwards; seeds brown (Sucre 5653), not available for study.

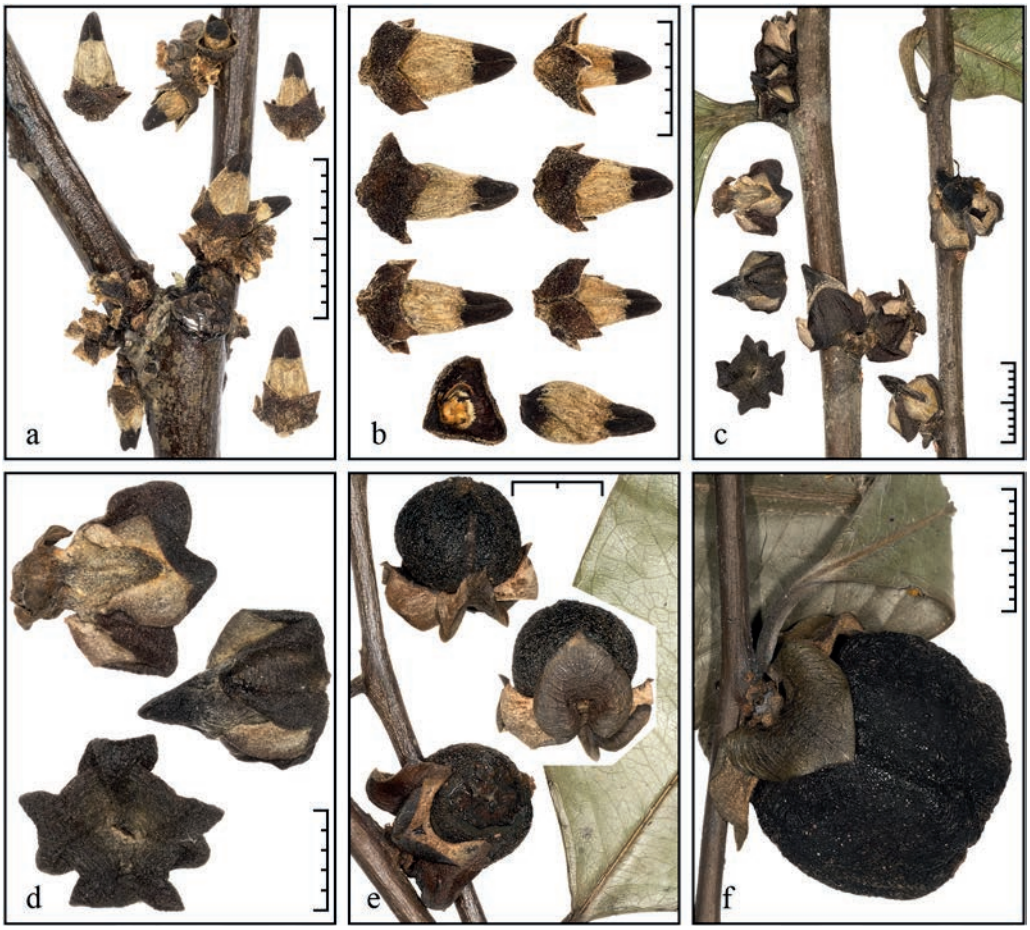

Fig. 10: *Diospyros impia*: a–b: male inflorescences and flowers (from Santos et al. 36 [W]); – c–d: female inflorescences and flowers (from Folli 5000, holo- and isotype [W]); – e: fruits (from Siqueira 154 [W]); – f: fruit (from Fiaschi et al. 279 [W]); – scale = 1 cm, except in b and d: 0.5 cm.

Distribution, habitat and phenology: The species is known from Espirito Santo and from the southern part of Bahia in eastern Brazil (Fig. 8). From the latter region I have seen so far only two digital photos of one collection which was gathered in the "Parque Nacional do Pau-Brasil" near Porto Seguro. More collections from this area are needed for study. – In Espirito Santo it was collected in woods and especially in the "mata de tabuleiro" (a special type of semideciduous forest, see ROLIM et al. 2016). Some collections are from periodically inundated forests: "várzea periodicamente inundável" (Siqueira 154), "mata alagadiça de palmito" (Sucre 5653), "igapó" (Kuhlmann 235). Two collections were gathered in the coastal "restinga forest": "floresta de restinga holocênica sobre cordões arenosos" (Jesus et al. 26) and "restinga, mata seca" (Pereira et al. 3378). – The species was collected at elevations up to 300 (–500) m. – It was found in flower in October, and in December, and in fruit from January to July, in October and in December.

Vernacular name: In Espirito Santo it is called "pindaíba pião" (Folli 5000, Folli 7231, Siqueira 154).

Literature: The species is listed under the name "*D. brasiliensis*" in Rolim et al. (2016) and is indicated for the tabuleiro and várzea forests. Moreau (2014) studied a forest fragment near Aracruz and observed 15 individuals of *"D. brasiliensis"* in 6 transects. According to Magnago (2013), its wood density is 0.573 g/cm^3.

Specimens examined: **Brasil**, Espirito Santo, Reserva de Sooretama, Macuco, [ca. 19°1' S, 40°7' W], mata alagadiça de palmito, (fr), 16 Jul. 1969, **D. Sucre 5653** [RB n.s. (dig. photo), W], "árvore ca. 5,5 m, umbrófila; cálice verde e bagas pretas (3 cm diâmetro); sementes de cor castanha"; – Linhares, Reserva Natural Vale, estrada Gávea, km 7, RFL-001/80 bloco D Trat. 1, [ca. 19°7' S, 40°0' W], mata de tabuleiro (on W-label: "várzea periodicamente inundável"), (fr), 12 Jan. 2004, **G.S. Siqueira 154** [CVRD n.s. (dig. photo), RFA n.s. (dig. photo), W 2×], "árvore 4 m; fuste 1,5 m, cilíndrico; CAP fuste 18 cm; casca áspera; diâmetro da copa 2 m; descamação ausente; exsudação: seiva, incolor; fruto imaturo verde"; – Linhares, Reserva Natural Vale, Regência, estrada Lagoa Parda, [ca. 19°7' S, 40°0' W], mata de tabuleiro, (fr), 26 Jun. 2014, **D.A. Folli 7231** [CVRD n.s. (dig. photo), RB n.s. (dig. photo)], "árvore 6 m; fuste 4 m; CAP do fuste 23 cm; diâmetro da copa 1 m; exsudação seiva, incolor; fruto imaturo verde"; – Rio Doce, Três Ilhas, [ca. 19°33' S, 39°52' W], igapó; mata, (fr), 20 Apr. 1934, **J.G. Kuhlmann 235** [MG, RB n.s. (dig. photo)], "árvore 3–5 m"; – Linhares, Reserva Biológica de Comboios, 19,6765° S, 39,9164° W [19°41' S, 39°55' W], floresta de restinga holocênica sobre cordões arenosos na zona de amortecimento da Rebio de Comboios, (fr), 27 Jun. 2014, **L.M. Jesus et al. 26** [SAMES n.s. (dig. photo), VIES n.s. (dig. photo)], "arbusto 2,5 m"; – Município de Aracruz, Retiro, 40.2733° W [coordinates partly covered on photo, ca. 19°44' S, 40°18' W], restinga, mata seca, (fr), 5 May 1992, **O.J. Pereira et al. 3378** [VIES 2× n.s. (dig. photos)], "planta 6 m; fruto verde"; – Aracruz, área da Fibria Celulose S.A., área 1, transecto 6, parcela 20, indivíduo 19, 19º48'8" S, 40º7'26" W, (fr), 21 Feb. 2013, **J.S. Moreau 46** [VIES n.s. (dig. photo)], "fruto verde arredondado e liso"; – Município de Santa Leopoldina, Colina Verde (Morro do Agudo), propr. Israel Elias Ramos (lado esquerdo da casa), 200–500 m, 20°6'11.4" S, 40°26'54" W, interior da mata, (fr), 30 Jun. 2006, **V. Demuner et al. 2543** [MBML n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore 5 m; frutos verdes"; – same locality and data except for: trilha da casa, 150–250 m, 20°6'28" S, 40°26'32" W, (fr), 29 May 2007, **V. Demuner et al. 4067** [MBML n.s. (dig. photo), SPF n.s. (dig. photo)], "arbusto 3 m; frutos verdes"; – same data: propr. Dona Maria, 150–300 m, 20°5'38" S, 40°25'56" W, interior da mata, (fr), 15 Mar. 2007, **V. Demuner et al. 3217** [MBML n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore 5 m; frutos verdes"; – same data: 150–350 m, 20°5'38" S, 40°25'54" W, mata em fundo de vale, (fr), 14 Sep. 2006, **V. Demuner et al. 2868** [MBML n.s. (dig. photo)], "arbusto 3 m; frutos maduros vináceos"; – same locality: (fr), 18 May 2006, **L.F.S. Magnago et al. 1032** [MBML n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore 5 m; frutos verdes"; – Mun. da Serra, Mestre Álvaro, vertente sudeste, próximo a Furnas, acesso pelo Bairro Jardim Tropical, 190 m, 20°10'52.3" S, 40°18'20.9" W, interior da mata, (fr), 7 Jan. 2010, **A.M. Vago et al. 25** [MBML n.s. (dig. photo), W], "arbusto 2,5 m; frutos verdes"; – same locality but: 180 m, 20°10'55.3" S, 40°18'16.9" W, (fr), 1 Jul. 2010, **B.H. Menezes et al. 10** [MBML n.s. (dig. photo)], "arbusto 4 m; frutos verdes"; – same locality: 80 m, 20°11'10.2" S, 40°18'23.8" W, (fl male), 8 Oct. 2010, **R. Santos et al. 36** [MBML n.s. (dig. photo), W], "arbusto 4 m; flores jovens verdes"; – Mun. Piúma, rodovia de Piúma para Itapemirim, na base do Morro do Aghá, Fazenda Aghá Grande, ca. 20°52' S, 40°46' W, no interior da mata com afloramentos graníticos, (fr), 19 May 2000, **P. Fiaschi et al. 279** [RB n.s. (dig. photo), SPF n.s. (dig. photo), W], "arvoreta delicada, ca. 3 m; folhas discolores; frutos imaturos verde claros".

Bahia, Porto Seguro, Parque Nacional do Pau-Brasil, estrada da Harpia, 90 m, 16°30' S, 39°15' W, floresta de tabuleiro; interior da mata, (fr), 12 Oct. 2009, **F.B. Matos et al. 1876** [CEPEC n.s. (dig. photo), RB n.s. (dig. photo)], "árvore ca. 6 m; frutos imaturos verdes".

***Diospyros tetrandra* Hiern**, Trans. Cambridge Philos. Soc. 12 (1): 210, pl. 6 (1873); – non *D. tetrandra* Span. nom. nud. in syn. sub *D. maritima* Blume (see Spanoghe 1841: 336); – [Fig. 11–13].

Protologue: "Guiana, Martin!, Rudge! A.D. [= Anno Domini] 1806, Poiteau!".

Typus: French Guiana (Guyane Française): Cayenne, [ca. 4°56' N, 52°20' W], (fr immature), s.d., **J. Martin s.n.** [lectotype (here selected): K (K000644356)]; – syntypes: Cayenne, (yfr), s.d., **J. Martin s.n.** [K (K000644358)]; – Guiane, (fl female, fr), s.d., **P.A. Poiteau s.n.** [K (K000644359)]; – Guiana, (fr), s.d., **E. Rudge s.n.** (leg. J. Martin) [BM (000512583)].

Possible syntypes: Guiana, s.d., (fl male), **J. Martin s.n.** [BM 2× (000512563, 000511177)]; – Cayenne, s.d., (fl male, yfr), **J. Martin s.n.** [K 4× (K000644354, K000644355, K000644357, + one more), P 2×]; – Cayenne, "il croit dans leur forêts de Kaw" [it grows in their forests of Kaw], s.d., (flbuds male), **J. Martin s.n.** [FI-W 2× (121911, 121926) n.s. (dig. photos)], "arbor mediocris"; – Cayenne, in sylvis, s.d., (flbuds male), **J. Martin s.n.** [G-DC (G00142159)], "arbor mediocris"; – Cayenne, (yfr), 1804, **E. Rudge s.n.** (leg. J. Martin) [BM (000512568)]; – Guyane Française, (fl female, fr), 1819–1821, **P.A. Poiteau s.n.** [G 2×]; – Cayenne, (flbuds female), s.d., **P.A. Poiteau s.n.** [W (1889-116104)].

Note: Very unfortunately the collections of Martin and Poiteau bear very little information (no collection numbers, no or no precise dates of collecting, and no or imprecise localities). It is therefore unknown how many times they collected *D. tetrandra* during their journeys, and thus difficult or impossible to clearly identify the syntype-collections. At least Martin's specimens are heterogeneous because he collected male and female plants. Hiern did most probably not see all the specimens collected by Martin (several of which are kept in K) because some of them may have been filed at his time in different families, e. g. under *Heisteria*, *Maytenus*, and "Violacea". Here only those specimens are regarded as syntypes which bear an annotation made by Hiern. – The two specimens in BM which are attributed to E. Rudge seem to be also from J. Martin (these specimens were among those which were confiscated by the British Navy during the Napoleonic wars; for details see STAFLEU & COWAN 1983: 971 and VEGTER 1983: 795). – WHITE (1981) indicated the "lectotype" to be in P (Paris) without using the words "here selected/designated". Two specimens are present there, but both bear no annotation made by Hiern. It is thus unknown whether or not Hiern saw these two specimens. One of them (specimen at present without bar code) was annotated by White as "? Isotype" and the other (P00721391) just only with the name of the species (both specimens bear a red isotype tag). For all these reasons WHITE's lectotypification is regarded here as invalid (ineffective). – Martin's specimen in K (K000644356) bears on the bottom in the right corner Hiern's annotation (in pencil), and is selected here as the lectotype because the fruit in the middle of the twig is exactly the one illustrated on plate 6f in the protologue. The characteristic shape of the calyx on the fruits is a very distinctive feature for that species. – Photos of the type-specimens in the Kew herbarium can be seen via the K-homepage, as well as via Reflora and JSTOR.

Treelet or tree up to 10 (–20) m tall, with a diameter up to 15 (–35) cm (Irwin et al. 54905: "tree 20 m, 35 cm diam."), already flowering when 2 m tall, evergreen; dead bark greenish-gray or dark gray, scaly, black when old; living bark and wood yellow when alive; twig apices and leaf primordia densely covered with appressed, straight, light hairs; young twigs terete, smooth, glabrescent, green when alive, blackish brown when dry; older twigs with longitudinal cracks (resembling lenticels); – **leaves** alternate; petioles 5–10 (–14) mm long, 1.5 mm thick, glabrous when mature, canaliculate adaxially; leaf lamina elliptic or broadly lanceolate, frequently also ± oblong, (3.5–) 10–20 (–27) cm

Fig. 11: *Diospyros tetrandra*: a: male inflorescence and flowers (from Irwin et al. 54905 [US]); – b: male flowers (from Maguire 24742 [W]); – c: female inflorescences (from Silva & Rosário 4827 [NY]); – d: young fruits (from Berg & Henderson BG 475 [F]); – e: fruits (from Prévost et al. 4713 [W]); – f: surface of a seed, magnification 60 × (from Irwin et al. 47339 [NY]); – scale = 1 cm, except in b: 0.5 cm.

long, (1.8–) 5–9 (–11) cm wide, (1.4–) 2–3 (–3.4) times as long as wide, widest ± at or slightly above the middle, chartaceous, glabrous on both surfaces when mature (sometimes with very scattered, appressed, short hairs when young), slightly shiny adaxially, dull abaxially when dry, discolorous, dark green adaxially when alive; leaf apex acute to acuminate, often with a drip tip, less frequently obtuse; base of the lamina cuneate; leaf margins entire, slightly revolute when dry, with a flattened, inconspicuously thickened border; flachnectaria few to up to ca. 20 on the abaxial leaf surface, rarely a few also on the adaxial surface (e. g., Acevedo & Grimes 4802 in NY, or even on the calyx: Vieira et al. 348), round or oval, 0.1–0.5 (–1) mm in diameter, arranged near the base of the lamina and in the vicinity of the midvein; midvein deeply sunken and sometimes hardly visible adaxially, markedly prominent abaxially; secondary veins ca. 10 per side, ± curved,

slightly raised adaxially, prominent abaxially; veins of third to fifth order slightly raised adaxially and usually well visible (less visible on old leaves which are often dirty and incrusted with epiphylls), not or only hardly visible abaxially; – **inflorescences**: cymes placed in the axil of leaves nearly up to the distal parts of new shoots (the lowermost in the axil of bracts); male cymes 1–3-flowered, solitary or densely clustered (with up to 20 or more flowers per leaf axil, see Fig. 11a); stalks (peduncles and pedicels) usually less than ca. 3 mm long (Fig. 11a), ± densely covered with ± appressed, brown hairs; pedicels of the lateral flowers 1.5–2 mm long, 1 mm thick; female cymes 1 (–4)-flowered (Fig. 11c; usually only one, rarely two of them developing into fruits); stalks (peduncles and pedicels) usually less than 3 (–4) mm long (Fig. 11c), 1–2 mm thick, ± densely hairy; bracteoles in both sexes 1–1.5 (–2.5) mm long and 0.8–1 mm wide, narrowly lanceolate to ± triangular, ± persistent, glabrous adaxially, ± densely hairy abaxially; – **flowers** 4-merous; **male flowers** 7–8 mm long at anthesis (pedicels excluded, and when corolla lobes reflexed; Fig. 11a–b), in bud green when alive; calyx 2.5–3.5 mm long and 4 mm wide, undivided in the proximal 1.5–2 mm, on the adaxial side glabrous, on the abaxial side with ± scattered, appressed, ± straight, short hairs; calyx lobes 1–2 mm long, 1.5–2 mm wide, triangular, with a tuft of hairs at the apex; sinuses between the calyx lobes inconspicuous; corolla at anthesis 6–7 mm long, glabrous inside, white, pale yellow or yellow when alive; corolla tube 5–6 mm long, 1.5–2 mm wide, ± cylindrical, hairy on the outside only distally (especially around the base of the lobes), greenish on the outside when alive; throat narrowed into a pore; corolla lobes 3 mm long, 2 mm wide, triangular, adaxially glabrous, abaxially medium densely covered with short hairs along the median line and sometimes also nearly up to the margins; stamens 4 (Acevedo-Rodriguez et al. 5849, Irwin et al. 54905, Maguire 24742, Zaandam 6679, all from Suriname; Bahia 85 and Sperling et al. 6390 from Pará/Brazil; Souza et al. 18763 from Mato Grosso), or 5 (Fróes 31009 from Pará; 4 long + 1 short: Silva & Rosário 4830 from Mato Grosso); stamens free, 4 mm long; filaments 1.5 mm long, attached near the base of the corolla, glabrous; anthers 2 mm long, ca. 0.3 mm wide; connectives in the proximal half on both sides with ± spreading, ± straight, light hairs, tapering into a 0.5 mm long apical mucro; rudiment of the ovary densely covered with spreading, brown hairs, tapering distally; **female flowers** ca. 6 mm long at anthesis (when corolla lobes reflexed and with pedicels excluded; Fig. 11c); calyx 5–6 mm long and 8–10 mm wide, undivided in the proximal ca. 3 mm, glabrous or with scattered, ± appressed, short hairs at the base on the inside and along the median line of the lobes on the outside; calyx lobes (including the bloated sinuses) 4 mm long, 4 mm wide, with distinct, 1.5–2 mm long apices; sinuses between the calyx lobes markedly expanded and bloated out- and downwards, usually glabrous on both sides (scattered hairy inside on Prance et al. P25335 from Pará, and on Thomas et al. 4107 from Mato Grosso); corolla 5 mm long at anthesis (when lobes reflexed), white or cream colored when alive; corolla tube ca. 5 mm long, ca. 2.5 mm wide, on the outside medium densely covered with ± appressed, light brown hairs distally, scattered hairy at the middle, glabrous proximally and inside; throat 1.5–2 mm wide; corolla lobes ± triangular, 3 mm long, 2.5–3 mm wide, acute, glabrous adaxially, on the abaxial side ± densely hairy along the median line and glabrous towards the margins (but sometimes with very short hairs nearly up to the margins); staminodia probably 4 (no flower available for dissection); ovary ca. 3 mm in diameter, ± abruptly narrowed into the stylodia, densely covered with brown, ± spreading hairs; stylodia 4, 1.5 mm long, free to the base, densely hairy proximally, with more scattered, appressed

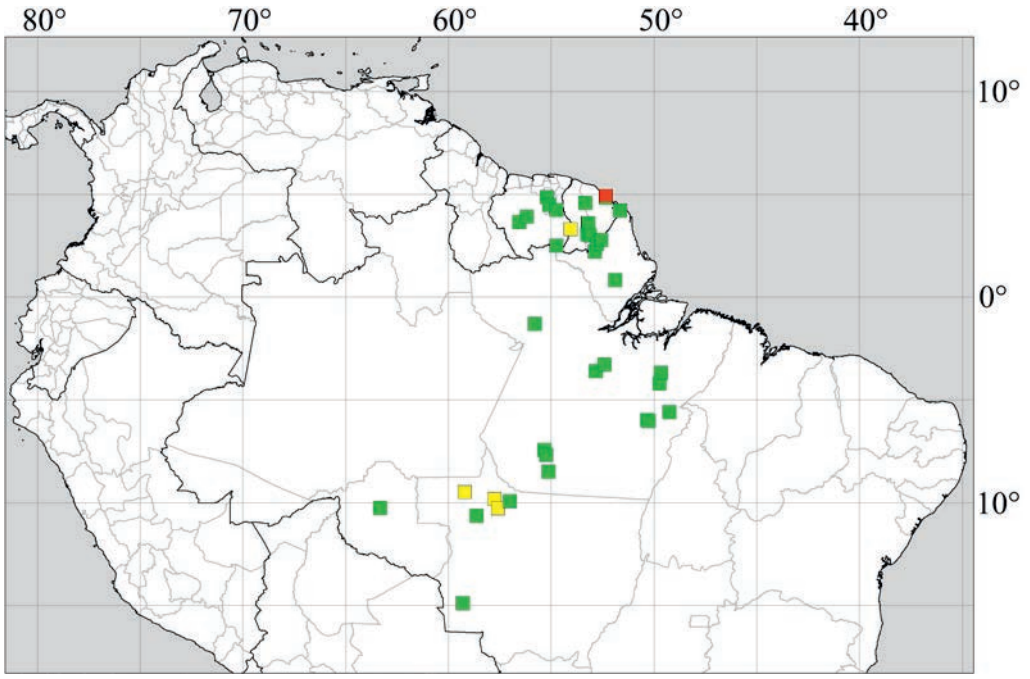

Fig. 12: Distribution of *Diospyros tetrandra* (■; type locality: ■; only digital photos of specimens seen: ■).

hairs distally; stigmata ca. 0.8 mm long; – stalk of the **fruits** usually less than 3 (–4) mm long, at the middle 2 mm thick, ± densely hairy; fruits (Fig. 11d–e, 13) up to 8-seeded, globose or oblate (depressed globose), up to 3 cm in diameter, medium densely covered with ± appressed, ± straight hairs of different length when young, glabrescent except at the base and the apex when older, smooth and with tightly adhering epidermis and black when dry, detaching with the calyx; living fruits green when unripe, dark brown, purplish black and finally black when mature; fruit wall ca. 0.8 mm thick; fruit pulp black and slimy (see Fig. 13); calyx on the fruits up to 2.2 cm in diameter and ca. 0.7 cm in height, green when alive; lobes ca. 6 mm long, ca. 10 mm wide, acute; area around the sinuses between the calyx lobes markedly expanded and bloated (inflated), glabrous on both sides; seeds shaped like the segments of an orange, or coffee-bean-shaped, 11–17 mm long, 6–10 mm wide, 5–9 mm thick, brown or dark brown when fresh, subcutaneously finely striate (Fig. 11f, 13).

Note: The species is closely related to *D. brasiliensis*. As can be seen from the specimens Oldeman 3082 and 3128 (from French Guiana), the growth architecture conforms to Massart's model (see for this: Hallé et al. 1978).

Figures: twig with male flowers, female flower, fruit (Hiern 1873: plate VI); calyx of a fruit (Roosmalen 1985: plate 42f); – fig. 41 in Torrico Pardo (1993) shows in reality *D. inconstans* instead of *D. tetrandra*.

Distribution: The species is known from Suriname, French Guiana (Guyane Française) and from Brazil (Amapá, Pará, western Mato Grosso, Rondônia; Fig. 12). It was reported from elevations of ca. 50–700 m.

Habitat: In Suriname it was collected in primary forests on laterite soil, in mixed high forests, along rivers, in a seepage area with low open vegetation, and in French Guiana in primary and secondary forests, in non-flooded moist forests, in the forest understory, in hillside forests, and in riverine forests. ROOSMALEN (1985) reported it as rare from the upland rain forest of the Guiana's. In Brazil (Pará and Mato Grosso) it grows in primary and secondary, moist or dry forests on terra firme, in the forest understory, in the contact zone of the rain forest and the seasonal forest, and in the "mata de cipó" (seasonally deciduous forest).

Phenology: The species was found in flower in February, March and from May to November, and in fruit all over the year except in September.

Vernacular names and use: In Suriname it is called blaka-oema (Lindeman et al. 379), or "laagland blaka oema" (Bhikhi et al. 626), and in French Guiana (Guyane Française) "mɨkulapi'asõwɨ" (Grenand 343), or mɨkulapiau (Prévost & Sabatier 2811) by people of the Wayãpi / Wayampi tribe. As no voucher could be verified, the two names "barabaraballi" (Arawak language) and "tarara" (Carib language) which were listed by KLOOSTER et al. (2003) need to be confirmed. – According to Bhikhi et al. 626, it is used in Suriname as follows: "Plant parts with leaves are boiled and used against leprosy. After bathing with this water, the leprosy wounds open, turn black, then dry up and eventually heal".

Literature: STEEGE et al. (2007) found 37 individuals in 23 vegetation plots in Suriname. The species is regarded by LOBOVA et al. (2009) as a "possible bat-dispersed species". Identification keys were presented by WALLNÖFER & MORI (2002) for central French Guiana, and by WHITE (1981) for the Guayana Highland. – *D. tetrandra* was cited in MARACAHIPES et al. (2014) and SANTOS (2011), but the species seems to be missing in eastern Mato Grosso. The correct name for their plants seems to be *D. santaremnensis* SANDWITH. – A DNA-sample of Prévost et al. 4713 was included in the study of DUANGJAI et al. (2006).

Specimens examined: **Suriname**, Brokopondo, Boschreserve Brownsberg, [4°53' N, 55°13' W], (st), 25 Sep. 1916, **Bureau v. h. Boschwezen (B.W.) 2448** [U]; – same area: (fr), 27 Jun. 1924, **J.W. Gonggrijp & G. Stahel 6474** [NY, U 2×, W], "boompje 7 m hoog; groene vruchten [= tree 7 m tall; fruits green]"; – same area: (fl male), 28 Oct. 1924, **C. Zaandam 6679** [CAY 2× (dig. photos), U 2×, W], "B [Bloemen] vuilwit [flowers dirty white]"; – van Blommesteijn Lake, Grancreek, south of the lake, on the beach, 47 m, 4°29.43' N, 55°6.27' W, primary forest on laterite soil, (fr), 12 Mar. 2011, **C.R. Bhikhi et al. 626** [L n.s., W], "shrubby tree 2 m; fruits green to black when ripe, glabrous; surface somewhat bumpy; apex rounded, retuse, ending in a short point; calyx lobes green to blackish; seeds 6 to 8, dark brown, surrounded by slimy black pulp". – Sipaliwini, Lely Mts., SW plateaus covered by ferrobauxite, forest on plateau 5 in base line p. 34–36, 550–710 m, [4°15' N, 54°45' W], (st), 25 Sep. 1975, **J.C. Lindeman et al. 379** [BBS n.s. (dig. photo), U], "tree 32 cm diam."; – Tafelberg (Table Mountain), vic. Augustus Falls, [3°56' N, 56°12' W], mixed high forest, (fl male), 15 Sep. 1944, **B. Maguire 24742** [F, GH n.s., IAN, K, MICH, MO, NY, P, RB n.s. (dig. photo), UC, US, W], "tree 10 m, 15 cm diam.; wood sap turning yellow; flowers white"; – Wilhelmina Gebergte, valley of West Rivier, 2–5 km SW of Juliana Top, 275–300 m, 3°36–41' N, 56°30–34' W, forested valley, (fl male), 19 Aug. 1963, **H.S. Irwin et al. 54905** [COL n.s. (dig. photo), FHO, MG n.s. (dig. photo), MO, NY 2×, US 2×], "tree 20 m, 35 cm diam.; corolla pale yellow"; – Tumuc Humac Mts., Talouakem, upper Litani River, 170–190 m, 2°31' N, 54°45' W, along river bank, (flbuds), 3 Aug. 1993, **P. Acevedo-Rodriguez et al. 5849** [CAY, COL n.s. (dig. photo), MO, NY, U], "shrub 5–7 m; flower buds light green"; – same data: (flbuds female), **5860** [CAY 2×, US n.s.], "shrub 4–5 m; sepals green, concave, slightly reflexed"; – same data but: 350 m, low open vegetation; along seepage area, open area on granite boulder, (flbuds male), 13 Aug. 1993, **P. Acevedo-Rodriguez et al. 6029** [U, US n.s.], "shrub 3–4 m; calyx green; corolla tube swollen, 4-gonous, greenish without [= on the outside]; lobes yellowish, reflexed".

Fig. 13: *Diospyros tetrandra*: a, c–d: fruits from Blommesteijn Lake in Brokopondo, Suriname (from Bhikhi 626); – b: fruits from Mont Grand Matoury in French Guiana (from Prévost et al. 4713); – photos a and c–d: courtesy of Chequita Ratnakoemarie Bhikhi (Suriname); b: courtesy of Marie-Françoise Prévost (†).

Guyane Française, Mont Grand Matoury, 4°52' N, 52°21' W, forêt secondaire, (fr), 26 Mar. 2003, **M.-F. Prévost et al. 4713** [CAY n.s. (dig. photo), MO n.s., P n.s., W], "arbre du modèle de Massart, 15 cm DBH; axes latéraux à rhytidome noirâtre; feuilles alternes, distiques sur les axes plagiotropes; limbe discolore souple à marge ourlée; fruits sessiles, axillaires sur axes latéraux; fruits verts, brillants avec 4 grands sépales persistants"; – same area: cascade sur dalles rocheuses ensoleillées, (fr), 19 Mar. 1985, **J.-J. de Granville 7236** [CAY, NY 2× (+ carp.), P, U 2×], "petit arbre de 3 à 4 m de haut poussant dans l'eau; fruits verts subsphériques à calice persistant, ondulé"; – same area: Reserve de la Mirande, NE side, 8 km from Cayenne, disturbed primary moist forest, in forest understory, (fr), 21 Apr. 1992, **P. Acevedo & J. Grimes 4802** [CAY, MO, NY], "shrub 4 m; fruits green, depressed globose, reflexed"; – same area: Lac des Américains, (flbuds male), 5 Mar. 1985, **J.-J. de Granville 7218** [U], "petit arbre du sous-bois de 5 m de haut env.; fleurs tubuleuses, fusiformes, vertes, 4-mères"; – Montagnes de la Trinité, sommet Nord, 400 m, [4°36' N, 53°21' W], forêt dense au pied d'une haute falaise granitique humide, (fr), 11 Jan. 1984, **J.-J. de Granville et al. 5881** [CAY, FHO, L, P, U], "arbre de 6 m de haut env.; fruits verts subsphériques, aplatis aux pôles de 3 cm de diam. env.; calice persistant vert, de forme ondulée"; – same area: sommet NE along creek near camp 4 (ca. 200 m) [INPA-label: "ca. 200 m along creek near camp 4"], [4°36' N, 53°21' W], (fr), 29 Jan. 1984, **J.-J. de Granville et al. 6362** [B, BBS n.s. (dig. photo), CAY, INPA, L, NY, P, U, US], "treelet 5 m × 8 cm; wood yellow; fruits green"; – Mt. Bruyere, 4°10' N, 51°43' W [correct is probably 4°13' N, 51°39' W], in hillside forest, (flbuds male), 3 Aug. 1960, **H.S. Irwin et al. 47326** [FHO, IAN n.s., MG, NY], "tree ca. 7 m; flowers greenish; occasional"; – same data: (fr), **47339** [GH n.s., IAN n.s., K, MG n.s. (dig. photo), NY (+ carp.), U, UC], "tree 8 m, common; immature fruit green, maturing purplish black"; – près de Saül, tracé Mulet Mort, [3°37' N, 53°12' W], flats, (fr), 5 Feb. 1966, **R.A.A. Oldeman 1971** [CAY 3×, NY n.s. (dig. photo)], "arbrisseau, env. 8 m de haut; écorce écailleuse, gris verdâtre, tachée; bois jaune; fruit immature vert"; – Saül and vicinity: just outside of village on trail to Cambrouse, ca. 200–250 m, 3°37' N, 53°12' W, disturbed non-flooded moist forest, (fr), 3 Aug. 1999, **S.A. Mori et al. 24920** [CAY n.s. (dig. photo)], "slender tree 5 m; fruits green then black"; – Région d'Antécume-Pata, Bassin du Maroni, 300 m, 3°19'0" N, 54°4'0" W, (defl), 6 Nov. 1977, **C. Moretti 810** [CAY n.s., MO n.s. (dig. photo)], "arbuste"; – Rivière "Petite Ouaqui", au niveau de l'ancien village Hubert, [3°5' N, 53°15' W], végétation ripicole, (fr), 21 Jul. 1973, **J.-J. de Granville 1884** [CAY 2×, L, P], "petit arbre de 5 m env., incline au-dessus de l'eau; fruits verts 4-meres, sphériques de 2,5 cm de diam., a 3–4 graines elliptiques, brunes, mucilagineuses"; – Mont Itoupé – Sommet Tabulaire, Point-quadrat Itoupé 8, 200 m, 3°1'25" N, 53°7'16" W, forêt primaire, (st), 21 Mar. 2010, **J.-F. Molino & D. Sabatier 2798** [CAY n.s. (dig. photo), W], "arbre DBH 11,8 cm; rameaux vert clair, devenant brun-noirâtre; limbe elliptique à lancéolé, gaufréondulé; nervure 1° en creux face supérieure; autres nervures sans relief sur les deux faces"; – Colline rive D. Yaroupi, au niveau de Saut Ouaimicouaré [= Waïmikwale Itou], [2°47' N, 52°34' W], (st), 14 Apr. 1970, **R.A.A. Oldeman 3082** [CAY 2×, FHO 2×, NY, P, U 2×], "jeune arbre, env. 3 m de haut, du modèle de Massart; écorce morte noir charbon; rhytidome jaune; bois jaunâtre"; – Mont Maunoir, sommet, ca. 300 m, [2°36' N, 52°46' W], forêt un peu broussailleuse avec beaucoup de lianas; sol peu profond, (st), 20 Apr. 1970, **R.A.A. Oldeman 3128** [CAY 2×, FHO 2×, P], "arbre ca. 3.5 m, stérile; croissance selon le modelé de Massart; écorce gris fonce, sur coupe; écorce morte noire; rhytidome jaune (et jaunissant davantage a l'air); régénération de troncs sur les branches plagiotropes"; – Bassin du haut Oyapock, Village Wayàmpi Trois-Sauts, 2°14' N, 52°52' W, forêt ripicole, (fr), 15 Aug. 1989, **M.F. Prévost & D. Sabatier 2811** [CAY, W], "petit arbre diam. 5.0 cm; pétiole canaliculé; limbe souple, chartace, atteint 25 × 10 cm, gaufré entre les nervures II; nervures I et II dépressives face sup.; nervure I très saillante face inf. et nervures II proéminentes sur cette face; fruits isoles axillaires sessiles a calice (S sup 1 cm) persistant, verts, 3 cm diam., avec 5–6 graines brunes dans pulpe molle également brune"; – Crique Kanikani [= Kani-kani], [2°15' N, 52°52' W], forêt primaire, (fr), 23 May 1974, **P. Grenand 343** [CAY], "petit arbre entre 5 et 10 m; fruits sphériques"; – without further data, (fl female), s.d., **F.M.R. Leprieur s.n.** [P].

Brasil, Amapá, [Serra do Navio], old road around C2 below crest, and trail toward Serro do Viado, beyond c3-DH5, [not traced but collected somewhere around 0°50' N, 51°53' W], (fl male, galled), 16 Nov. 1954, **R.S. Cowan 38350** [FHO, MG n.s. (dig. photo), NY], "tree 3 m; flowers greenish-white"; – Pará, Mun. de Oriximiná, estrada BR-163, próximo ao Rio Cuminá/Mirim, 75 km de Oriximiná, 60 m, [1°18' S, 55°48' W], mata; terra firme, (fr), 4 Jun. 1980, **G. Martinelli et al. 6765** [INPA, NY, RB n.s. (dig. photo)], "arbusto 3,5 m; folhas discolores; frutos imaturos de cor verde"; – planalto de Santarém, Currupirú [CAVALCANTE 1963: "Currupiú"; both not located], terra firme, mata virgem, (flbuds male), 20 Aug. 1954, **R.L.de Fróes 31009** [FHO (fragm.), IAN, K, MG], "árvore"; – Altamira, Extração Experimental da EMBRAPA, margem direita do roçado de bananas, [ca. 3°16' S, 52°25' W], mata de cipó [= floresta estacional decidual], terra

firme, (fl male), 19 Aug. 1978, **R.P. Bahia 85** [F, MER n.s., MG n.s. (dig. photo), MO, NY], "vara 7 m; flor amarela"; – Itaituba, estrada Altamira, experimentação da EMBRAPA, [ca. 3°16' S, 52°25' W], mata de cipó [= floresta estacional decidual], terra firme, (fl female), 12 Aug. 1978, **R.P. Bahia 90** [MG n.s. (dig. photo), NY], "árvore 15 m × 20 cm circ.; flor esverdeada; fruto imaturo verde"; – Altamira, km 74 da Transamazônica, rumo Itaituba, [ca. 3°36' S, 52°50' W], sub-bosque da mata virgem seca, (fr), 22 Jul. 1971, **P. Cavalcante & M. Silva 2776** [MG], "arb. 4 m; frutos maduros, negros"; – Tucuruí, arredores da cidade, [3°40' S, 49°40' W], próximo a margem da estrada; mata úmida, próximo a um lugar encharcado, com lago de água estagnada, (fr), 6 Dec. 1979, **M.F.F. da Silva et al. 68** [INPA, MBM n.s. (dig. photo), MG n.s. (dig. photo), UFMT n.s. (dig. photo)], "árvore 10 m × 12 cm; fruto jovem verde"; – ca. 70 km from Tucuruí, 65 km SSW in old BR-422, then 5 km NW on new logging road, ca. 4°11' S, 49°44' W, forest on terra firme, (yfr), 18–20 Nov. 1981, **D.C. Daly et al. 1465** [FHO], "tree 5m; flowers white; fruits green"; – same area and data: disturbed area, (yfr), **1466** [FHO, NY 2×, W], "tree 10 m; fruits green"; – Serra dos Carajás, 2 km W of camp ECB on the ferrovia, ca. 47 km W of road BR-150, ca. 150 m, ca. 5°35' S, 49°15' W, forest on terra firme, (fl male), 28 Jun. 1982, **C.R. Sperling et al. 6390** [FHO, MG n.s., NY n.s. (dig. photo), W], "tree 6.0 m, dbh 10 cm; flowers cream colored"; – Marabá, Serra dos Carajás, estrada do Pojuca, [ca. 5°58' S, 50°20' W], (fr), 2 Feb. 1985, **O.C. Nascimento & R.P. Bahia 1130** [MG], "árvore 10 m × 40 cm circ.; frutos imaturos verdes"; – Serra dos Carajás, Serra Norte, ca. 15 km W of AMZA Exploration Camp, ca. 400 m, ca. 6° S, 50°15' W [ca. 6°1' S, 50°15' W], forest on slope, (yfr), 12 Oct. 1977, **C.C. Berg & A.J. Henderson BG475** [F, FHO, GH n.s., K, MG, MICH, NY, RB n.s. (dig. photo)], "tree 4 m; calyx and fruit green"; – Município de Itaituba, estrada Santarém/Cuiabá, BR-163, km 974 a 980, 7°25' S, 55°20' W, capoeira de terra firme; solo areno-pedregoso, (fr), 12 May 1983, **M.N. Silva et al. 299** [FHO (+ carp.), INPA, MG n.s. (dig. photo), NY n.s. (dig. photo), RB n.s. (dig. photo), W], "arvoreta 4 m; frutos imaturos verdes"; – same município: BR-163, km 1011 com a penetração de 3 km, margem direita do rio Jamanxim, 7°40' S, 55°15' W, mata de terra firme; solo argilo-arenoso, (fr), 11 May 1983, **M.N. Silva et al. 290** [FHO, INPA, NY], "arbusto 2,5 m; frutos imaturos verdes"; – BR-163, km 919, Cuiabá/Santarém highway N of Rio Pará, [ca. 8°29' S, 55°8' W], forest on terra firme, (fr), 13 Nov. 1977, **G.T. Prance et al. P25335** [F, FHO, GH n.s., K, MG, MICH, MO 2×, NY, RB n.s. (dig. photo)], "shrub 2 m; fruit green". – Rondônia, Mineração Taboca a 55 km de Ariquemes, próximo a Massangana, BR-421, 10°15' S, 63°20' W, mata de terra firme; solo argilo-arenoso, (fr), 9 Oct. 1979, **G. Vieira et al. 348** [FHO, INPA, K, MG 2×, MO, NY, R, RB n.s. (dig. photo)], "árvore 6 m × 10 cm diam.; frutos verdes"; – Rio Jamarí, entre São Joâo e Santa Cruz, [ca. 10°15' S, 63°20' W], (fr), 28 Jun. 1965, **J.M. Pires & R.T. Martin 9938** [C, IAN, K, NY, SI, UB], "árvore de 10 m × 15 cm de diam.; frutos redondos sem pelos, marrom-escuros, polpa preta". – Mato Grosso, Colniza, Conglomerado MT-104, Subunid. 1, Subparc. 01, Nº arv. 02_F6, 9°21'36" S, 5512°00'00" W [ca. 9°28' S, 59°13' W], solo arenoso; área de manejo florestal; regeneração, (fl female), 20 Oct. 2015, **L.P. Bona 196** [HERBAM n.s., RB n.s. (dig. photo)], "árvore 9,7 m; base dilatada; casca áspera, esfoliante; casca externa fina de cor verde; cor da casca interna laranja; flor branca; órgão reprodutivo amarelo"; – Município Nova Bandeirantes, estrada para Rolândia, Sítio Ouro Fino, 9°48'22" S, 57°46'9" W, floresta ombrófila aberta, sub-bosque; relevo suave ondulado; solo tipo podzólico, (fr), 29 May 1997, **N.M. Ivanauskas et al. 1983** [ESA n.s. (dig. photo), UFMT n.s. (dig. photo), UFRN n.s. (dig. photo)], "árvore 3,5 m; frutos imaturos verdes"; – Mun. Alta Floresta, 12 km N of Alta Paraiso [= Alto Paraiso], 22.5 km W of Rio Apiacá on road to Alta Floresta (MT-208), 10°0' S, 57°6' W [correct seems to be 9°55' S, 57°1' W], forest on terra firme, (defl female, yfr), 30 Sep. 1985, **W. Thomas et al. 4107** [FHO, INPA, MG, NY n.s., U, SPF, W], "treelet 2 m; leaves subcoriaceous, dark green above; flowers pale green"; – Nova Bandeirantes, Conglomerado MT_357, subunid. 1, subparc. 03, Nº arv. 20_F6, 10°15'36" S, 57°36'0" W, sub-bosque; vegetação de APP, (defl), 29 Jul. 2016, **R.S. Dourado 238** [HERBAM n.s., RB n.s. (dig. photo)], "árvore 7,5 m; base reta; casca áspera; casca externa fina, marrom esverdeado; casca interna amarela (oxida após o corte); desprendimento tipo esfoliante; odor do corte presente"; – Município Juruena, estrada Juruena/Castanheira, ca. 37 km S (em linha reta) de Juruena, 10°38' S, 58°38' W, contato floresta ombrófila/floresta estacional, (flbuds male), 11 Jul. 1997, **V.C. Souza et al. 18763** [ESA n.s. (dig. photo), RB n.s. (dig. photo), UFMT n.s., W], "arbusto ca. 2 m; flores esverdeadas"; – same data: (fr), **18768** [ESA n.s. (dig. photo), UFMT n.s. (dig. photo)], "arvoreta; frutos imaturos verdes"; – km 330 da rod. BR-174, acampamento da Betomarco, Rio Tucanãzinho, [ca. 14°53' S, 59°18' W], mata de terra firme; solo argiloso, (fl female), 8 Jun. 1979, **M.G. Silva & C. Rosário 4827** [IAN, INPA, MG, NY], "árvore 4 m; flor branca"; – same data: (fl male), **4830** [MG, NY 2×], "árvore 4 m; flor branca; botões verdes".

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