

A revision of neotropical *Diospyros* (Ebenaceae): part 12

B. Wallnöfer*

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 agnitser* B.WALLN., and *D. robotot* B.WALLN. are described as new species from Bahia (Brazil). *D. gaultheriifolia* MART. ex MIQ. (synonym: *D. duartei* CAVALCANTE), and *D. riedelii* (HIERN) B.WALLN. (basionym: *D. peruviana* HIERN var. *riedelii* HIERN) from Eastern Brazil are here described in detail. *D. spinosa* HIERN is relegated into the synonymy of the Indian *D. chloroxylon* ROXB. Figures, two distribution maps, vernacular names, information on habitat, lists of specimens, and an identification key for the *Diospyros gaultheriifolia* group are included.

Key words: Ebenaceae, *Diospyros agnitser*, *chloroxylon*, *duartei*, *gaultheriifolia*, *riedelii*, *robotot*, *spinosa*, 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 agnitser* B.WALLN. und *D. robotot* B.WALLN. werden als neue Arten aus Bahia (Brasilien) beschrieben. Die beiden ostbrasilianischen Arten *D. gaultheriifolia* MART. ex MIQ. (Synonym: *D. duartei* CAVALCANTE) und *D. riedelii* (HIERN) B.WALLN. (Basionym: *D. peruviana* HIERN var. *riedelii* HIERN) werden eingehend beschrieben. *D. spinosa* HIERN wird als ein Synonym des indischen *D. chloroxylon* ROXB. erkannt. Abbildungen, zwei Verbreitungskarten, Volksnamen, Angaben zum Habitat, Listen der gesehenen Herbarbelege, sowie ein Bestimmungsschlüssel für die *Diospyros gaultheriifolia* Gruppe 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 were already published: WALLNÖFER 1999, 2000, 2001a, 2001b, 2003, 2004a, 2004b, 2004c, 2005, 2007–2018, 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).

Note: Additions are given in brackets; coordinates given in brackets were determined during this revision; acronyms of herbaria according to THIERS (2018); 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.

* Dr. Bruno Wallnöfer, Naturhistorisches Museum Wien, Botanische Abteilung, Burgring 7, 1010 Wien, Austria. – bruno.wallnoefer@nhm-wien.ac.at.

Key for the *Diospyros gaultheriifolia* group

- 1 Abaxial surfaces of leaves and midveins with scattered, appressed hairs *D. agnitser*
- 1* Abaxial surfaces of leaves and midveins more densely covered with patent hairs 2
- 2 Leaf lamina narrowly ovate to lanceolate (= narrowly elliptic), up to 3.6 cm wide, flat; secondary veins never sunken, not or only hardly visible adaxially; tertiary veins not visible adaxially *D. riedelii*
- 2* Leaf lamina usually much wider, 4–10 cm wide, often ± bullate; secondary and tertiary veins well visible and sunken adaxially 3
- 3 Leaf lamina 6–10.3 cm wide; fruit body up to 3.7 cm in diameter and 2.5–3.5 cm in height; calyx on fruits up to 6 cm in diameter and 2.5 cm in height, thick and hard (slightly woody) *D. robotot*
- 3* Leaf lamina (2–) 4–5.5 (–6.5) cm wide; fruit body up to 2.5 cm in diameter and up to 2.5–3 cm in height; calyx on fruits up to 3 cm in diameter and ca. 1.5 cm in height, not as above *D. gaultheriifolia*

***Diospyros agnitser* B.WALLN., sp.n.** – [Figs. 1–3].

Typus: Brasil, Mun. de Ilhéus, ca. 5–6 km W do Distrito de Olivença, na estrada que liga Olivença a Vila Brasil, 14°47' S, 39°2' W [correct is 14°57' S, 39°2' W], restinga; solo arenoso, (fl male), 11 Nov. 1994, **J.G. Jardim & Flávia 595** [holotype: W (Figs. 1, 2a), isotypes: CEPEC n.s. (dig. photo), NY], "arvorezinha ca. 4,5 m; folhas verdes e brilhantes na face superior, com face inferior mais clara; flores com pétalas brancas; estames cremes e cálice verde com indumentos dourados".

Treelet or tree up to 9 (– ca. 15) m tall, with a diameter up to 10 cm (Belém & Pinheiro 2398), already flowering when ca. 2 m tall, evergreen; twig apices and leaf primordia densely covered with appressed or slightly spreading, straight or slightly flexuose, light hairs; twigs terete, smooth, ± scattered hairy, glabrescent with age, greenish-yellow when alive; thicker twigs light brown with slightly corky longitudinal fissures; lateral branches long and pendent (Thomas & Kallunki 10911); – **leaves** alternate; petioles 6–8 (–12) mm long, 1.8–2 mm thick, flat or canaliculated adaxially, medium densely hairy; leaf lamina ovate to lanceolate (= narrowly elliptic), (6–) 13–25 cm long, (2.5–) 4–8.5 cm wide, 2–3 (–4.7) times as long as wide, widest below the middle, sometimes ± at the middle, ± coriaceous, at least partially ± bullate when mature; adaxial leaf surface glabrous except on veins when young, dark green and shiny when alive, dark grayish-brown and slightly shiny when dry (drying ± black when immature); abaxial leaf surface with scattered, appressed or slightly spreading, straight or slightly flexuose hairs (densely hairy when immature), pale green or greenish-yellow when alive, reddish-brown to chestnut-brown and dull when dry; leaf apex acute to acuminate, sometimes with a drip tip; base of the lamina abruptly cuneate, rounded, sometimes slightly cordate or truncate; leaf margins entire, revolute, densely covered with golden hairs when alive; flachnectaria on abaxial leaf surface minute, usually circular, ca. 0.2 mm in diameter, few to many but hardly detectable, apparently missing on some leaves; midvein sunken, its surface ± flat or slightly raised, densely covered with spreading, light hairs adaxially (glabrescent when old), markedly prominent and medium densely covered with ± appressed or slightly

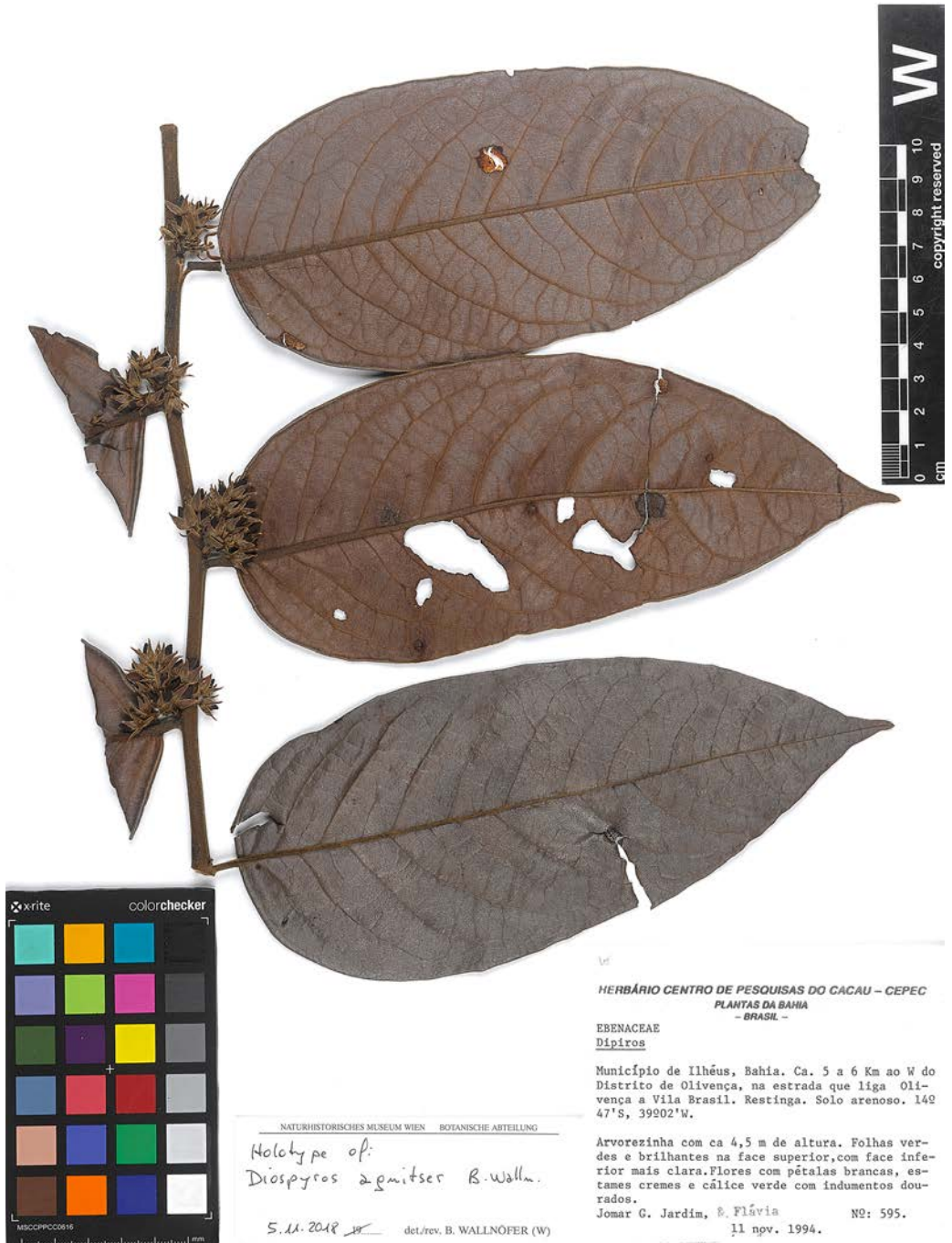


Fig. 1: Holotype of *Diospyros agnitser* B.WALLN. [W].

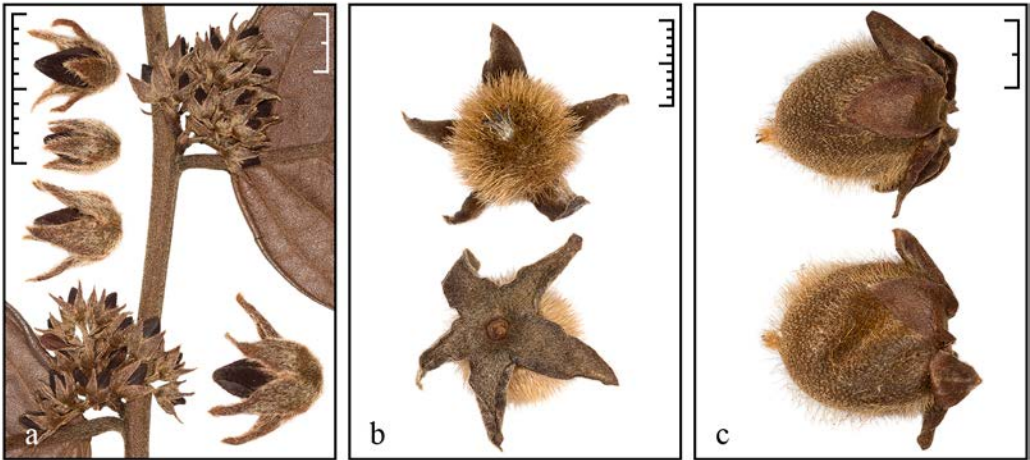


Fig. 2: *Diospyros agnitser*: a: male inflorescences and flowers (from Jardim & Flávia 595, holotype [W]); – b: young fruits (from Sant’Ana et al. 1116 [W]); – c: fruits (from Mori & Boom 13938 [W]); – scale = 1 cm.

spreading hairs abaxially; secondary veins 8–10 per side, sunken (leaf lamina \pm bullate), their surface \pm flat or slightly raised, slightly decurrent along the midvein, scattered hairy adaxially (glabrous when old), prominent and \pm medium densely covered with \pm appressed hairs abaxially; veins of higher order glabrous, flat or slightly sunken abaxially, slightly prominent and hairy abaxially; – male **inflorescences** multi-branched, up to 2–2.5 cm long, placed in the axil of mature leaves nearly up to the apex of twigs, up to 25 (–40?)-flowered; inflorescence axes \pm densely covered with \pm spreading, \pm flexuose hairs; stalks 3–5 mm long and 1.5–2 mm thick; pedicels of lateral flowers 2–4 mm long, 1 mm thick; female cymes (as seen on fruiting specimens) 1–3-flowered, sometimes at the base with up to 3, additional (lateral) cymes (thus with up to 5 flowers per leaf axil); bracteoles on male inflorescences 6–9 mm long, 3–4 mm wide, lanceolate, \pm elliptic or obovate, acute or rounded, medium densely covered with hairs abaxially, nearly glabrous adaxially, densely hairy on the margins, caducous during or shortly after flowering; – **flowers** 4–5 (–6)-merous; male flowers (Fig. 2a) 8–9 mm long at anthesis (when petals erect and with pedicels excluded); calyx up to 11.5 mm long and ca. 10 mm wide, undivided in the proximal 2–3 mm, green and with ferruginous or golden indumentum when alive; calyx lobes up to 9.5 mm long, 4–5.5 mm wide, triangular, acute, flat, medium densely covered with appressed hairs on both sides (densely hairy on the margins); sinuses between the calyx lobes not or only scarcely expanded; corolla white or cream when alive, ca. 10 mm long and wide, contorted, glabrous on both sides (except for clusters composed of few to many, slightly spreading or \pm appressed, short and long hairs along the median line at the base of lobes on the outside); corolla tube 1–2 mm long; lobes 7 mm long, 4 mm wide, broadly rounded, abaxially with raised stone cell granules when dry; stamens 51–72 (Jardim & Flávia 595: 51, Martinelli et al. 9680: 65, each in a 5-merous flower; Sobral 3578: 72 in a 6-merous flower), free, strongly differing in size, the outer 2–2.5, the inner ones up to 4–5 mm long, cream-colored when alive (Jardim & Flávia 595), covered on both sides with long, \pm appressed hairs (setulose) proximally and with shorter hairs more distally (hairs everywhere long and overtopping

the apex of stamens up to 1 mm in Martinelli et al. 9680); filaments up to ca. 0.5 mm long, attached near the base of the corolla and on the receptacle; anthers 1.8–3.5 mm long; connectives tapering into a 0.4–0.8 mm long, \pm acute apex; rudiment of the ovary apparently missing; – **female flowers** not available; – stalk of the **fruits** up to 10 (–22) mm long, at the middle 2–3 mm thick, widened distally, \pm densely hairy (as the male inflorescence axes); lateral pedicels 4–5 mm long, 1 mm thick; fruits (Fig. 2b–c) 1–4 per leaf axil, usually up to 8 (–10)-seeded, \pm globose, up to 3.5 cm in diameter, covered with well-spaced, up to 3–4 mm long, \pm straight, patent bristles and a dense layer of very short, patent hairs; hairs around the base of the bristles sometimes longer and forming dense tufts (area between these tufts covered with minute hairs); fruits \pm glabrescent except at the base and the apex when \pm mature, with tightly adhering epidermis when dry, detaching with the calyx; living fruits green when immature and orange when mature (Borges et al. 738, Harley et al. 18553), covered with ferruginous-brown, ginger or golden indumentum; stylodia 4 or rarely 5, 4–5 mm long, fused together ca. 1.5 mm above their bases, medium densely covered with appressed hairs; stigmata bilobed, ca. 1 mm long; calyx on fruits up to 4 cm in diameter when lobes spreading and ca. 0.5 cm in height, undivided in the proximal 2 mm, green or yellow-green when alive, medium densely (distally) to densely (at the base) covered with appressed hairs on both sides; lobes up to 18 mm long and 8 (–15) mm wide, acute, with flat or \pm revolute margins, spreading or appressed to the fruit (except the apices), medium densely covered with appressed hairs and with a tuft of hairs at the apex; area around the sinuses between the calyx lobes markedly expanded outwards; seeds not available.

Note: This species is quite similar to *D. gaultheriifolia* and is mainly distinguished by its appressed indumentum (see the identification key). The flowers are apparently often galled and deformed (e. g., Harley et al. 18288, Hatschbach et al. 63342, Mello Filho & Emmerich 3064, Sant'Ana et al. 342, Silva et al. 1484, Thomas et al. 9069). The older galls are apparently greenish when alive. – Some collections were available for study only via digital photos. Unfortunately, the resolutions of the latter were sometimes too low to allow an accurate examination of the indumentum, thus slight doubts concerning the identity of a few specimens remained.

Distribution, habitat and phenology: The species is only known from the southern part of the federal state of Bahia in Brazil (Fig. 3). It is a member of the coastal "restinga forest" which grows mostly over sand (see THOMAS & BARBOSA 2008), and it was reported from the "moist coastal forest in valleys" (Thomas et al. 9069), from the "floresta ombrófila densa" (Amorim et al. 7673, Pereira et al. 7), the "floresta de tabuleiro" (Asprino et al. 80), the "floresta estacional semidecídua" (Borges et al. 738), and from disturbed forests (capoeirão). It was collected at elevations up to 70 m. – The species was found in flower from October to December, and in fruit from February to August (October).

Specimens examined: **Brasil, Bahia**, Mun. de Valença, estrada Valença/Guaibim, km 8 a E [NE!] de Valença, [13°19' S, 39°02' W], restinga arbórea, (fr), 27 Jul. 1981, **A.M. de Carvalho & J. Gatti 821** [CEPEC n.s. (dig. photo), FHO, MG n.s. (dig. photo)], "ca. 6 m; folhas discolor com face dorsal levemente acobreada; frutos imaturos verdes com pilosidade levemente acobreada"; – arquipélago do Município de Cairu, Ilha de Boipeba, APA Tinharé-Boipeba, 13°35'19" S, 38°55'11" W, floresta estacional semidecídua, (yfr), 4 Feb. 2007, **R.A.X. Borges et al. 738** [CEPEC 2 \times n.s. (dig. photos), NY, SPF n.s. (dig. photo)], "arvoreta 4 m; ramos amarelo-esverdeados; folhas discoloradas, amarelo-esverdeadas abaxialmente; nervura central creme; cílios marginais dourados; frutos maduros alaranjados coberto por indumento dourado"; – same area: Mata Grande em estrada de acesso a Moreré, 50 m, 13°37'10" S, 38°55'80" W [correct is probably 13°37'10" S,

38°55'8" W], floresta ombrófila densa sob solo arenoso, (fr), 18 Aug. 2008, **A.M. Amorim et al. 7673** [CEPEC n.s. (dig. photo), SPF n.s. (dig. photo)], "arvoreta ca. 8 m; folhas coriáceas a face superior brilhante; frutos verdes, cobertos por indumento ferrugineo"; – Ituberá, Pratiği (entrada da Tapera), 13°43'60" S, 39°1'26" W, restinga, floresta, (st), 3 Oct. 2011, **E. Matos et al. 2700** [HUEFS n.s. (dig. photo)], "árvore 9 m; fuste 1; CAP 16,5 cm"; – same area and collectors: 13°44'23" S, 39°1'42" W, floresta, (fr), 3 Oct. 2011, **615** [HUEFS n.s. (dig. photo)], "árvore ca. 8 m; folhas indumentadas"; – near Maraú, 20 km N from road junction from Maraú to Ponta do Mutá, 0–50 m, ca. 13°57' S, 38°57' W, mixed restinga vegetation on sand, (fr), 3 Feb. 1977, **R.M. Harley et al. 18553** [FHO, HUEFS n.s. (dig. photo), K, P n.s. (dig. photo), W 2×], "tree to 5 m; leaves coriaceous strongly rugose, very dark green glossy above, pale green with prominent veins beneath; sepals in fruit fleshy, rather bright green; young fruit covered with ginger hairs; ripe fruit orange"; – Itacaré, estrada de Itacaré para Barra Grande, depois da sede de Maraú, 13°59'3" S, 38°56'58" W, (fr), 19 Mar. 2004, **P. Fiaschi et al. 2078** [CEPEC n.s. (dig. photo), NY, SPF n.s. (dig. photo)], "arvoreta ca. 4 m; folhas fortemente discolores; frutos imaturos castanho-acinzentados, com cálice verde claro"; – Itacaré, Campo Cheiroso, rodovia Ilhéus/Itacaré, km 46, 14°23'11" S, 39°2'21" W, floresta ombrófila densa, (fl male), 3 Dec. 2011, **R.C.A. Pereira et al. 7** [CEPEC n.s., HUEFS n.s. (dig. photo), RB n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore ca. 15 m; folhas discolores, face adaxial verde-escura e abaxial verde-clara; flores alvas"; – Ilhéus, [14°47' S, 39°3' W], em interior de mata, (fl male), Dec. 1984, **M. Sobral 3578** [C, G, ICN n.s.], "arvoreta até 6 m; fl. brancas"; – (Itabuna, Cururupe, [14°51' S, 39°2' W], restinga, (fl male, galled), 1 Dec. 1970, **L.E. de Mello Filho & M. Emmerich 3064** [R], "árvore 4 m; flores alvas; cálice verde"; – Município de Ilhéus, Fazenda Guanabara (junto à Fazenda Barra do Manguinho), ramal com entrada no km 10 da rod. Ilhéus/Oliveira, lado direito 4 km a oeste da rodovia, [ca. 14°54' S, 39°4' W], mata estragada; solo arenoso a sílico-argiloso, (yfr), 7 Mar. 1985, **L.A.M. Silva et al. 1879** [CEPEC n.s. (dig. photo), ICN n.s.], "árvore 6 m; frutos verdes"; – estrada Oliveira/Maruim, kms 5–8, 40–50 m, [ca. 14°57' S, 39°4' W], restinga arbórea e arbustiva, (fl male), 16 Oct. 1983, **G. Martinelli et al. 9680** [CEPEC n.s. (dig. photo), MBM n.s., RB 2× n.s. (dig. photos), TUSG n.s., US], "arbusto escandente [?]; folhas discolores; cálice verde; corola alvacenta"; – road from Oliveira to Maruim, 6–8 km W of Oliveira, ca. 50 m, [ca. 14°57' S, 39°4' W], disturbed forest and savanna on white sand, (fr, partly galled), 10 May 1981, **S.A. Mori & B.M. Boom 13938** [CEPEC n.s. (dig. photo), FHO, NY n.s., W], "small tree 4 m × 6 cm"; – Oliveira, [ca. 14°57' S, 39°1' W], mata úmida, (fr), 25 Mar. 1994, **A. Fernandes & M. Andrade s.n. (EAC 20460)** [EAC n.s. (dig. photo)], "arbusto"; – estrada que liga a Estação Hidromineral de Oliveira ao Povoado de Vila Brasil, 5 km ao sudoeste de Oliveira, [14°59' S, 39°3' W], região de mata higrófila Sul Baiana; capoeirão em solo arenoso, (yfr), 8 Feb. 1982, **L.A.M. Silva et al. 1483** [CEPEC n.s. (dig. photo), MG n.s. (dig. photo)], "arvorezinha 6 m; frutos novos, esverdeados com pelos marrons"; – same data and collectors: (defl, galled), **1484** [CEPEC n.s. (dig. photo), FHO, MG n.s. (dig. photo)], "arvorezinha 5 m; frutos imaturos, verde-claros e glabros"; – road from Oliveira to Maruim, 6.1 km W of Oliveira, forest on N side of road, 14°59' S, 39°3' W, restinga forest over sand; moist coastal forest in valleys, (fr, partly galled), 1 May 1992, **W.W. Thomas et al. 9069** [CEPEC n.s. (dig. photo), HUEFS n.s. (dig. photo), K, MBM n.s. (dig. photo), NY, W], "treelet 4 m; leaves dark, shiny green above, paler beneath; calyx pale green; mature fruits hispid, orangish, ca. 2.5 cm in diameter"; – rod. a 6 km de Oliveira na estrada para Vila Brasil, 14°58'39" S, 39°2'6" W, mata de restinga, (yfr), 19 Feb. 2004, **S.C. de Sant'Ana et al. 1116** [CEPEC n.s. (dig. photo), NY n.s. (dig. photo), SPF n.s. (dig. photo), W], "árvore 5 m; folhas verde discolores; fruto imaturos amarronzados"; – 6 km SW of Oliveira on road to Vila Brasil, 14°58'40" S, 39°2'7" W, disturbed restinga forest, (fr), 14 May 1995, **W.W. Thomas & J. Kallunki 10911** [CEPEC n.s. (dig. photo), MBM n.s. (dig. photo), NY, W], "tree 7 m tall with long, pendent lateral branches bearing leaves and axillary fruits; leaves subcoriaceous, lustrous dark green above, paler beneath; calyx yellow-green; fruit dark green with yellowish prickles"; – Mun. de Una, entrada à direita, no km 10,4 da rod. Una/Ilhéus, [15°13' S, 39°3' W], restinga arbórea, (defl, galled, no fruits), 28 Jul. 1993, **S.C. de Sant'Ana et al. 342** [CEPEC n.s. (dig. photo), K, MBM n.s. (dig. photo), NY, W], "árvore 7 m; frutos imaturos esverdeados"; – rod. BA-001, 8–10 km ao N de Una, [15°13' S, 39°3' W], restinga arbórea, (fr), 12 Apr. 1992, **G. Hatschbach et al. 57012** [CTES, MBM], "arvoreta"; – rod. BA-001 Ilhéus/Una, entrada para Pedras de Una, floresta à direita a ca. 500 m da rodovia, 70 m, 15°16'12" S, 39°3'11" W, floresta de tableiro, (fr), 20 May 2014, **R. Asprino et al. 80** [CEPEC n.s., RB n.s. (dig. photo)], "arbusto ca. 2 m; folhas discolores, face abaxial verde clara; cálice verde; frutos verde-escuros; tricomas marrons"; – rodovia para Pedras de Una, [15°18' S, 39°2' W], mata da encosta de colina, (defl, galled), 15 Aug. 1995, **G. Hatschbach et al. 63342** [CEPEC n.s. (dig. photo), CTES, HBG, MBM n.s. (dig. photo), Z], "arbusto 2 m"; – Una, [ca. 15°18' S, 39°5' W], mata litorânea, (fr), 19 May 1965, **R.P. Belém & M. Magalhães 1049** [NY, UB], "arbusto de 2 m; frutos verdes"; – 6 km E of Una along the old road to Pedras, by the

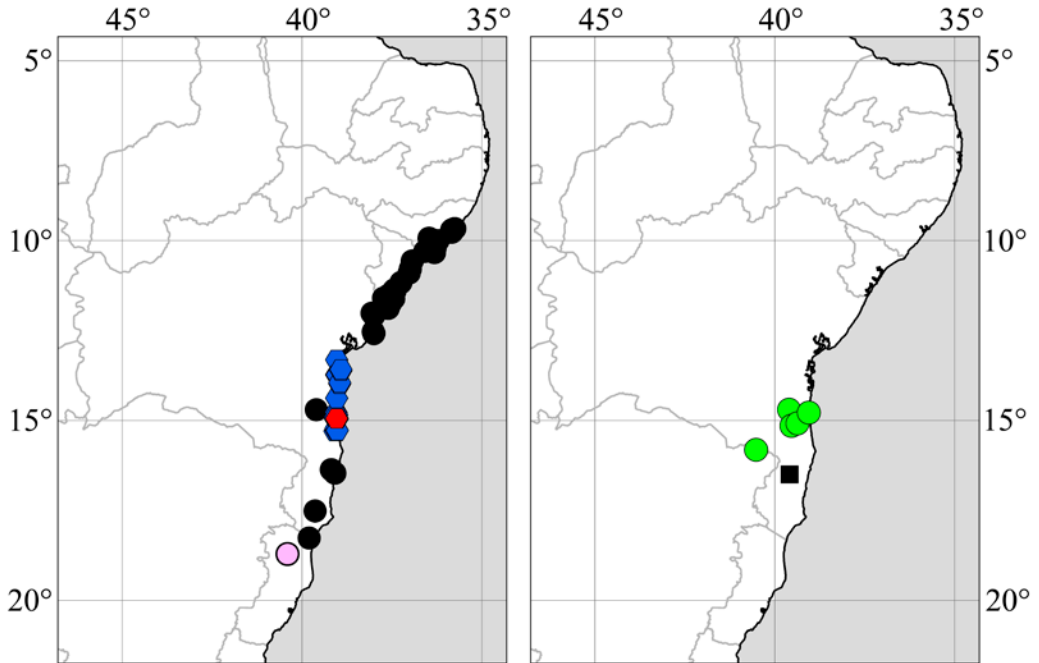


Fig. 3: On left side distribution of *Diospyros gaultheriifolia* (●; type locality of *D. duartei*: ○), and *D. agnitser* (●; type locality ○); – on right side distribution of *D. riedelii* (●), and *D. robotot* (■, type locality).

sea, sea level, 15°17' S, 39°1' W, high restinga forest, partly cut over with some lower shrubby disturbed vegetation by roadside, (fl male, galled), 26 Jan. 1977, **R.M. Harley et al. 18288** [CEPEC n.s. (dig. photo), FHO, HUEFS n.s. (dig. photo), K, NY n.s. (dig. photo), U, W], "small tree to 3 m; leaves coriaceous, dark green, paler beneath; sepals pale with reddish-brown hairs; corolla cream; unripe fruit green"; – margem da rodovia Una/Olivença, mata costeira, (fr), 2 Jun. 1966, **R.P. Belém & R.S. Pinheiro 2398** [CEPEC n.s. (dig. photo), IAN, MG, UB], "árvore de 6 m × 10 cm diam.; frutos verdes com pilosidade marrom".

***Diospyros gaultheriifolia* ["*gaultheriaefolia*"] MART. ex MIQ.**, Fl. Bras. (Martius) 7 (17): 5, tab. 2, fig. 1 (1856); – [Figs. 3–7].

Typus: Brasil, Bahia, crescit in altioribus mediterraneis, (fl male), s.d., **J. Blanchet 1886** [lectotype: BR (Fig. 4), isotypes: F (photo F 59329), G 4× (photo F 26765 at F, GH, MICH, MO, US), NY, P].

= *Diospyros duartei* CAVALCANTE, Bol. Mus. Paraense Emilio Goeldi, N. S., Bot., 21: 2, estampa I (1963).

Typus: Brasil, Espírito Santo, Município de Nova Venécia, [ca. 18°43' S, 40°24' W], sub-bosque em formação primária, (fl female), 14 Nov. 1953, **A.P. Duarte 3733 & J.C. Gomes 461** [holotype: MG (neg. at FHO), isotypes: RB 6× (Figs. 5f–g, 6), SP n.s. (dig. photo)], "pequena árvore, pouco frequente".

Note: The specimens were most likely collected east of Nova Venécia towards the coast. I saw the holotype many years ago.

Treelet or tree up to 10 (–15) m tall, already flowering when ca. 1 m tall, evergreen (according to A. Popovkin, personal communication Sept. 2018); twig apices and very young leaves densely covered with \pm patent, straight or slightly flexuose, up to 1.5 mm long hairs; twigs terete, very long, slender, pendent or inclined downwards (Figs. 6, 7a), reddish-brown, with raised, subepidermal stone-cell nodules, medium densely to densely covered with long, \pm patent hairs, glabrescent with age; – **leaves** alternate; petioles 3–7 mm long, 1.5–2 mm thick (up to 15 mm long and 2.5 mm wide on leader shoots of Paixão et al. 875), \pm flat adaxially, covered with same indumentum as that on young twigs, glabrescent when old; leaf lamina often strongly revolute longitudinally (see Figs. 5a, 7b), at least partially \pm bullate when fully mature, ovate to narrowly ovate, (6–) 10–17 cm long, (2–) 4–5.5 cm wide (up to 21.5 cm long and 6.5 cm wide on the type of *D. duartei*), (1.7) 2.5–3 (–4) times as long as wide, widest below the middle, firmly chartaceous to coriaceous; adaxial leaf surface glabrous (except the midvein and rarely also the secondary veins), grayish to dark brown and dull when dry, shiny when alive; abaxial leaf surface with well-spaced, long, patent to spreading, distally \pm curved hairs, dull and brown to reddish-brown when dry, lighter green and with \pm ferruginous indumentum when alive; leaf apex acute to acuminate, sometimes with a drip tip; base of the lamina cuneate, truncate or slightly cordate; leaf margins entire, revolute, densely covered with golden hairs when alive; flachnectaria scattered on abaxial leaf surface, minute, \pm circular, ca. 0.2 mm in diameter, few to ca. 30, apparently missing on some leaves; midvein sunken, its surface flat, densely covered with \pm patent, \pm flexuose, persisting long hairs adaxially, markedly prominent and medium densely covered \pm patent, long hairs abaxially; secondary veins ca. 9 per side, sunken, their surface \pm flat or slightly raised, glabrous or rarely scattered hairy adaxially, prominent and medium densely covered with \pm patent hairs abaxially; tertiary veins slightly or sometimes strongly sunken and glabrous abaxially, slightly prominent and hairy abaxially; – male partial **inflorescences** multi-branched, contracted, up to 1.5 (–2) cm long, placed in the axil of new mature leaves often up to the distal parts of new shoots, up to ca. 20-flowered; stalks up to 2 mm long and ca. 1 mm thick; pedicels of lateral flowers 2–5 mm long, ca. 0.8 mm thick; female partial inflorescences up to 6-flowered (on Esteves & Lyra-Lemos 1986 apparently multi-branched and with more crowded flowers), but usually only 1 fruit, rarely 2 fruits developing; stalks (peduncles and pedicels) ca. 12 mm long; pedicels up to 10 mm long, 1 mm thick; inflorescence axes in both sexes \pm densely covered with \pm patent, \pm flexuose, up to 1 (–1.5) mm long hairs; bracteoles in both sexes up to 4–6 mm long, 1.5–3 mm wide, lanceolate, \pm elliptical, or obovate, rarely \pm linear, acute or rounded, medium densely hairy abaxially, glabrous adaxially, caducous during or shortly after flowering; – **flowers** 5 (–6)-merous, hanging; male flowers (Fig. 5b–c) 8–9 mm long at anthesis (when petals erect and with pedicels excluded); calyx 6–8 mm long and up to ca. 10 mm wide, undivided in the proximal 2.5–3 (–4) mm, medium densely covered with spreading or \pm patent, \pm flexuose, up to 1 mm long hairs abaxially; calyx lobes 3–6 mm long, 2–3 mm wide, triangular, acute, flat, inside densely covered with \pm appressed hairs (indumentum towards the margins less dense and more spreading); sinuses between the calyx lobes not or only slightly expanded; corolla white, cream or yellowish when alive, 6–7 mm long, (6–) 8–10 mm wide, glabrous on both sides (except for few, \pm spreading, \pm curved, long hairs along the median line at the base of lobes on the outside); corolla tube 1.5–2 mm long; lobes 4.5–6 mm long, 3–4 mm wide, broadly rounded; stamens exserted, 32–70 (32 in a 6-merous flower of Sant'Ana et al. 458; 45

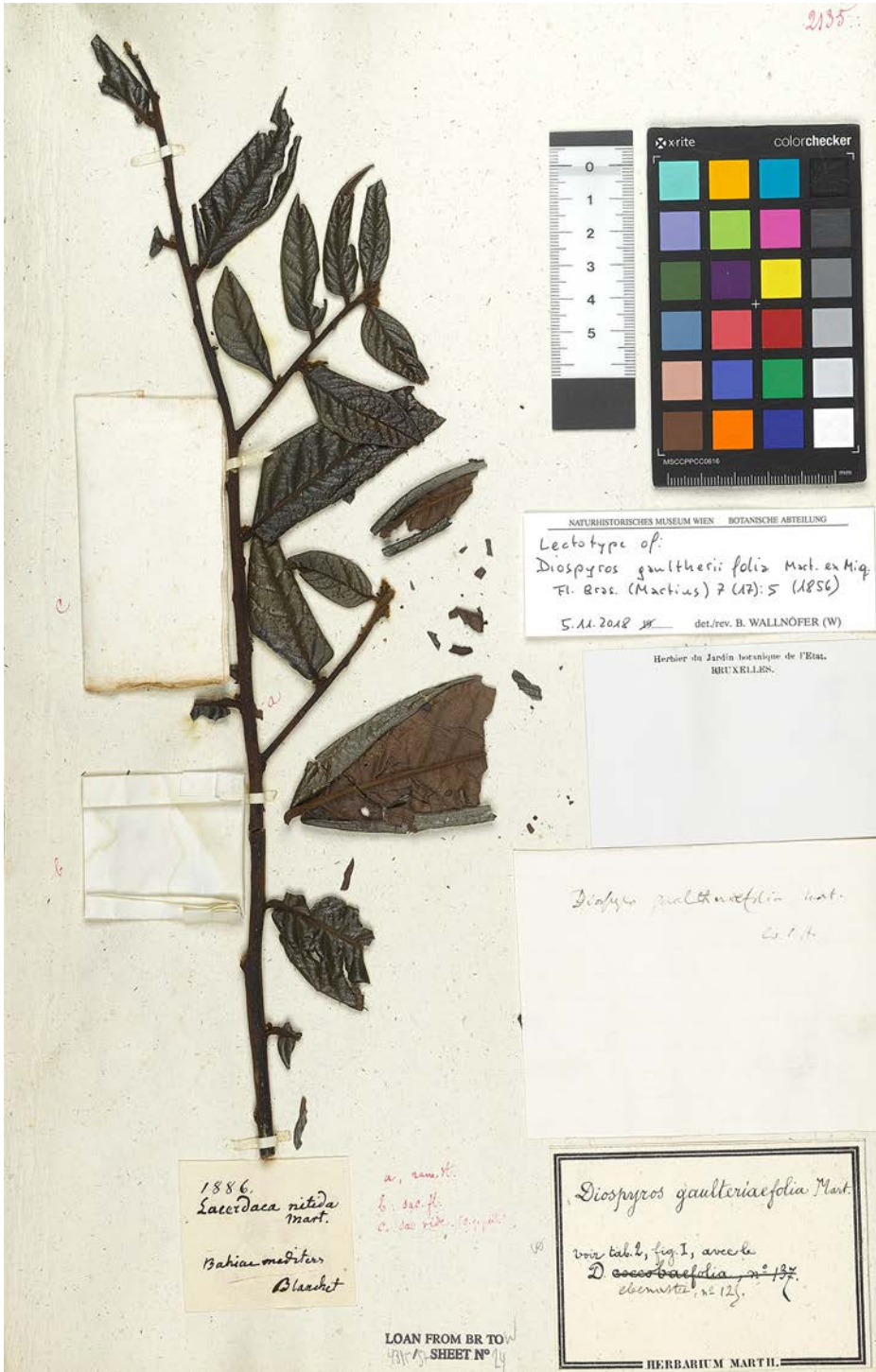


Fig. 4: Lectotype of *Diospyros gaultheriifolia* MART. ex MIQ. [BR].



and more in Blanchet 1886 [as indicated in Miquel 1856]; 68 in a 5-merous flower of Gardner 1412; 70 in a 6-merous flower of Thomas et al. 13295), usually free, some in pairs, strongly differing in size, the outer 1.7–2.6, the inner ones up to 4–5 mm long; filaments and connectives covered on both sides with up to 2 mm long, \pm appressed, \pm straight hairs (the distal hairs overtopping the apex of stamens up to ca. 1 mm); filaments 0.5–1.6 mm long, attached near the base of the corolla and on the receptacle; anthers 1.2–5 mm long, 0.3 mm wide; connectives tapering into an up to 0.6 mm long, \pm flattened apex; rudiment of the ovary apparently missing; – **female flowers** (Figs. 5d, f–g, 7c) ca. 13 mm long at anthesis (pedicels excluded); calyx 11 mm long and ca. 8 mm wide, undivided in the proximal 2 mm; calyx lobes 8 mm long, 3 mm wide, narrowly triangular, acute, flat at anthesis, soon accrescent and becoming longitudinally \pm revolute (Fig. 5e); sinuses between the calyx lobes at first inconspicuous, soon expanding; corolla 12 mm long, 15 mm wide (one flower on the type of *D. duartei* is ca. 25 mm wide, Fig. 5g), glabrous on both sides (except for few, \pm spreading, \pm flexuose, long hairs along the median line at the base of lobes on the outside), white or yellowish when alive; corolla tube 2–2.5 mm long, ca. 3 mm wide; lobes 10 mm long, 7 mm wide, obtuse or rounded; staminodia 10 (only one flower bud from Esteves & Lyra-Lemos 1986 dissected), 17–24 (Duarte 3733, as indicated in CAVALCANTE 1963), or ca. 20 (as can be seen on photos of Alex Popovkin, see Fig. 7e), ca. 1 mm long in bud (at anthesis probably up to ca. 4 mm long), single or less frequently in pairs, glabrous, adnate to the corolla tube ca. 0.5 mm above its base; antherodes slightly widened, ca. 0.5 mm long in bud (free part of one visible staminodium at anthesis: 2 mm long); ovary 4 mm in diameter (including the dense layer of indumentum), densely covered with straight, spreading, erect, long hairs, white when alive (Coelho et al. 772); stylodia (3–) 4 (–5), up to 6 mm long, fused together ca. 1 mm above their bases, with scattered, appressed, straight hairs, sometimes flattened distally; stigmata bilobed, ca. 1.5 mm long; – stalk of the **fruits** 6–10 (–18) mm long, at the middle 2–3 mm thick, widened distally, \pm densely hairy; fruits (Figs. 5h–i, 7b, 7d) 1–2 per leaf axil, hanging, usually up to 8 (10?)-seeded, globose, oblate or slightly ellipsoidal, up to 2.5 cm in diameter and 2.5–3 cm in height, covered with small or sometimes very prominent tubercles (the latter e. g. in Thomas et al. 15585; see also Fig. 7d); indumentum on fruits composed of well-spaced, 3–4 mm long, \pm straight, patent bristles (usually placed on top of the tubercles), of very short, patent hairs and \pm curled minute, gland-like structures; hairs around the base of the bristles forming dense tufts on some specimens (especially on distal parts of the fruits); fruit body detaching with the calyx; living fruits changing color from green or greenish to greenish-yellow, yellowish-orange and finally orange and brown when mature, covered with a ferruginous or golden indumentum; calyx on fruits up to 3 cm in diameter and ca. 1.5 cm in height, undivided in the proximal ca. 3 mm, green, olive green, or sometimes cream or yellow, covered with

◀ Fig. 5: *Diospyros gaultheriifolia*: a: twig with revolute leaves (from Esteves & Lyra-Lemos 1986 [SPF: sheet 2]); – b: male inflorescences (from Gardner 1412 [G]); – c: male flowers (from Gardner 1412 [P]); – d: female flowers (from Esteves & Lyra-Lemos 1986 [SPF: sheet 1]); – e: very young fruits (from Esteves & Lyra-Lemos 1986 [SPF: sheet 2]); – f: female flower bud with large bracteoles (see also fig. 6); – g: female flower (f–g from Duarte 3733 & Gomes 461 [RB, isotypes of *D. duartei*]); – h: fruits (from Matos & Vidal 2704 [W]); – i: fruits (from Thomas et al. 15585 [W]); – scale = 1 cm (except for 0.5 cm in figure c).

a ferruginous or brown indumentum when alive; lobes 11–15 mm long and 8 mm wide, acute, \pm appressed to the fruit (except the apices), proximally with undulated or less frequently non-undulated, longitudinally \pm revolute margins; area around the sinuses between the calyx lobes usually markedly expanded outwards or on some specimens \pm flat; seeds not available.

Note: The species is rather variable. Some collections were available for study only via digital photos. Unfortunately, the resolutions of the latter were sometimes too low to allow an accurate examination of the indumentum, thus slight doubts concerning the identity of some specimens remained.

Duarte 3733 & Gomes 461 (the type of *D. duartei*, see Fig. 6) is from northern Espírito Santo and looks slightly different: the leaves are only a little revolute, much longer than wide, and acuminate. However, similar specimens were collected also far in the north in Alagoas! – The collections Carvalho & Paixão 369, Coelho et al. 589, 772, Folli 716, Oliveira et al. 65, and Paixão et al. 875 are also somewhat differing and were collected at slightly higher elevations in a hilly area which is more distant from the coast in southern Bahia. The abaxial side of the leaves of these specimens is ferruginous, the indumentum is denser abaxially and the patent hairs are shorter. The margins are not strongly revolute. Paixão et al. 875 displays up to 15 mm long petioles on the leader shoots (8–9 mm on shorter shoots), and slightly bullate laminae. Many more collections from these southern populations are needed for further study.

Figures: twig with male flowers, stamens (MIQUEL 1856: tab. 2, fig. I); leaf transection (PARMENTIER 1892: plate 3: 17); leaf, dissected female flower (CAVALCANTE 1963: estampa I).

Growth form: The leaves of populations growing in open, sandy areas are longitudinally bent and strongly revolute most likely in response to high solar irradiation and the resulting temporary aridity (see Figs. 5a, 7b). They resemble old-fashioned boats or canoes which are turned upside down. – As can be seen on photos taken by Eloina Neri de Matos und Alex V. Popovkin, the growth form of *D. gaultheriifolia* is quite extraordinary: the twigs are very long, \pm hanging or inclined downwards and apparently only scarcely branched (see Fig. 7a). This peculiar growth resembles the one of some Annonaceae and needs further study. It could be an adaptation to severe conditions which seem to occur at least temporarily in the habitat of this evergreen species. The duration of exposure of the leaves to the sun may be reduced that way. The specimens of the type collection of *D. duartei* also display very long, unbranched twigs (see Fig. 6).

Distribution, habitat and phenology: The species grows in Brazil near the coast between Alagoas in the North and the northern part of Espírito Santo in the South (Fig. 3). It is a member of the "restinga vegetation" which grows usually over sand (see THOMAS & BARBOSA 2008), and was collected in \pm open woods as well as in areas covered by shrubs, often on dunes. On herbarium specimens it was indicated from the following habitats: "Atlantic coastal rain forest (mata de tabuleiro)" (Thomas et al. 13281), "disturbed moist forest (tabuleiro forest) over sand and clay" (Thomas et al. 15585), "restinga arbórea intercalada com coqueiral, várzea e campos úmidos" (Carvalho et al. 4328), "riparian forest, restinga-type forest" (Popovkin on several collections), and in general from the "mata atlântica". SANTOS & SANO (2009) indicated it for the "floresta estacional semidecidual" (seasonal semideciduous forest), and the restinga. – It was collected at



Fig. 6: Isotype of *Diospyros duartei* CAVALCANTE [RB] (see also fig. 5f).

elevations up to ca. 150 m, and was found in flower from October to June and in August, and in fruit in February, March, May, and from July to December.

Anatomy: The anatomy of the leaves is described in detail in PARMENTIER (1892: 125, plate 3: 17).

Vernacular names: In Alagoas it is called "grão de macaco" (Machado & Bayma 42, Machado 521, 587; MOURA 2006), and "cabeluda" (Santos 66), and in Bahia "caqui-preto" (Folli 716).

Literature: Both specimens cited in the checklist of OLIVEIRA et al. (2014) belong to *D. gaultheriifolia* (the Amazonian *D. artanthifolia* does not occur in Sergipe). MATOS (2014) found 13 individuals in 7 of the 105 10 × 10 m vegetation plots. The average height of these individuals was 8 m, and the average dbh was 5.5 cm. But at least two of her collections (Matos et al. 615, 2700) which I have seen only afterwards, seem to belong to *D. agnitser*. The specimen Agra et al. 5626 which was cited in DAVID et al. (2007) as *D. gaultheriifolia* belongs in reality to *D. inconstans* subsp. *obovata*.

Specimens examined: **Brasil, Alagoas, Maceió**, [ca. 9°40' S, 35°45' W], woods; common in sandy shrubby places, (fl male, fr), Feb.–Apr. 1838, **G. Gardner 1412** [BM 2×, F 2×, FI-W n.s. (dig. photo), G 2×, GH, K 3×, MG n.s. (dig. photo), NY, OXF, P 3×, US, W 2×], "a shrub ca. 12 or 14 feet high"; – Maceió, Restinga da Praia do Francês, ca. 9°42' S, 35°52' W [correct seems to be ca. 9°46' S, 35°51' W], mata de restinga rala; solo arenoso branco; com muitos *Anacardium occidentale*, *Tapirira guianensis*, *Protium heptaphyllum*, Myrtaceae, (fl male), 26 Jan. 1993, **J.R. Pirani & J.A. Kallunki 2671** [FHO, MAC n.s., NY n.s. (dig. photo), RB n.s. (dig. photo), SPF n.s. (dig. photo), W 2×], "árvore 7 m; com longos ramos decumbentes e folhas deflexas, a lamina revoluta, lustrosa na face superior, discolor; botões creme"; – Mun. de Marechal Deodoro, APA de Santa Rita, Reserva ecológica do Saco da Pedra, [9°42' S, 35°50' W], restinga; vegetação arbórea aberta sobre cordões litorâneos, (fl female, yfr), 28 Aug. 1987, **G.L. Esteves & R.P. Lyra-Lemos 1986** [MAC n.s., SPF 2×], "árvore ca. 5 m; pétalas alvas, carnosas"; – same data: (fl female, yfr), 17 May 1988, **G.L. Esteves et al. 2096** [K, MAC n.s., SPF], "arbusto ca. 2 m"; – Município de Barra de São Miguel, 8 km do entroncamento do Francês, 9°45'57" S, 35°49'25" W, restinga arbustiva, sobre dunas, (fl female), 13 Feb. 2001, **R.P. Lyra-Lemos & E.M. Duarte 5491** [HUEFS n.s. (dig. photo), MAC n.s.], "árvore ca. 1 m; ramos decumbentes; botões verdes; flores brancas"; – Junqueiro, Serra da Maçaranduba, 9°56'20.5" S, 36°27'36.5" W, cerrado, (fr), 14 Sep. 2002, **A.L.S. Santos 66** [EAC n.s. (dig. photo), MAC n.s.], "arbusto 1,5–2 m; frutos imaturos verdes e peludos"; – Mun. Coruripe, Coruripe, Usina Coruripe, Fazenda Riachão Bloco Neves, 10°0'55" S, 36°16'37" W, mata atlântica, (fl male), 25 Nov. 2004, **M.A.B.L. Machado 521** [EAC n.s. (dig. photo), MAC n.s.], "árvore ca. 3 m; botões verdes e flores brancas"; – same area: Mata do Capiatã, 130–135 m, 9°59'40.3"–10°0.95' S, 36°14.233'–36°15.498' W, Atlantic coastal rain forest (mata de tabuleiro), (fr), 4 Nov. 2002, **W.W. Thomas et al. 13281** [CEPEC n.s. (dig. photo), HUEFS n.s. (dig. photo), NY n.s. (dig. photo), RB n.s. (dig. photo), SPF n.s. (dig. photo), W], "tree 3 m; fruit dark olive green"; – same data and collectors: (fl male), 4 Nov. 2002, **13295** [CEPEC n.s. (dig. photo), HUEFS n.s. (dig. photo), NY n.s., RB n.s. (dig. photo), SPF n.s. (dig. photo), UFRN n.s. (dig. photo), W 2×], "tree 3–6 m; calyx pale olive; corolla white"; – same area: Fazenda Progresso, Bloco Candieiro, "10003°70' S, 36131°80' W" [ca. 10°0' S, 36°13' W], mata atlântica, (st), 30 Aug. 2001, **M.A.B.L. Machado & I.A. Bayma 42** [EAC n.s. (dig. photo), MAC n.s.], "arvoreta ca. 7 m; botões verdes"; – same area: Barro Vermelho, [ca. 10°7' S, 36°17' W], mata atlântica, (fl male), 22 Jun. 2012, **M.C.S. Mota & E.C.O. Chagas 11700** [MAC n.s., RB n.s. (dig. photo)], "árvore ca. 5 m; flores masculinas, cremes"; – same area: Fazenda Capiatã A (on an extra label: 10°12'56" S, 36°17'56" W), mata atlântica; borda da mata; encosta, (fl male), 5 Apr. 2005, **M.A.B.L. Machado 587** [ASE n.s. (dig. photo), MAC n.s.], "flores amarelas"; – Penedo, [10°18' S, 36°35'

Fig. 7: *Diospyros gaultheriifolia* from the restinga forests in Bahia, Brazil: a: whole plant; – b: twig with fruits; – c: female flowers; d: immature fruit; – e: detached corolla displaying the ring of staminodia; – photos a–b: courtesy of Eloina Neri de Matos; c–e: courtesy of Alex V. Popovkin (both from Bahia).



W], restinga, (fl male), 15 Mar. 1981, **C.T. Rizzini & H. de Mattos Filho 1522** [RB 2× n.s. (dig. photos)], "arbusto ca. 3 m"; – Piaçabuçu, Povoado Murici, Várzea de Marituba, 10°18.06' S, 36°24.09' W, restinga arbórea, mata arenosa, (fr), 15 Mar. 2003, **R. Lemos et al. 7483** [MAC n.s., UFRN n.s. (dig. photo)], "árvore ca. 3 m; folhas coriáceas com margem revoluta; frutos maduros pilosos"; – Feliz Deserto, Folha SC.24.ZB, ponto 19, 10°20' S, 36°19' W, restinga; solo arenoso, (fl female), 25 Feb. 1978, **R.P. Orlandi 188** [RB n.s. (dig. photo)], "arvoreta; flores alvo-amareladas".

Sergipe, Japarutuba, Mata do P.A. Ivan Ribeiro (INCRA), [ca. 10°34' S, 36°56' W], borda de mata, (fl male), 6 Jan. 1997, **M. Landim et al. 1127** [ASE n.s., CEN n.s. (dig. photo), UFRN n.s. (dig. photo)], "arvoreta ca. 3 m; botões esverdeados; fruto imaturo verde e maduro esverdeado amarelo"; – Santo Amaro das Brotas, [ca. 10°47' S, 36°59' W], restinga, (fl male), 25 Mar. 2011, **J.E. Nascimento-Júnior et al. 851** [ASE n.s., UEC n.s. (dig. photo)], "árvore 4 m; flores creme"; – Município de Barra dos Coqueiros, km 1 da rodovia SE-100, sentido Terminal Portuário Barra, [ca. 10°54' S, 37°1' W], restinga remanescente alta, arbustiva com moitas, (fl female, yfr), 19 Nov. 1991, **C. Farney 2898** [CEPEC n.s. (dig. photo), MBM n.s., NY n.s. (dig. photo), RB n.s. (dig. photo)], "árvore 6 m; ramos longos, flexuosos; folhas longas cocleariformes, verdes, discolorés; cálice castanho; corola alaranjada; frutos imaturos castanhos esverdeados"; – Barra dos Coqueiros, [ca. 10°54' S, 37°1' W], interior da restinga, (fr), 17 Jul. 1998, **A. Cruz & E. Santos 73** [ASE n.s. (dig. photo)], "árvore ca. 3 m; presença de muitos frutos imaturos (marrons peludos)"; – Município Itaporanga d'Ajuda, 40 km S of Aracaju on SE-99 to Povoado Paraé, then 4 km Fazenda Trapsa, 40 m, 11°09'59" S, 37°15'22" W, disturbed moist forest (tabuleiro forest) over sand and clay; habitat for *Calicebus coimbrae*, (fr), 3 Nov. 2011, **W.W. Thomas et al. 15585** [JPB n.s., NY n.s. (dig. photo), W], "tree 4 m; fruit green becoming yellow"; – same area: Fazenda Trapsa, [ca. 11°10' S, 37°15' W], mata atlântica, (st), 25 Aug. 2009, **J.P. Souza-Alves ASE 15449** [ASE n.s., RB n.s. (dig. photo)]; – Mun. de Santa Luzia do Itanh, Crasto, ca. 2 km na estrada Crasto para Sta. Luzia do Itanh, [ca. 11°22' S, 37°26' W], mata costeira; restinga arbórea intercalada com coqueiral; várzea e campos úmidos, (fr), 5 Oct. 1993, **A.M. de Carvalho et al. 4328** [ASE n.s., CEPEC n.s. (dig. photo), NY, W], "árvore ca. 6 m; folhas discolorés com face inferior verde mais claro algo ferrugineas; frutos imaturos verdes com indumento ferrugíneo"; – same area: entrada a 1 km à esquerda da estrada Santa Luzia/Crasto, ca. 1 km adentro, [ca. 11°22' S, 37°26' W], mata, (fl male), 29 Nov. 1993, **S.C. de Sant'Ana et al. 458** [FHO, NY], "árvore ca. 6 m; flores com pétalas brancas"; – same area: RPPN Mata do Crasto, 11°23'31" S, 37°25'7" W, mata atlântica; área antropizada; borda da mata; solo areno-argiloso, (defl, galled), 4 Jul. 2010, **A.P. Prata et al. 2285** [NY n.s. (dig. photo), RB n.s. (dig. photo), W], "arbusto ca. 2,9 m; frutos pilosos castanhos com indumentos ferrugíneos"; – Mata do Crasto, 2–20 m, 11°36'70" S, 37°41'70" W [correct is 11°24' S, 37°25' W], (fr), 2 Mar. 2011, **W.W. Thomas et al. 15268** [JPB n.s., NY n.s., RB n.s., W], "tree 6 m; calyx olive green; fruit pale green with golden stiff hairs"; – Indiaroba, P.A. Sepé-Tiaraju II, 11°30'44" S, 37°34'47" W, mata atlântica, (flbuds male), 24 Oct. 2007, **C. Gomes ASE 33278** [ASE n.s. (dig. photo)].

Bahia, Jandaíra, Fazenda Rio Fundo, 11°35'42" S, 37°43'52" W, mata ombrófila densa, em estágio avançado de regeneração; substrato areno-argiloso, (fr), 11 May 2000, **M.L. Guedes et al. 7505** [ALCB n.s., CEPEC n.s. (dig. photo), HUEFS n.s. (dig. photo)], "arbusto 4 m; folhas coriáceas, discolorés; face abaxial com tomento ferrugíneo; frutos imaturos verdes, com pelos hirtos ferrugíneos; cálice persistente amarelo"; – Jandaíra, próximo entrada faz. Luzomar [Lusomar], 11°36'46" S, 37°27'30" W, (fr), 23 Jul. 2011, **E. Matos et al. 157** [HUEFS n.s. (dig. photo)], "árvore ca. 6 m; frutos verdes"; – Conde, Cavalo Russo, 11°44'76" S, 37°31'49" W [correct is probably 11°44'16" S, 37°31'49" W], (fr), 20 Mar. 2003, **N.G. Jesus et al. 1765** [HUEFS n.s. (dig. photo), HUNEB n.s.], "arvoreta 4 m, ocasional; folhas cartáceas; fruto amarelo-alaranjado"; – Conde, Fazenda Cezo, 11°53'30" S, 37°36'2" W, restinga, floresta, (fr), 29 Jul. 2011, **E. Matos et al. 2699** [HUEFS n.s. (dig. photo)], "árvore 4 m; fuste 1; CAP 12 cm"; – Conde, Sítio do Conde, Fazenda Cezo, 11°53'20" S, 37°36'4" W, restinga, floresta, (fr), 25 Nov. 2011, **E.N. de Matos & G. Vidal 2704** [HUEFS n.s. (dig. photo), W], "árvore 7 m; fuste 1; CAP 23,5 cm"; – Entre Rios, Rio do Negro valley, Fazenda Rio do Negro, ca. 15 km SE of Entre Rios, 153 m, 12°1' S, 38°3' W, riparian forest; residual stands of the Atlantic forest; restinga-type forest, (fr), 8 Feb. 2012, **A.V. Popovkin & J.C. Mendes 1056** [HUEFS n.s. (dig. photo)], "tree 5 m"; – same area: 12°1' S, 38°2' W, [Popovkin via email: at the edge of the former tabuleiro forest but now a *Eucalyptus* plantation], (fl female), 14 Dec. 2009, **A.V. Popovkin 640** [HUEFS n.s. (dig. photo)], "tree 4 m; pistillate flowers white, [Popovkin via email: with leafy branches concentrated at the top; pistillate flowers 5- and 6-merous]; – same locality: (fr), 8 May 2010, **A.V. Popovkin 698** [HUEFS n.s. (dig. photo)], "tree 4 m"; – (fr), 17 Aug. 2010, **A.V. Popovkin 731** [HUEFS n.s. (dig. photo)], "tree 4 m"; – same area: 12°2' S, 38°1' W, (fl female, fr), 1 Dec. 2010, **A.V. Popovkin & J.C. Mendes 813** [HUEFS n.s. (dig. photo)], "tree 5 m; pistillate flowers and fruit"; – same area: 12°3' S, 38°0' W, (yfr), 17 Feb. 2010, **A.V. Popovkin 663** [HUEFS

n.s. (dig. photo)], "tree 4 m"; – Entre Rios, Imbé, 150 m, 12°3' S, 38°0' W, mata atlântica, (st), 14 Jan. 2010, **A.V. Popovkin & J.C. Mendes 649** [HUEFS n.s. (dig. photo)], "tree 4 m"; – same locality and collectors: (st), 10 Mar. 2010, **671** [HUEFS n.s. (dig. photo)], "tree 15 m"; – same area and collectors: 150 m, 12°5' S, 38°0' W, (fr), 7 May 2015, **1903** [HUEFS n.s. (dig. photo)], "tree 10 m; fruit immature"; – Mata de São João, Praia do Forte, Folha SD.24-X-A, 12°31'48" S, 38°1'28" W, restinga, (fr), 10 Feb. 2001, **M. Hohlenwerger 34** [HRB n.s., HUEFS n.s. (dig. photo)], "arbusto ca. 3 m; ramos pendentes aproximando-se do solo; folhas crassas, distica; frutos maduros cor laranja"; – Praia do Forte, AC4B, [12°34' S, 38°0' W], (fl male), 29 Aug. 2010, **H. Adorno 24** [HUEFS n.s. (dig. photo), PEUFR n.s., RB n.s. (dig. photo), UFRN n.s. (dig. photo)], "arbusto ca. 1,2 m; ramos marrom-acinzentados; folhas coriáceas; botões florais em estágio inicial de desenvolvimento; sépalas verde-claro; pétalas creme"; – same area: (fr), 19 Dec. 1953, **C. Adilson & Augusto 1** [ALCB n.s., HUEFS], "folha coriácea, discolor; flores de cor amarelada"; – Mun. Mata de São João, restinga arbórea, interior da mata, (fr), 12 Jul. 2013, **A.M. Miranda et al. 6596** [HUEFS n.s. (dig. photo), PEUFR n.s., RB n.s. (dig. photo)], "arvoreta ca. 4 m, ocasional; caule verde-amarronzado; folhas coriáceas; frutos maduros marrons"; – Litoral Sul, Itagibá, Mata do Cacau, 14°0' S, 39°0' W [?], mata de Cabruca, (defl, galled), 14 Jul. 2009, **M.L. Guedes et al. 16434** [ALCB n.s., NY n.s. (dig. photo)], "árvore ca. 6 m; ramos pendentes; folhas coriáceas, discoloreres, face abaxial com tomento ferrugíneo; cálice e pecíolos com indumento ferrugíneo"; – Almadina, Serra do Corcovado, acesso pela vertente oposta à de Seu Francisco, área denominada de Corcovado São Domingos, acesso pela Fazenda Aleluia, proprietário Sérgio Brito, Contato seu China, 14°42'6" S, 39°38'12" W [correct seems to be: 14°42' S, 39°36' W], floresta ombrófila densa montana, (fl female), 8 Jun. 2012, **M.M. Coelho et al. 772** [CEPEC n.s. (dig. photo)], "árvore ca. 15 m; folhas ferrugíneas na face abaxial; botões florais verde-ferrugíneos; flores femininas com cálice verde, ferrugíneo; pétalas alvas; gineceu alvo"; – same data: (flbuds male), 2 Feb. 2012, **M.M. Coelho et al. 589** [CEPEC n.s. (dig. photo)], "árvore; caule ferrugíneo; botões florais verdes, pilosos"; – same area: rod. Almadina/Coaraci, ca. 5 km, 300–900 m, 14°42'13" S, 39°36'9" W, (fr), 19 Mar. 2006, **J.L. Paixão et al. 875** [CEPEC n.s. (dig. photo), HUEFS n.s. (dig. photo), NY, RB n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore ca. 15 m; folhas discoloreres; frutos imaturos verdes com cálice creme"; – Mun. Porto Seguro, entrada EPB2, Arrastão do Araipe, na Fazenda do Calimã, 81 m, 16°22'5.02" S, 39°11'24.08" W, mata; relevo plano; substrato areno-argiloso, (defl, galled), 5 Mar. 2002, **G.M.S. de Oliveira et al. 65** [CEN n.s. (dig. photo)], "arbóreo 6 m, CAP 7 cm; frequência: comum; flor branca"; – Porto Seguro, RPPN Estação Veracel, 100 m, 16°30' S, 39°15' W [correct is 16°23'17" S, 39°10'11" W], floresta de tabuleiros; interior de floresta alta; platô, (defl, galled), 17 Apr. 2010, **G.M. Carvalho & J.L. Paixão 369** [ALCB n.s. (dig. photo), CEPEC n.s. (dig. photo), RB n.s. (dig. photo)], "árvore ca. 10 m; folhas discoloreres; indumento ferrugíneo; flores alvas"; – Reserva Florestal de Porto Seguro, CVRD/BA, Est. Municipal, km 7.200, lado esquerdo, [16°23' S, 39°10' W], em floresta alta; mata de tabuleiro, (fl female), 27 Apr. 1988, **D.A. Folli 716** [CEN n.s. (dig. photo), CVRD n.s., RB n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore ca. 6 m; fuste cilíndrico, ca. 4 m, DAP 4 cm; casca áspera; diâmetro da copa ca. 1 m; flor e botão verde"; – entre Ajuda e Porto Seguro, [16°28' S, 39°5' W], (fr), 28 May 1962, **A.P. Duarte 6633** [CEPEC n.s., CESJ n.s., FHO (only carp. seen), HUEFS n.s. (dig. photo), K n.s., MBM n.s., MG 2×, NY 2×, RB n.s. (dig. photo), RBR n.s., SP n.s., SPF n.s. (dig. photo)], "pequena árvore grácil com ramos pêndulos e flexuosos"; – Teixeira de Freitas, Vale do rio Alcobaça [= rio Itanhém], [ca. 17°31' S, 39°38' W], mata, (fr), 12 May 1971, **T.S. dos Santos 1622** [CEPEC n.s. (dig. photo), FHO], "arvorezinha de 8 m; fruto verde".

Espirito Santo, Conceição da Barra, Reserva Biológica do Córrego Grande, estrada interna km 4, [18°16' S, 39°48' W], floresta alta sobre tabuleiro, (fr), 20 Mar. 2011, **M. Ribeiro et al. 465** [RB n.s. (dig. photo), SAMES n.s.], "árvore 4,5 m; fruto verde; tricomas de cor marrom claro".

***Diospyros riedelii* (HIERN) B.WALLN.**, Ann. Naturhist. Mus. Wien, B, 102: 427 (2000); – [Figs. 3, 8–9].

≡ *Diospyros peruviana* HIERN var. *riedelii* HIERN, J. Bot. 12: 240 (1874).

Typus: Brasil, Bahia, (fl male), s.d., **L. Riedel s.n.** [holotype: OXF (Figs. 8, 9a), isotypes: LE n.s.].

Note: The following collections display the same peculiar sort of indumentum on the calyx of the male flowers, and are thus most likely part of the type collection: (fl male),

s.d., **L. Riedel & G.H. von Langsdorff 666** [NY (ex LE)]; – Bahia, in sylva mand., (fl male), 23 Nov., **L. Riedel s.n.** [NY 2× (ex LE)], "arbor 12–15 ped.; flores albi".

Treilet or tree up to 16 m tall, already flowering when ca. 4 m tall, evergreen; twig apices and very young leaves densely covered with ± patent, straight, ochraceous-colored, long hairs; twigs terete, ± smooth, covered with well-spaced, patent, ± straight, 0.8–3.5 mm long hairs (the longer hairs prevailing), glabrescent with age; – **leaves** alternate; petioles 3–4 mm long, 1–1.5 mm thick, flat adaxially, medium densely covered with same indumentum as that on young twigs; leaf lamina narrowly ovate to lanceolate (= narrowly elliptic), less frequently oblong or ± asymmetrical, (2–) 7–16 cm long, (1–) 1.6–3.6 cm wide, (2.2) 3–6 times as long as wide, widest below the middle or sometimes at the middle, chartaceous; adaxial leaf surface glabrous (except the midvein and the secondary veins), slightly warty due to subepidermal stone-cell granules, grayish black (black when very young) and dull when dry; abaxial leaf surface with well-spaced, patent (± appressed after mechanical pressure), ± straight or distally flexuose, long hairs (densely covered with indumentum when young), dull and brown when dry; leaf apex acuminate, sometimes with a drip tip; base of the lamina cuneate or slightly rounded; leaf margins entire, revolute proximally, nearly flat elsewhere, densely covered with hairs; flachnectaria scattered on abaxial leaf surface, minute, ± circular, ca. 0.2 mm in diameter, few to ca. 10 (–25), hardly visible; midvein on adaxial side sunken proximally, ± flat distally, ± densely covered with ± patent, ± flexuose hairs, on abaxial side markedly prominent and medium densely covered with ± patent hairs of different length (the longest up to 3 mm); secondary veins ca. 10 per side, adaxially ± flat, scattered hairy when young, soon glabrescent, hardly or not visible on mature leaves, abaxially hairy and slightly prominent; higher order veins not visible adaxially, scarcely visible abaxially; – **male partial inflorescences** branched (axes hidden between the long hairs and hardly discernible), contracted, 1–1.5 cm long, placed in the axil of new but sometimes also of old leaves, up to ca. 10-flowered; stalks very short, hardly visible; pedicels of lateral flowers 1–5 mm long, ca. 0.5 mm thick; inflorescence axes ± densely covered with ± patent, straight or slightly flexuose, up to 2.5 mm long hairs; bracteoles 3–6 mm long, 1–2 mm wide, narrowly ovate to lanceolate, acute, with long hairs abaxially, ± glabrous adaxially, caducous during or shortly after flowering; – **flowers** 5 (–6)-merous; male flowers (Fig. 9a–c) 7–9 mm long at anthesis (when petals erect and with pedicels excluded); calyx 6–6.5 mm long and up to ca. 8 mm wide, undivided in the proximal 1–2 mm, green when alive, with well-spaced, patent, straight or only slightly flexuose, up to 2–3 mm long hairs abaxially (the type shows also shorter, more curled hairs between the longer ones); calyx lobes 3–4 mm long, 2–3 mm wide, triangular, acute, flat, inside ± densely covered with shorter, ± flexuose, ± appressed or spreading hairs, and with flexuose or ± curled hairs along the margins; sinuses between the calyx lobes not expanded; corolla white soon becoming brownish-red when alive, ca. 7 mm long, up to 12 mm wide, glabrous adaxially, usually with few, ± curved, ± spreading long hairs along the median line at the base of lobes on the outside, glabrous elsewhere (the type differs in having nearly up to the apex of the lobes a more dense, appressed indumentum along the median line); corolla tube 1.8–2 mm long; lobes 5–6 mm long, 5 mm wide, broadly rounded, widest in the distal half, with or without (the type) a tuft of hairs at the apex; stamens well exposed, 50–79 (Mori et al. 12824: 50 in a 5-merous flower; Blanchet s.n. ["1851"]: 67 in a 5-merous flower; Riedel s.n. [the type, counted by Hiern]: 72; Blanchet s.n. ["Ilheus"]: 79 in



Fig. 8: Holotype of *Diospyros riedelii* (HIERN) B.WALLN. [OXF].



Fig. 9: *Diospyros riedelii*: a: male inflorescences (from Riedel s.n., holotype [OXF]); – b: male inflorescences (from Blanchet s.n., “Illheos” [G]); – c: male flowers (from Blanchet s.n., “an schattigem Ort” [G]); – d: male flowers (from Mori et al. 12824 [NY]); – e: male flowers (from Mori et al. 12824 [MO]); – f: fruits (from Fiaschi & Sant’Ana 1078 [W]); – scale = 1 cm.

a 5-merous flower), usually free, some apparently in pairs, strongly differing in size, the outer 1.5–1.8, the inner ones up to 5 mm long; filaments 0.5–1 mm long, covered on both sides with long hairs, attached near the base of the corolla and on the receptacle; anthers 1–3.5 mm long, ca. 0.2 mm wide; connectives abaxially with up to 2 mm long, appressed or slightly spreading, \pm straight hairs (the distal hairs overtopping the apex of stamens up to ca. 1 mm), tapering into a 0.3–0.5 mm long, \pm flattened apex; rudiment of the ovary apparently missing; – **female flowers** not available; – stalk of the **fruits** up to 6–10 mm long, at the middle ca. 1 mm thick, widened distally, covered with patent long hairs; fruits (Fig. 9f) \pm globose, up to 2–3.5 cm in diameter, covered with small tubercles; indumentum on living fruits ferruginous (Amorim et al. 4677), composed of well-spaced up to ca. 3.5 mm long, \pm straight, patent bristles (usually placed on top of the tubercles), of very short, patent hairs and \pm curled minute, gland-like structures; fruit

body detaching with the calyx, green when immature and orange when mature (Fiaschi & Sant'Ana 1078); fruit wall ca. 0.5 mm thick, with tightly adhering epidermis when dry; calyx on fruits up to ca. 3 cm in diameter, undivided in the proximal ca. 3 mm, scattered hairy, green when alive; lobes 15–21 mm long, 4–4.5 mm wide, narrowly triangular, acuminate, spreading or flexed downwards; margins flat; area around the sinuses between the calyx lobes inconspicuous; seeds shaped like the segments of an orange, 20 mm long, 9 mm wide, 8 mm thick, finely striate.

Note: This species is imperfectly known. More collections are needed, and especially such with female flowers. – The inflorescences and flowers of Mori et al. 12824 and Salino et al. 9111 seem to be anomalous: although seemingly being those of female plants, they developed due to unknown reasons stamens instead of ovaries. The cymes of these plants are only 1 (–2)-flowered, the peduncles and pedicels much longer, and the flower buds much larger than those of true males (Fig. 9d–e). From Salino et al. 9111 I have seen only digital photos but on some close-up photos of the duplicate kept in BHCB, the exerted stamens can clearly be seen. The vegetative parts (stem, leaves, indumentum) of these specimens are identical with those of the other specimens representing genuine *D. riedelii*. A description of the inflorescences and flowers based on Mori et al. 12824 is added here separately: cymes up to 23 mm long (including the flower buds), with several large scales (resembling bracteoles) proximally; stalk (peduncles and pedicels) 5–10 mm long, 0.8 mm thick, medium densely covered with long, patent hairs; pedicels 3–5 mm long, also hairy; bracteoles 5–9 mm long, up to ca. 3 mm wide, lanceolate (= narrowly elliptic), glabrous adaxially, hairy abaxially; flower buds up to 12 mm long (calyx and corolla equal in length); calyx undivided in the proximal 3 mm; lobes up to 8.5 mm long, 3–4 mm wide, triangular, flat, warty due to subepidermal stone-cell granules on the outside (for indumentum: see the general description); corolla covered on the outside along the median line at the base of lobes with \pm straight or slightly curved, appressed hairs of different length; apical parts and especially the margins of the lobes with \pm scattered, \pm patent, short hairs; corolla elsewhere glabrous; corolla tube ca. 1 mm long; stamens 50 (only one 5-merous flower bud dissected), 2–4 mm long (indumentum as on males), some of them \pm irregular and split distally; filaments up to 0.3 mm long; anthers 1.3–2.5 mm long; apices of the connectives up to 1 mm long; pistillode apparently missing.

Distribution, habitat and phenology: The species occurs in the Atlantic forest (mata atlântica) biome, and is only known from the southern part of the federal state of Bahia and from a nearby area in northeastern Minas Gerais in Brazil (Fig. 3). It was collected in dense montane and submontane rainforests ("floresta ombrófila") at elevations of 300–900 m. – The species was found in flower from September to November, and with fruits in January, March, and September.

SANTOS & SANO (2009) indicated it for the "floresta ombrófila densa/aberta", and COELHO & AMORIM (2014) for the Atlantic forest. The collection Fiaschi & Sant'Ana 1078 is cited in AMORIM et al. (2005) as "*Diospyros* sp."

Specimens examined: **Brasil, Bahia**, Almadina, Serra do Corcovado, rod. Almadina/Coaraci, ca. 5 km, 300–900 m, 14°42'13" S, 39°36'9" W, floresta ombrófila densa montana, (fr), 19 Mar. 2006, **J.L. Paixão et al. 879** [CEPEC n.s. (dig. photo), HUEFS n.s. (dig. photo), RB n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore ca. 15 m; folhas discolores; frutos imaturos verdes com cálice verde"; – same Serra: 13,8 km ao SW de Coaraci na estrada para Almadina, Fazenda São José, proprietário senhor Francisco, 650–900 m, 14°42'21" S, 39°36'12" W, floresta ombrófila densa montana com algumas áreas perturbadas; interior de mata em área

de afloramento, (yfr), 30 Jan. 2005, **A.M. Amorim et al. 4677** [CEPEC n.s. (dig. photo), HUEFS n.s. (dig. photo), SPF n.s. (dig. photo)], "árvore ca. 16 m; ramos levemente ferrugíneos; folhas discolors, verde-claro com a face inferior opaca; cálice verde; frutos jovens cobertos por indumento ferrugíneo"; – Illheus [= Illhéus], [ca. 14°47' S, 39°3' W], (fl male), s.d., **J. Blanchet s.n.** [G 3×]; – an schattigem Ort [on a shaded place], (fl male), Nov. [ca. 1850], **J. Blanchet s.n.** [G 2×], "Strauch, braunrote Blume [shrub, brownish-red flower]": These two specimens are probably part of the former collection. One sheet bears the annotation "Feira St anna prov. Bahia 1850" and the other "Bahia Mr. Blanchet 1851"; – Jussari, rodovia Jussari/Palmira, estrada ca. 7,5 km de Jussari, Fazenda Teimoso, RPPN Serra do Teimoso, 15°9'29" S, 39°31'43" W, (fr), 19 Sep. 2002, **P. Fiaschi & S.C. Sant'Ana 1078** [CEPEC n.s. (dig. photo), NY n.s., SPF n.s. (dig. photo), W], "arvoreta ca. 5 m; folhas com face adaxial verde escura; frutos alaranjados"; – Mun. de Una, estrada que liga BR-101 (São José) com BA-265, a 17 km da primeira, ca. de 35 km ao S de Itabuna, [ca. 15°5' S, 39°22' W], região de mata higrofila Sul Baiana, (fl male), 27 Sep. 1979, **S.A. Mori et al. 12824** [CEPEC n.s. (dig. photo), K, MG n.s. (dig. photo), MO, NY, RB n.s. (dig. photo)], "arvorezinha 4 m × 3 cm; corola verde". – **Minas Gerais**, Bandeira, área ca. 14 km da sede de Bandeira, na divisa com a Bahia, 500–550 m, 15°49'30.2" S, 40°31'15.8" W, borda da mata; floresta ombrófila densa submontana; floresta razoavelmente alterada com trechos com bastante bambu, (fl male), 6 Oct. 2003, **A. Salino et al. 9111** [CEPEC n.s. (dig. photo), BHCN n.s. (dig. photo)], "árvore 5 m; cálice verde; corola branca; anteras castanho claro".

***Diospyros robotol* B.WALLN., sp.n.** – [Figs. 3, 10–11].

Typus: Brasil, Bahia, rodovia BR-5 [= the actual BR-101], 16 km S Eunápolis, [ca. 16°30' S, 39°35' W], plantação de cacau, (fr), 4 Oct. 1966, **R.P. Belém & R.S. Pinheiro 2723** [holotype: UB (Figs. 10–11), isotypes: CEPEC n.s. (dig. photo), IAN, MG, UB], "árvore ereta de 6 m × 8 cm diam.; frutos pilosos; coleção de madeira".

Note: I have studied and taken photos of the specimens kept in IAN and MG many years ago. One of the two specimens in UB shows only two large leaves.

Tree 6 m tall, with a diameter up to 8 cm, probably evergreen; twigs terete, reddish-brown, medium densely covered with spreading or ± patent, ± flexuose, up to 1.5 mm long hairs, glabrescent with age; – **leaves** alternate; petioles 6 mm long, 3 mm thick, ± flat adaxially, covered with same indumentum as the one on young twigs, glabrescent when old; leaf lamina slightly bullate, ovate, 15–24 cm long, 6–10.3 cm wide, 2.1–2.3 times as long as wide, widest below the middle, ± firmly chartaceous; adaxial leaf surface glabrous when mature, grayish black and dull when dry; abaxial leaf surface covered with well-spaced, patent, distally ± curved, up to 1.5 mm long hairs, dull and ferruginous brown when dry; leaf apex acute to acuminate; base of the lamina rounded or slightly truncate; leaf margins entire, slightly revolute; flachnectaria on abaxial leaf surface, minute, ± circular, ca. 0.2 mm in diameter, only two seen on one leaf; midvein sunken, its surface flat, covered with old remnants of indumentum adaxially, markedly prominent and densely covered with spreading to patent, slightly flexuose, up to 1.5 mm long hairs abaxially; secondary veins ca. 10 per side, sunken and glabrous adaxially, prominent and medium densely hairy abaxially; tertiary and quaternary veins ± sunken adaxially, slightly prominent and hairy abaxially; – **inflorescences** and **flowers** not known; – **fruits** (Figs. 10–11) globose or oblate, up to 3.7 cm in diameter and 2.5–3.5 cm in height, covered with small tubercles; indumentum on fruits composed of well-spaced, ca. 3 mm long, ± straight, patent bristles (usually placed on top of the tubercles), of short, patent hairs (± crowded around the base of the bristles) and ± curled minute, gland-like structures; calyx on fruits up to 6 cm in diameter and 2.5 cm in height, undivided in the proximal 7 mm, thick and hard, detaching with the fruit body; calyx medium densely covered with patent, ± straight hairs on the outside, on the inside densely covered with appressed hairs along the median



Fig. 10: Holotype of *Diospyros robolot* B.WALLN. [UB], (see also fig. 11).



Fig. 11: *Diospyros robolot*: a–b: fruit; – c: adaxial (on top) and abaxial (on bottom) side of calyx fragments (a–c from Belém & Pinheiro 2723, holotype [UB]); – scale = 1 cm.

line of the lobes, and medium densely to scattered with spreading or \pm patent, \pm flexuose, shorter hairs towards the margins; lobes 2.2 cm long and 1.8 cm wide, acute, appressed to the fruit only along the median line of the lobes, longitudinally markedly bent outwards, but margins involute; area around the sinuses between the calyx lobes expanded outwards; seeds not available.

Distribution, habitat and phenology: The species was apparently only collected once in 1966 in a cocoa plantation in the southern part of the federal state of Bahia in Brazil (Fig. 3), and has most likely become extinct in the meantime due to the immense and irresponsible destruction of the Brazilian coastal rain forests (see RIBEIRO et al. 2009). It was found in fruit in October.

Diospyros chloroxylon ROXB., Pl. Coromandel 1 (2): 38, t. 49 (1795).

= *Diospyros spinosa* HIERN, Trans. Cambridge Philos. Soc. 12 (1): 247–248 (1873).

Typus: "Brasilia, Martius" s.n., [holotype: M (Fig. 12; photo F 20083 at F, GH, US)].

Note: The specimen was provided with a wrong label which states only "Brasilia" and "Martius". At a later point Schultes added the name of the taxon and the place of publication. The twig on bottom on the right side displays a small tag with the number 144. This is not the number of a collector but it is instead an old internal number in the Munich herbarium and means: sheet 144 in the old Ebenaceae collection. An additional label states the following in German: "Hiervon wurde an Herrn Hiern eine Blume und Blatt abgegeben; er hielt sie für eine neue Ebenacea" (from this specimen a flower and a leaf was given to mister Hiern; who believed it to be a new species). It is unknown whether or not that leaf and the fragments of the flower were preserved. Hiern did not annotate the sheet but he certainly saw it because he visited Munich and described later on the specimen in detail in the protologue. He mentioned also the number 144. Although he published a world monograph of the Ebenaceae (HIERN

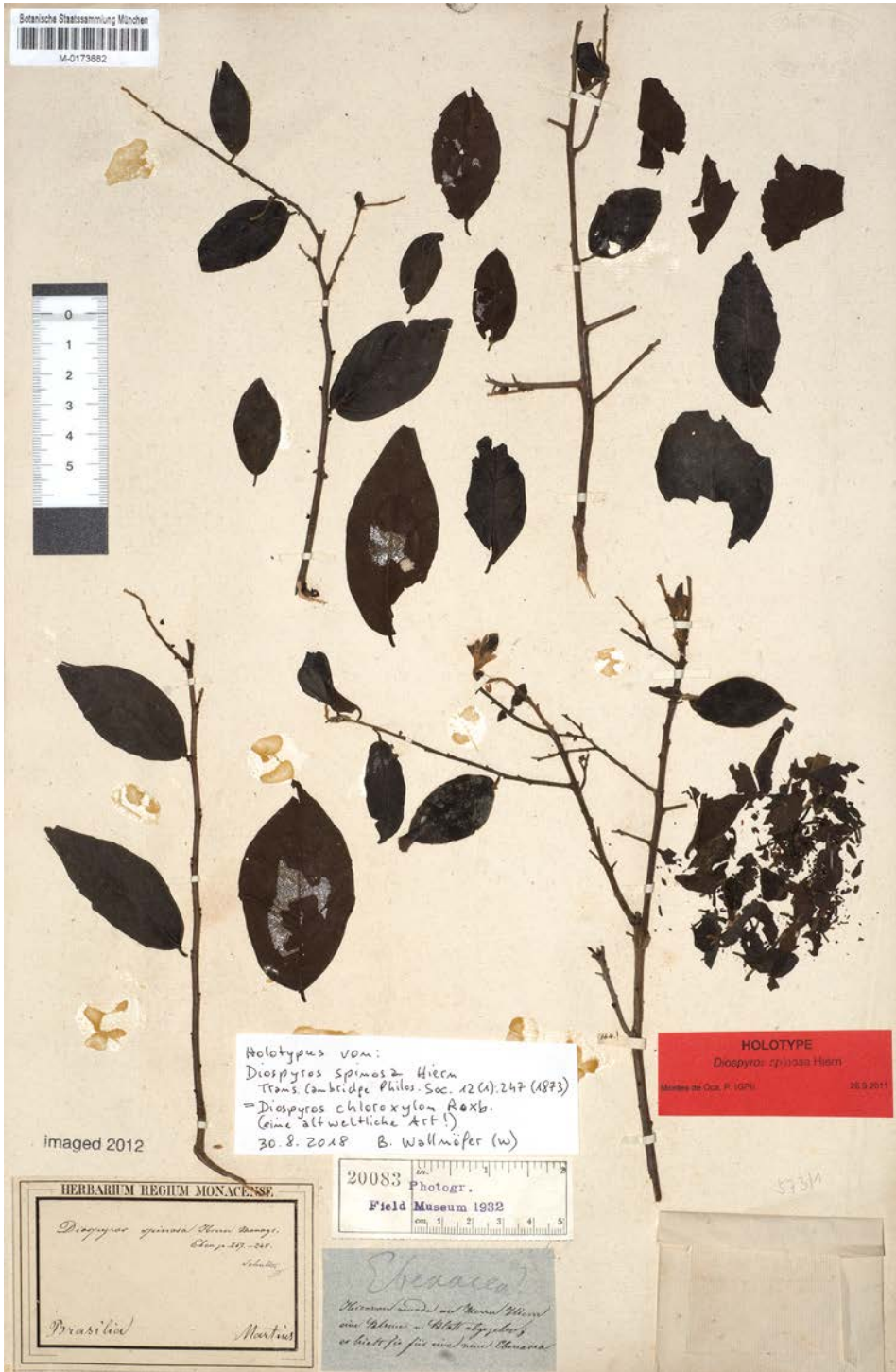


Fig. 12: Holotype of *Diospyros spinosa* HIERN [M].

1873), he astonishingly did not recognize the true identity of the plant. As can be seen in other cases (e. g., see under *D. revoluta* and *D. velutina* in WALLNÖFER 2014, and 2015c, respectively), he seems not to have had a good knowledge of the family. – The twigs of the holotype are displaying some thorns ("sprossdorns"), a feature which cannot be found on American species. – *D. chloroxylon* is an Indian species (see SINGH 2005).

Acknowledgements

I wish to thank the following persons for sending specimens, digital photos and for providing information: João Aguiar Nogueira Batista (BHCB), Taciana Cavalcanti (CEN), Andreas Fleischmann (M), Rafaela Campostrini Forzza (RB), Washington Marcondes-Ferreira (UEC), Josef Muhsil-Schamall (Vienna), Luciano P. de Queiroz (HUEFS), Matheus Fortes Santos (Brazil). Eloina Neri de Matos and Alex V. Popovkin (both from Bahia) sent me very informative photos of the living plants (see Fig. 7). Walter Till (WU) is acknowledged for critically reading the manuscript, Heimo Rainer (W, WU) for allowing me to use his application for ArcMap 10 for creating the distribution maps, Wolfgang Reichmann (Vienna) for arranging figure 7, Ines M. Ternbach (Vienna) for correcting the English, and our librarian Andrea Kourgli (Vienna) for procuring rare literature. – Special thanks go to the administrators and collaborators of the Brazilian internet platforms Reflora and SpeciesLink for making available thousands of digital photos of herbarium specimens! Last but not least, I am grateful to the directors and curators of approximately 100 herbaria who kindly made their herbarium material available or sent photos.

References

- AMORIM A.M., FIASCHI P., JARDIM J.G., THOMAS W.W., CLIFTON B.C. & CARVALHO A.M.V. DE, 2005: The vascular plants of a forest fragment in southern Bahia, Brazil. – *Sida* 21 (3): 1727–1752.
- CAVALCANTE P.B., 1963: Nova contribuição ao conhecimento do gênero *Diospyros* DALECH. (Ebenaceae) no Brasil. – *Bol. Mus. Paraense Emilio Goeldi, N. S., Bot.* 21: 1–15 (estampa I– II).
- COELHO M.M. & AMORIM A.M., 2014: Floristic composition of the montane forest in the Almadina-Barro Preto axis, southern Bahia, Brazil. – *Biota Neotropica* 14 (1): e20133878.
- DAVID J.P., MEIRA M., DAVID J.M., BRANDÃO H.N., BRANCO A., AGRA M. DE F., BARBOSA M.R.V., QUEIROZ L.P. DE & GIULIETTI A.M., 2007: Radical scavenging, antioxidant and cytotoxic activity of Brazilian caatinga plants. – *Fitoterapia* 78 (3): 215–218.
- DUANGJAI S., WALLNÖFER B., SAMUEL R., MUNZINGER J. & CHASE M.W., 2006: Generic delimitation and relationships in Ebenaceae sensu lato: evidence from six plastid DNA regions. – *Amer. J. Bot.* 93 (12): 1808–1827.
- DUANGJAI S., SAMUEL R., MUNZINGER J., FOREST F., WALLNÖFER B., BARFUSS M.J.H., FISCHER G. & CHASE M.W., 2009: A multi-locus plastid phylogenetic analysis of the pantropical genus *Diospyros* (Ebenaceae), with an emphasis on the radiation and biogeographic origins of the New Caledonian endemic species. – *Molec. Phylogen. Evol.* 52: 602–620.
- ESTRADA J. & WALLNÖFER B., 2007: Ebenaceae. – In: DUNO DE STEFANO R., AYMARD G. & HUBER O., (eds.): *Catálogo anotado e ilustrado de la flora vascular de los Llanos de Venezuela*, 460. – Caracas: FUDENA / Fundación Empresas Polar / FIBV.
- HIERN W.P., 1873: A monograph of Ebenaceae. – *Trans. Cambridge Philos. Soc.* 12 (1): 27–300.
- HIERN W.P., 1874: Notes on Ebenaceae; with description of a new species. – *J. Bot.* 12: 238–240.
- MATOS E.N. DE, 2014: Padrões de composição e dominância de florestas de restinga sob diferentes sedimentos e regimes climáticos. – Tese (doutorado): Universidade Estadual de Feira de Santana.

- MIQUEL F.A.G., 1856: Ebenaceae, Symplocaceae et Sapoteae. – In: MARTIUS C.F.P. VON, (ed.): Flora Brasiliensis, 7: 1–10 + 3 plates. – Lipsiae [Leipzig]: F. Fleischer.
- MOURA F. DE B.P. (ed.), 2006: A mata atlântica em Alagoas. – Maceió: EDUFAL.
- OLIVEIRA E.V. DA S., LIMA J.F., SILVA T.C. & LANDIM M.F., 2014: Checklist of the flora of the restingas of Sergipe State, northeast Brazil. – Check List 10 (3): 529–549.
- PARMENTIER P., 1892: Histologie comparée des Ébénacées dans ses rapports avec la morphologie et l'histoire généalogique de ces plantes. – Ann. Univ. Lyon 6 (2): 1–155.
- RIBEIRO M.C., METZGER J.P., MARTENSEN A.C., PONZONI F.J. & HIROTA M.M., 2009: The Brazilian Atlantic forest: how much is left, and how is the remaining forest distributed? Implications for conservation. – Biological conservation 142 (6): 1141–1153.
- ROXBURGH W., 1795: Plants of the Coast of Coromandel, 1. – London: W. Bulmer and Co.
- SANTOS M.F. & SANO P.T., 2009: Ebenaceae. – In: STEHMANN J.R. et al. (eds.): Plantas da Floresta Atlântica, 239–240. – Rio de Janeiro: Jardim Botânico do Rio de Janeiro.
- SINGH V., 2005: Monograph on Indian *Diospyros* L. (Persimmon, Ebony), Ebenaceae. – Kolkata: Botanical Survey of India.
- THIERS B., 2018: see websites.
- THOMAS W.W. & BARBOSA M.R. DE V., 2008: Natural vegetation types in the Atlantic coastal forest of northeastern Brazil. – In: THOMAS W.W. (ed.): The Atlantic coastal forest of northeastern Brazil. – Mem. New York Bot. Gard. 100: 6–20.
- WALLNÖFER B., 1999: Neue *Diospyros*-Arten (Ebenaceae) aus Südamerika. – Ann. Naturhist. Mus. Wien, B, 101: 565–592.
- WALLNÖFER B., 2000: Neue *Diospyros*-Arten (Ebenaceae) aus Südamerika – II. – Ann. Naturhist. Mus. Wien, B, 102: 417–433.
- WALLNÖFER B., 2001a: The Biology and Systematics of Ebenaceae: a Review. – Ann. Naturhist. Mus. Wien, B, 103: 485–512.
- WALLNÖFER B., 2001b: Lectotypification of *Diospyros cayennensis* A.DC. (Ebenaceae). – Taxon 50: 887–889 [see also the Erratum in Taxon 50 (4): 1319].
- WALLNÖFER B., 2003: A new species of *Diospyros* from southwestern Amazonia. – Ann. Naturhist. Mus. Wien, B, 104: 563–566.
- WALLNÖFER B., 2004a: A revision of *Lissocarpa* BENTH. (Ebenaceae subfam. Lissocarpoideae (GILG in ENGLER) B.WALLN.). – Ann. Naturhist. Mus. Wien, B, 105: 515–564.
- WALLNÖFER B., 2004b: Ebenaceae. – In: KUBITZKI K., (ed.): The families and genera of vascular plants, 6: 125–130. – Berlin, Heidelberg: Springer.
- WALLNÖFER B., 2004c: Lissocarpaceae. – In: KUBITZKI K., (ed.): The families and genera of vascular plants, 6: 236–238. – Berlin, Heidelberg: Springer.
- WALLNÖFER B., 2005: New species of *Diospyros* (Ebenaceae) from the Neotropics and additional information on *D. apeibacarpos*. – Ann. Naturhist. Mus. Wien, B, 106: 237–253.
- WALLNÖFER B., 2007–2018: A revision of neotropical *Diospyros* (Ebenaceae): part 1–11. – Ann. Naturhist. Mus. Wien, B, 108: 207–247, 110: 173–211, 111: 101–133, 112: 181–220, 113: 223–251, 115: 219–235, 116: 153–179, 117: 151–218, 118: 79–114, 119: 183–226, 120: 145–226.
- WALLNÖFER B., 2008a: Ebenaceae. – In: HOKCHE O., BERRY P.E. & HUBER O., (eds.): Nuevo Catálogo de la Flora Vascular de Venezuela, 356–357. – Caracas: Fundación Instituto Botánico de Venezuela Dr. Tobías Lasser.

- WALLNÖFER B., 2008b: Ebenaceae. – In: ZULOAGA F.O., MORRONE O. & BELGRANO M.J., (eds.): Catálogo de las Plantas Vasculares del Cono Sur. – Monogr. Syst. Bot. Missouri Bot. Gard. 107: 1987.
- WALLNÖFER B., 2010a: Ebenaceae. – In: FORZZA R.C. et al., (eds.): Catálogo de plantas e fungos do Brasil 2: 931–932. – Rio de Janeiro: Jardim Botânico do Rio de Janeiro.
- WALLNÖFER B., 2010b: Ebenaceae. – In: Lista de espécies da flora do Brasil. – Jardim Botânico do Rio de Janeiro. – <http://floradobrasil.jbrj.gov.br/2010/>.
- WALLNÖFER B., 2010c: Ebenaceae. – In: Flora de la Península de Yucatán. – Herbario CICY, Mérida, Yucatán, México. – <http://www.cicy.mx/sitios/flora%20digital/index.php>
- WALLNÖFER B., (ed.), 2012: EbonaBase: Ebenaceae GSD (version 1.0). – In: BISBY F. et al., (eds.): Species 2000 & ITIS Catalogue of Life, 24th September 2012. – Reading, UK: Species 2000. – Digital resource at www.catalogueoflife.org/col/.
- WALLNÖFER B., 2014: A revision of neotropical *Diospyros* (Ebenaceae): part 7. – Ann. Naturhist. Mus. Wien, B, 116: 153–179.
- WALLNÖFER B., 2015a: Ebenaceae. – In: BERNAL R., GRADSTEIN S.R. & CELIS M., (eds.): Catálogo de plantas y líquenes de Colombia. – Bogotá: Instituto de Ciencias Naturales, Universidad Nacional de Colombia. – <http://catalogoplantascolumbia.unal.edu.co>.
- WALLNÖFER B., 2015b: A new species and two new synonyms of *Diospyros* (Ebenaceae) from Mexico. – Stapfia 103: 111–113.
- WALLNÖFER B., 2015c: A revision of neotropical *Diospyros* (Ebenaceae): part 8. – Ann. Naturhist. Mus. Wien, B, 117: 151–218.
- WALLNÖFER B. & CHÁVEZ E., 2014: Ebenaceae. – In: JØRGENSEN P.M., NEE M.H. & BECK S.G., (eds.): Catálogo de las plantas vasculares de Bolivia. – Monogr. Syst. Bot. Missouri Bot. Gard. 127 (1): 572–574.
- WALLNÖFER B. & MORI S.A., 2002: Ebenaceae. – In: MORI S.A., CREMERS G., GRACIE C.A., GRANVILLE J.-J. DE, HEALD S.V., HOFF M. & MITCHELL J.D., (eds.): Guide to the vascular plants of central French Guiana, 2: Dicotyledons. – Mem. New York Bot. Gard. 76 (2): 254–257, pl. 50–51.

Used websites (accessed 2018)

Google: <https://www.google.at/>

Google Earth Pro

Google Scholar: <https://scholar.google.at/>

Herbarium NY: <http://sweetgum.nybg.org/science/vh/>

Reflora: <http://reflora.jbrj.gov.br/reflora/herbarioVirtual/>

SpeciesLink: <http://inct.splink.org.br/>

THIERS B., 2018 (continuously updated): Index Herbariorum: A global directory of public herbaria and associated staff. – New York Botanical Garden's Virtual Herbarium. <http://sweetgum.nybg.org/science/ih/>

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Annalen des Naturhistorischen Museums in Wien](#)

Jahr/Year: 2019

Band/Volume: [121B](#)

Autor(en)/Author(s): Wallnöfer Bruno

Artikel/Article: [A revision of neotropical Diospyros \(Ebenaceae\): part 12 271-298](#)