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Taxonomic studies of *Diospyros* (Ebenaceae) from the Malagasy region. V. Synoptic revision of the *Bernieriana* group in Madagascar and the Comoro Islands

George E. Schatz, Porter P. Lowry II & Peter B. Phillipson

Abstract

SCHATZ, G.E., P.P. LOWRY II & P.B. PHILLIPSON (2020). Taxonomic studies of *Diospyros* (Ebenaceae) from the Malagasy region. V. Synoptic revision of the *Bernieriana* group in Madagascar and the Comoro Islands. *Candollea* 75: 203–218. In English, English and French abstracts. DOI: <http://dx.doi.org/10.15553/c2020v752a5>

A synoptic revision of the *Bernieriana* group of *Diospyros* L. (Ebenaceae) in Madagascar and the Comoro Islands is presented in which seven species are recognized, including four new species that are described and illustrated (*Diospyros hongwae* G.E. Schatz, Lowry & Phillipson, *Diospyros ranirisonii* G.E. Schatz, Lowry & Phillipson, *Diospyros silicea* G.E. Schatz, Lowry & Phillipson, and *Diospyros suarezensis* G.E. Schatz, Lowry & Phillipson). A key to the species is provided, along with a risk of extinction assessment for each species using the IUCN Red List criteria. Two species are assessed as “Endangered” (*Diospyros hongwae* and *Diospyros silicea*), one as “Vulnerable” (*Diospyros ranirisonii*), two as “Near Threatened” (*Diospyros suarezensis* and *Diospyros torquata* H. Perrier), and two as “Least Concern” (*Diospyros bernieriana* (Baill.) H. Perrier and *Diospyros danguyana* H. Perrier).

Résumé

SCHATZ, G.E., P.P. LOWRY II & P.B. PHILLIPSON (2020). Études taxonomiques du genre *Diospyros* (Ebenaceae) de la région malgache. V. Révision synoptique du groupe *Bernieriana* à Madagascar et aux Comores. *Candollea* 75: 203–218. En anglais, résumés anglais et français. DOI: <http://dx.doi.org/10.15553/c2020v752a5>

Une révision synoptique du groupe *Bernieriana* du genre *Diospyros* L. (Ebenaceae) à Madagascar et aux Comores est présentée. Sept espèces sont reconnues dont quatre nouvelles décrites et illustrées ici (*Diospyros hongwae* G.E. Schatz, Lowry & Phillipson, *Diospyros ranirisonii* G.E. Schatz, Lowry & Phillipson, *Diospyros silicea* G.E. Schatz, Lowry & Phillipson, et *Diospyros suarezensis* G.E. Schatz, Lowry & Phillipson). Une clé d'identification des espèces est fournie ainsi qu'une évaluation préliminaire du risque d'extinction de chaque espèce selon les critères de la Liste Rouge de l'UICN. Deux espèces sont considérées comme «En Danger» (*Diospyros hongwae* and *Diospyros silicea*), une «Vulnérable» (*Diospyros ranirisonii*), deux «Quasi-menacée» (*Diospyros suarezensis* and *Diospyros torquata* H. Perrier), et deux «Préoccupation mineure» (*Diospyros bernieriana* (Baill.) H. Perrier and *Diospyros danguyana* H. Perrier).

Keywords

EBENACEAE – *Diospyros* – Madagascar – New species – New synonyms

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Introduction

An ongoing revision of the *Ebenaceae* of Madagascar, undertaken to update the *Flore de Madagascar et des Comores* treatment by PERRIER DE LA BÂTHIE (1952b), has revealed a large number of undescribed species in the genus *Diospyros* L. (SCHATZ & LOWRY, 2011, 2018, 2020; SCHATZ et al., 2013; MADAGASCAR CATALOGUE, 2020). Currently, of the c. 730 accepted species of *Diospyros* worldwide (GOVAERTS, 2020), 97 species are recognized in Madagascar, of which all but three species are endemic, and an additional 154 endemic species have been tentatively identified as new to science (MADAGASCAR CATALOGUE, 2020). Most Malagasy *Diospyros* species can easily be placed in one of about a dozen informal morphological groups recognized on the basis of vegetative and reproductive features. Such groups constitute hypotheses of monophyletic groups within *Diospyros* as revealed by analyses using molecular sequence data (DUANGJAI et al., 2006, 2009; LINAN et al., 2019). One such group, comprising *Diospyros bernieriana* (Baill.) H. Perrier and its putative relatives, has been named the Bernieriana group. It is characterized by axillary, solitary female flowers with a cupuliform to cylindrical-tubular to obconical calyx with an entire, truncate or sometimes shallowly lobed apex, the calyx strongly accrescent in fruit such that the fruit is usually wholly included within the calyx (the exceptions being *D. hongwae* G.E. Schatz, Lowry & Phillipson and *D. silicea* G.E. Schatz, Lowry & Phillipson in which the apex of fruit is visible and slightly exerted above the calyx), and the calyx irregularly tearing and breaking off during fruit maturation.

Three currently recognized species conform to the Bernieriana group (*D. bernieriana*, *D. danguyana* H. Perrier, and *D. torquata* H. Perrier), to which an additional four new species are herein described, each accompanied by an illustration and an assessment of its conservation status according to the IUCN Red List Categories and Criteria (IUCN, 2012). Because three of the species treated in this revision can form sufficiently large trees to be potential sources of ebony wood, which is under significant pressure in Madagascar from illegal, unsustainable exploitation (MASON et al., 2016), geo-coordinates and detailed locality data have been withheld for them, and public access to this information through the MADAGASCAR CATALOGUE (2020) has been restricted. Full specimen records and distribution maps are available for the remaining members of the group in the *Catalogue of the Plants of Madagascar* (MADAGASCAR CATALOGUE, 2020), and can also be found in the SONNERAT (2020) database. Post-facto georeferencing of historical specimens is indicated by square brackets.

Key to the species of the Bernieriana group of *Diospyros*

1. Leaf margins distinctly undulate 2
- 1a. Leaf margins flat or revolute, not distinctly undulate (weakly undulate in fresh material of *D. hongwae*) 3
2. Apex of fruit completely enclosed within the calyx; fruit spherical; N and NE Madagascar and the Comoro islands (Anjouan, Grande Comore, Mayotte and Moheli) 1. *D. bernieriana*
- 2a. Apex of fruit exerted above the calyx; fruit ellipsoid; Zombitsy, Tsihombe 5. *D. silicea*
3. Leaf blade with margins flat or slightly revolute, abaxial surface not at all obscured 4
- 3a. Leaf blade with margins strongly revolute, obscuring much of the abaxial surface on at least some leaves 5
4. Largest leaf blade 2–4(–5) cm long; apex of fruit enclosed within the calyx; free portion of calyx tubular; western forest, Bongolava to Kirindy 7. *D. torquata*
- 4a. Largest leaf blade 11–12 cm long; apex of fruit exerted above the calyx; free portion of calyx cupuliform; Behefaka, Irarona (S of Ambilobe) 3. *D. hongwae*
5. Leaves elliptic to obovate, broadest blade less than 3 times longer than wide, glabrous or initially with white farinose indument on the abaxial surface, glabrescent; accrescent portion of fruiting calyx entire; Antsiranana area S to Daraina 6. *D. suarezensis*
- 5a. Leaves narrowly elliptic or narrowly oblong to linear, occasionally narrowly obovate, broadest blade at least (3–)4–8 times longer than wide, with rufous farinose indument on abaxial surface and sometimes adaxial surface, rarely glabrous; accrescent portion of fruiting calyx distinctly lobed 6
6. Female flowers narrowly ellipsoid, 11–15 mm long, at least 2 times longer than wide; mature fruit 12–16 × 7–10 mm, the lobes of the calyx 6–8 mm long; far N of Madagascar 4. *D. ranirisonii*
- 6a. Female flowers ellipsoid to subspherical, 5–10 mm long, only slightly longer than wide; mature fruit 10–13 × 6 mm, the lobes of the calyx 3 mm long; central and southern Madagascar 2. *D. danguyana*

Clé d'identification des espèces de *Diospyros* du groupe Bernieriana

1. Marges des feuilles distinctement ondulées 2
- 1a. Marges des feuilles planes ou révolutes, pas distinctement ondulées (légèrement ondulées en matériel frais de *D. hongwae*) 3
2. Apex du fruit complètement entouré par le calice; fruit sphérique; N et NE de Madagascar et des Îles Comores

- (Anjouan, Grande Comore, Mayotte et Mohéli) 1. *D. bernieriana*
- 2a. Apex du fruit prolongé au-delà du calice; fruit ellipsoïde; Zombitsy, Tsihombe 5. *D. silicea*
3. Limbe foliaire plane ou à marges légèrement revolutées, surface abaxiale visible 4
- 3a. Limbe foliaire fortement révoluté, cachant beaucoup de la surface abaxiale sur au moins certaines feuilles 5
4. Limbe de la feuille la plus grande mesurant 2–4(–5) cm de long; apex du fruit entouré par le calice; partie libre du calice tubulaire; forêts occidentales, Bongolava à Kirindy 7. *D. torquata*
- 4a. Limbe de la feuille la plus grande mesurant 11–12 cm de long; apex du fruit dépassant le calice; partie libre du calice cupuliforme; Behefaka, Irarona (au S d'Ambilobe) 3. *D. hongwae*
5. Feuilles elliptiques à obovales, limbe le plus large moins de 3 fois plus long que large, surface abaxiale glabre ou initialement portant un indument farineux, glabrescent; partie accrescente du calice en fruit entière; région d'Antsiranana jusqu'à Daraina 6. *D. suarezensis*
- 5a. Feuilles étroitement elliptiques ou étroitement oblongues à linéaires, parfois étroitement obovales, limbe le plus large au moins (3–)4–8 fois plus long que large, surface abaxiale portant un indument roux-farineux, parfois également sur la surface adaxiale, rarement glabre; partie accrescente du calice en fruit nettement lobée 6
6. Fleurs femelles étroitement ellipsoïdes, 11–15 mm de long, au moins 2 fois plus longues que larges; fruit mature 12–16 × 7–10 mm, lobes du calice 6–8 mm de long; extrême N de Madagascar 4. *D. ranirisonii*
- 6a. Fleurs femelles ellipsoïdes à subsphériques, 5–10 mm de long, à peine plus longues que larges; fruit mature 10–13 × 6 mm, lobes du calice 3 mm de long; parties centrale et sud de Madagascar 2. *D. danguyana*

Systematics

1. *Diospyros bernieriana* (Baill.) H. Perrier in Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 4: 154. 1952.

= *Olex bernieriana* Baill. in Adansonia 3: 121. 1862.

Holotypus: MADAGASCAR. **Reg. DIANA [Prov. Antsiranana]:** “In Malacassia, Diégo Suarez”(= Madagascar, Antsiranana), s.d., fr., *Bernier 259 A'* (P [P00573708]!; iso-: P [P00573568]!).

= *Diospyros hildebrandtii* Gürke in Bot. Jahrb. Syst. 14: 312. 1892. = *Diospyros haplostylis* var. *hildebrandtii* (Gürke) H. Perrier in Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 4: 135. 1952. **Lectotypus** (designated here): MADAGASCAR.

Reg. DIANA [Prov. Antsiranana]: “Vavatobé”, II.1880, fr., *Hildebrandt 3319* (P [P00573728]!; isolecto-: G [G00341339, G00341340]!, JE [JE00000257, JE00000258] image seen, M [M0105326] image seen, P [P00573729]!, US [US00113447] image seen, W [W-18890089177] image seen).

Vernacular names. – “Jobiampototra” (*Leopold 142*); “Kirandrambiavy” (*Be et al 100, 125*; *Service Forestier 6274*); “Kirandrambiavy vavy” (*Christian et al. 71*); “Luangati mainty” (*Barthelat et al. 331*); “Mampingo” (*Andriamihajarivo et al. 1067*); “Mapingo” (*Service Forestier 5581*); “Tamtam hazou” (*Barthelat et al. 331*); “Tongozo lolo” (*Pascal 943*).

Distribution and ecology. – *Diospyros bernieriana* is known from dry to subhumid forest on both sand and calcareous substrates from Oranjia south to Vohemar along the east coast of Madagascar and Mahajanga along the west coast, as well as from Mayotte, Mwali and Grande Comore (MADAGASCAR CATALOGUE, 2020), at an elevation of 0–432 m.

Conservation status. – *Diospyros bernieriana* has a geographic range in the form of an Extent of Occurrence (EOO) of 188,912 km² and a minimum Area of Occupancy (AOO) of 148 km². It is present in the Andrafiarana Andavakoera, Ankarana, Antrema, Loky Manambato, Montagne des Français, and Oranjia protected areas. Outside of protected areas, it is threatened by fire, forest clearing for agriculture, grazing, and exploitation for firewood and house construction material. With respect to the principal threat of forest clearing for agriculture, it exists at 35 locations. Therefore, *D. bernieriana* can be assessed for its risk of extinction as “Least Concern” [LC].

Notes. – *Diospyros bernieriana* is one of only three Malagasy members of the genus that are not endemic to the island (MADAGASCAR CATALOGUE, 2020). It is characterized by leaves with distinctly undulate margins and a calyx in fruit that completely encloses the fruit (Fig. 1A).

Two sheets of *Bernier 259* are deposited in the Paris herbarium, one of which is annotated “*Olex bernieriana* H. Bn.” in Baillon’s hand, which we take to be the holotype. A second sheet of *Bernier 259* with the original label is a mixture, comprising a small branch of *D. bernieriana* and a second branch that is clearly assignable to *D. haplostylis* Boivin ex Hiern. This sheet has an annotation label prepared by Perrier de la Bâthie indicating that he assigned it to *D. haplostylis* var. *hildebrandtii*, and indeed he cited *Bernier 259* under that name. In order to avoid any possible confusion, we have therefore annotated the material belonging to *D. bernieriana* as *Bernier 259 A'* and that to *D. haplostylis* as *Bernier 259 B*. The holotype of *D. hildebrandtii* at B was destroyed. We have therefore selected the best preserved of the two sheets at P as the lectotype.

Additional material examined. – **COMOROS. Anjouan (Ouani):** *sine loco*, 100 m, 28.XI.1963, ♂ fl., *Service Forestier* 21748 (P). **Grande Comore (Ngazidja):** inter Mitsamiouli et Ivoini, [11°22'20"S 43°20'40"E], 10 m, 3.XII.1967, ♂ fl., *Bernardi* 11692 (G, MO, P, US). **Moheli (Mwali):** Djando, Itasmia, Chisswa Madahani, 22.XI.1999, fr., *Labat et al.* 3193 (CNDRS, G, K, MO, P); Hamavouno, Lac de Boundouni, 26.V.2006, fr., *Labat* 3701 (MO, P); Wanani, Itsamia, au dessus de Boundouni, 26.XI.1999, ♂ fl., *Labat et al.* 3232 (CNDRS, G, K, MO, P).

MADAGASCAR. Reg. Boeny [Prov. Mahajanga]: Ambalakida, forêt à l'W Alanandriamisasa, 20.IV.2007, fr., *Miandrimanana et al.* 114 (MO, P, TAN); Antrema, IV.2011, *Ranaivoson et al.* 12-0063/V (DBEV); forêt d'Antsahanitia, 19.II.2010, fr., *Silo National des Graines Forestières (SNGF)* 2443 (K, P, TAN). **Reg. DIANA [Prov. Antsiranana]:** Andavakoera, 9.I.2006, fr., *Leopold et al.* 142 (CNARP, MO, P, TAN); Andrafiabe, presqu'île entre Ambolobozobe et Ambolobozokely, 9.II.2005, fr., *Ratovoson* 975 (CNARP, MO, P, TAN); *ibid. loco*, Ampasimena, 28.XII.2008, fr., *Christian et al.* 71 (CNARP, MO, P, TAN); *ibid. loco*, 16.VI.2005, fr., *Be* 125 (CNARP, MO, P, TAN); Ankarana, 29.IV.1966, fr., *Service Forestier* 24732 (G, K, MO, P); Ankerika, 7.II.1966, ♀ fl., *Service Forestier* 24537 (G, K, MO, P, TEF); baie des Sakalaves, 13.III.1988, fr., *Cheek & Rakotozafy* 1485 (K, MO, P, TAN); aux env. de la Baie de Rigny et à Diégo-Suarez, s.d., ster., *Richard* 112 (P); sur la piste d'Ambilobe à Ambakirano, [13°14'S 49°09'E], 9.III.1964, fr., *Service Forestier* 23415 (MO, P); à l'E. de Diégo-Suarez, 25.II.1964, fr., *Service Forestier* 23253 (MO, P); *ibid. loco*, 23.I.2005, fr., *Ratovoson et al.* 768 (CNARP, MO, P, TAN); *ibid. loco*, 15.XII.1963, ♂ fl., *Service Forestier* 22957 (MO); *ibid. loco*, 15.XII.1963, ♀ fl., fr., *Service Forestier* 22958 (G, K, MO, P, TEF, WAG); forêt d'Ambararata, 13.II.2005, fr., *Schatz et al.* 4256 (CNARP, MO, P, TAN); forêt d'Ankonahona, 25.I.2007, fr., *Rakotonandrasana et al.* 1152 (CNARP, MO, P, TAN); forêt de Sahafary, 15.II.2005, fr., *Schatz et al.* 4298 (CNARP, MO, P, TAN); forêt Orangéa, 30.III.2015, fr., *Tombonirina* 77 (MO, P, TAN); *ibid. loco*, 15.XII.1963, buds, *Service Forestier* 22958 (G, K, MO, P, TEF, WAG); Mahavanona, Mahagaga, Ampitilantiambo, 12.VI.2004, fr., *Razafitsalama et al.* 602 (CNARP, MO, P, TAN); Montagne des Français, 13.XII.2006, buds, *Andriamihajarivo & et al.* 1067 (CNARP, MO, P, TAN); *ibid. loco*, 24.III.1955, ♂ fl., *Service Forestier* 13138 (TEF); Ambato massif, 16.II.1993, fr., *Birkinshaw* 232 (MO, P); Nosy Voanio, 18.III.2006, fr., *Razafitsalama* 957 (CNARP, MO, P, TAN); Oranjia, 14.I.2011, fr., *Schatz et al.* 4342 (MO); *ibid. loco*, 26.III.2019, fr., *Randriamahazomanana* 25 (MO, P, TAN); Ambodivahibe, 18.V.2005, fr., *Be* 100 (CNARP, MO, P, TAN); *ibid. loco*, 19.V.2005, fr., *Ramananjana* et al. 311 (CNARP, MO, P, TAN); rte de Ramena, 18.X.2013, fr., *SNGF* 3258 (K, MO, P, TAN, TEF). **Reg. SAVA [Prov. Antsiranana]:** Loky Manambato, 6.X.2013, ster., *Manjakahery et al.* 455 (MO, TAN); *ibid. loco*, 6.X.2013, ster., *Manjakahery et al.* 479 (MO, TAN); *ibid. loco*, 11.V.2004, fr., *Rabebevitra et al.* 958 (MO, P, TEF); *ibid. loco*, 2.XI.2002, buds, *Rabenantoandro & et al.* 1102 (G, MO, P, TEF); *ibid. loco*, 24.II.2003, fr., *Rabevohitra et al.* 4522 (G, MO, P); *ibid. loco*, 10.VII.2003, buds, *Razakamalala* 529 (MO, P, TEF); *ibid. loco*, 7.IV.2004, fr., *Ranirison* 573 (MO, P); *ibid. loco*, 1.XII.1952, fr., *Service Forestier* 6274 (MO, P, TEF); S de Vohemar, 13.III.1967, fr., *Service Forestier* 27478 (MO, P, TEF). **Reg. Sofia [Prov. Mahajanga]:** Ambanja, 15.VIII.1952, fr., *Service Forestier* 5581 (P, TEF).

MAYOTTE. Cant. Bouéni: Passi Keli, 18.I.1997, fr., *Pascal* 865 (K, MO, NY, P, WAG); Rassi Maoussi, 17.V.1999, fr., *Mas* 179 (K, MO, P). **Cant. Dembeni:** Sohoa, 28.VI.1997, fr., *Pascal* 943 (MO, P). **Cant. Dzaoudzi:** Labattoir, 15.I.2002, ♀ fl., *Barthelat & Al Sifari* 698 (G, K, MO, P). **Cant. Mamoudzou:** Îlot Bouzi, 14.III.2001, fr., *Barthelat et al.* 331 (G, K, MAO, MO, P); *ibid. loco*, 26.IX.2001, fr., *Barthelat et al.* 528 (P).

2. *Diospyros danguyana* H. Perrier in Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 4: 117. 1952.

Lectotypus (designated by SCHATZ & LOWRY, 2011: 274): **MADAGASCAR. Reg. Anosy [Prov. Toliara]:** bassin

supérieur du Mandrare (SE): mont Amboahangy, près d'Esira, [24°15'S 46°39'E], 1000–1150 m, 25.IX.1928, buds & ♀ fl., *Humbert* 6826 (P [P00573529]!; isolecto-: BR!, G [G00191501]!, K!, MO-6128543!, MO-6128571!, NY!, P [P00573530]!, PRE!, TAN!, TEF!).

= *Maba enervis* H. Perrier in Inst. Sci. Madagascar, Sér. B, Biol. Vég. 4: 997. 1952. = *Diospyros enervis* (H. Perrier) G.E. Schatz & Lowry in Adansonia ser. 3, 33: 274. 2011. **Holotypus:** **MADAGASCAR. Reg. Menabe [Prov. Toliara]:** Ankilizato (bassin de Morondava), [20°25'S 45°03'E], VII.1917, buds, *Perrier de la Bâthie* 3010 (P [P00573700]!; iso-: P [P00541720]!), **syn. nov.**

Vernacular name. – “Hazonamalo” (*Andriamihajarivo* 489).

Distribution and ecology. – *Diospyros danguyana* is known from subarid thicket and forest on sand, sandstone, and lateritic substrates from Ambatofinandrahana in the east and Ankilizato in the west, south to Tolagnaro and north of Cap Sainte Marie (MADAGASCAR CATALOGUE, 2020), at an elevation of 20–1800 m.

Conservation status. – *Diospyros danguyana* has a geographic range in the form of an EOO of 125,261 km² and a minimum AOO of 128 km². It is present in the Analavelona, Andohahela, Isalo, and Makay protected areas. Outside of protected areas, it is threatened by fire and grazing. With respect to the principal threat of grazing, it exists at 29 locations. Therefore, *D. danguyana* can be assessed for its risk of extinction as “Least Concern” [LC].

Notes. – *Maba enervis* H. Perrier. (= *Diospyros enervis* (H. Perrier) G.E. Schatz & Lowry) is here placed into synonymy under *D. danguyana*. Described from the northwestern portion of the overall range of *D. danguyana*, and thus from the transition from subarid to dry bioclimates, *M. enervis* exhibits leaves that are somewhat less strongly revolute upon drying, but are otherwise identical to *D. danguyana* in shape and size, with identical fruit completely enclosed within the cylindrical-tubular accrescent calyx. *Diospyros danguyana* can be distinguished from other members of the *Bernieriana* group by its linear leaves 4–8 times longer than wide, its elliptic to subspherical female flowers only slightly longer than wide, and its distinctly lobed accrescent calyx enclosing the fruit, the lobes 3 mm long.

Additional material examined. – **MADAGASCAR. Reg. Amoron'i Mania [Prov. Fianarantsoa]:** Ambatofinandrahana, PK 2 rte de Fenoarivo, rocailles de cipolins, [20°34'48"S 45°48'38"E], IX.1956, buds, *Bosser* 9799 (MO, P [3 sheets], TAN); *ibid. loco*, 1600–1800 m, [20°35'S 45°48'E], 21.II.1938, fr., *Decary* 13136 (P [2 sheets]); *ibid. loco*, à quelques km au S, rte de Fenoarivo, [20°35'S 45°48'E], 3.XII.1964, ♀ fl., *Service Forestier* 23885 (MO, P [2 sheets], TEF). **Reg. Androy [Prov. Toliara]:** Ampilira (limite NE de



Fig. 1. – *Diospyros bernieriana* (Baill.) H. Perrier: **A.** Immature fruits with developing calyx. *D. hongwae* G.E. Schatz, Lowry & Phillipson: **B–D.** Nearly mature fruits with expanding calyx. [**A:** Schatz et al. 4342; **B–D:** Hong-Wa 317] [Photos: **A:** G.E. Schatz; **B–D:** C. Hong-Wa]

l'Androy), [24°28'00"S 45°30'00"E], [450 m], 23.XI.1931, buds, *Decary* 9370 (MO, P [2 sheets]); env. d'Ampandrandava (entre Bekily et Tsivory), [24°05'S 45°42'E], 1945, buds, *Seyrig* 779 (P); *ibid. loco*, 1945, buds, *Seyrig* 779B (P); Maroakoho, colline gneissique, rive droite de la Menarandra, près de Tranoroa, [24°42'S 45°04'E], 14.XI.1967, ♀ fl., *Service Forestier* 27966 (MO, NY, P [2 sheets], TEF, WAG); Marovato, E sur la rte de Tsihombe au Cap Sainte-Marie, [25°35'S 45°09'E], 17.XII.1968, ♀ fl., *Service Forestier* 28532 (P [2 sheets]); rte from de Cap Sainte Marie to Tsihombe, c. 20 km from Cap Sainte Marie, 25°28'04"S 45°21'01"E, 28 m, 4.IV.2010, fr., *De Block et al.* 2434 (BR, MO, P); village d'Ankorakosy, au SSE de Tsihombe, [25°18'00"S 45°29'00"E], [20–50 m], 17.XII.1968, buds, *Service Forestier* 28523 (K, MO, P [2 sheets], TEF). **Reg. Anosy [Prov. Toliara]:** Analapatsy, fokontany

Ambaribe, 25°10'23"S 46°39'19"E, 253 m, 17.II.2019, ster., *Bernard et al.* 2670 (DBEV, MO, P, TAN); Andohahela PN, Ambatoabo, Imonty-Evasia, en bas d'Apiky, 24°47'11"S 46°43'26"E, 680 m, 17.XII.2004, fr., *Andriamihajarivo* 489 (MO, P, TAN, TEF); *ibid. loco*, Parcel 2, [24°53'S 46°35'E], [120–1000 m], 20.X.1990, ♀ fl., *Dumetz* 1338 (MO, P); *ibid. loco*, Parcel 3, 25°01'06"S 46°38'13"E, 200–600 m, 17.XI.1990, ♀ fl., *Dumetz* 1418 (MO, P); *ibid. loco*, 25°01'12"S 45°38'18"E, 100–300 m, 8.IV.1993, fr., *Randriamampionona* 279 (MO, P); *ibid. loco*, au bord de la RN 13, 25°01'S 46°38'E, 100 m, 29.IV.1995, fr., *Eboroke* 1011 (MO, P); Mont Apiky au-dessus de Mahamavo, bassin de la Mananara, [24°47'S 46°44'E], 1.I.1934, fr., *Humbert* 13853 (K, MO, P [2 sheets], TAN); Mont Morahariva (Mahamena), vallée de la Manambolo, rive droite (bassin du Mandrare) aux env. d'Isomono (confluent de la Saka-

malio), [24°32'06"S 45°37'48"E], 1000–1400 m. XII.1933, ster., *Humbert 13217ter* (P); Mont Vohipolaka, au N de Betroka, [23°08'S 45°05'E], XI.1933, ster., *Humbert 11667ter* (P); Mont Vohitrosy, vallée moyenne du Mandrare, près d'Anadabolava, [24°15'S 46°43'E], [800–850 m], XII.1933, fr., *Humbert 12731* (MO, P [2 sheets]); PK 40 on RN 13 from Fort Dauphin to Ambovombe, 25°00'14"S 46°36'04"E, 28.III.2010, fr., *De Block et al. 2378* (MO); rte Ambovombe–Ft. Dauphin, env. de Bevilany, [25°00'30"S 46°36'00"E], 100 m, 23.IX.1953, buds, *Service Forestier 8494* (P, TEF); *ibid. loco*, S of Bevilany village, 25°01'S 46°36'E, 100 m, 27.III.1991, fr., *Randrianasolo 203* (MO, TAN); *ibid. loco*, c. 60 road-km W of Tolagnaro, 24°59'S 45°33'E, 70 m, 24.V.1991, fr., *Zarucchi et al. 7484* (MO, P); Vinanibe, [25°03'33"S 46°56'28"E], [100 m], 17.X.1990, ♀ fl., *Dumetz 1320* (MO, P). **Reg. Atsimo-Andrefana [Prov. Toliara]:** Beroroha, 4 km avant Antsoa, sur crête, 21°15'33"S 45°09'52"E, 492 m, 4.XII.2010, buds, *Andrianiana et al. 1024* (MO, P, TAN); *ibid. loco*, forêt d'Anosilamy, 21°20'30"S 45°10'53"E, 448 m, 13.I.2010, fr., *Razakamalala et al. 5164* (MO, P, TAN); Makay Massif, plateau to the W of Lake Anosilahy, 21°20'17"S 45°10'42"E, 607 m, 27.XI.2010, ♀ fl., *Phillipson et al. 6256* (G, K, MO, P, TAN); massif d'Analavelona, bassin de la Mananadabo, [22°37'18"S 44°10'41"E], 1000–1300 m, 13.XII.1962, ster., *Service Forestier 22196 bis* (P). **Reg. Ihorombe [Prov. Fianarantsoa]:** entre Tametsoa et Sahanafa, au N de l'Isalo, [22°18'S 45°22'E], [700–1100 m], 30.I.1955, fr., *Cours 5048* (P [2 sheets]); Kitranga, entre Ambararata et Ivandrika, 20 km au NE d'Ihosy, [22°17'S 46°18'E], 22.II.1970, fr., *Service Forestier 29061* (K, MO, P [2 sheets], TAN); massif de Lalandrano (versant oriental), au N d'Ihosy, [22°21'00"S 45°07'30"E], 9.X.1964, ster., *Service Forestier 23517* (K, MO, P [2 sheets], TEF); *ibid. loco*, [22°21'00"S 45°07'30"E], 800–1000 m, 9.X.1964, ♀ fl., *SF 23521* (BR, G, MO, NY, P, TAN, TEF, WAG); massif de l'Isalo (col des Tapia), [22°33'S 45°20'E], 19.VI.1956, fr., *Service Forestier 18582* (P); *ibid. loco*, 28.XI.1946, *Humbert 19504* (MO); *ibid. loco*, [22°11'00"S 45°10'00"E–22°43'00"S 45°21'00"E], 514–1268 m, 24.I.1955, ster., *Service Forestier 11649* (P [2 sheets]); *ibid. loco* (secteur N), montagne au S du Village de Sahanafa, vallée de la Sahanafy (affluent de la Malio), [22°20'S 45°18'E], 600–1000 m, 28.XI.1946, ♂ fl., *Humbert 19501* (K, MO, P [3 sheets], TAN); Mont Vohipolaka (versant NW), au N de Betroka, [23°08'S 46°05'E], XI.1933, ♂ fl., *Humbert 11635* (B, G, K, P [3 sheets], S); Vallée d'Ihosy, [22°23'58"S 45°08'10"E], VII.1911, fr., *Perrier de la Bathie 3008* (P). **Reg. Menabe [Prov. Toliara]:** Ankilizato (bassin de Morondava), [20°25'S 45°03'E], VII.1911, fr., *Perrier de la Bathie 3010* (P).

3. *Diospyros hongwae* G.E. Schatz, Lowry & Phillipson, **sp. nov.** (Fig. 1B–D, 2).

Holotypus: MADAGASCAR. **Reg. DIANA [Prov. Antsiranana]:** env. d'Iraro (vallée de l'Ifasy), [13°24'S 48°55'E], 50 m, IV.1951 [31.III.1951], ♀ fl., fr., *Service Forestier 3075* (P [P03975005]!; iso-: MO-6956006!, G [G00341733]!, P [P00722702]!, TEF!, W!).

Diospyros hongwae G.E. Schatz, Lowry & Phillipson can be distinguished from other members of the *Bernieriana* group by its large lamina (to 12 × 4.9 cm) with a flat margin and subspherical fruit slightly exserted above the cupuliform calyx, i.e., the apex of the fruit visible.

Shrub to tree 4–15 m tall. *Young stems* initially sparsely to moderately densely covered with appressed, very short (< 0.1 mm) gray trichomes, glabrescent. *Leaves* 4–12 × 1.4–4.9 cm, elliptic, glabrous above and below, glossy above, base acute to cuneate, margin flat (weakly undulate in fresh material), apex acuminate, the acumen to 11 mm,

rounded, midrib slightly impressed above, raised below, venation weakly brochidodromous with 8–10 secondary veins per side, flat to slightly raised above and below, faintly visible, tertiary venation indistinct; petiole 7–11 mm, 1 mm diam., canaliculate, initially sparsely to moderately densely covered with appressed, very short (< 0.1 mm) gray trichomes glabrescent. *Male flowers* not seen. *Female flowers* solitary in the axils of leaves and fallen leaves; pedicel 2–3 mm long, 2–3 mm diam., bearing several bracts (based upon bract scars), densely covered with very short, erect, light golden to gray trichomes; flowers ellipsoid at anthesis, calyx fully fused, adnate to the receptacle, the apex entire, 7–8 mm long, 6 mm in diam., glabrous outside, densely covered with very short, erect light golden to gray trichomes inside; calyx rapidly expanding post anthesis, extending an additional 4 mm, cupuliform; corolla tubular, 15 mm long, 4 mm in diam., lobes 4, ovate, 5 × 4 mm, apex acute, adaxially concave, densely covered with very short, appressed trichomes outside, glabrous inside; staminodia c. 18, inserted at base of corolla tube, filaments 3 mm, the distal 1 mm free, antherodes 1.5 mm, ovary subspherical, crowned by conical style, the stigma 4-lobed, lobes 1.5 mm long. *Pedicel* in fruit expanding to 4–5 mm in diam., with a distinct apical rim to 6 mm in diam., the apex convex. *Receptacle* in fruit to 3 mm thick at base. *Fruit* subspherical, the apex slightly exserted above the prolonged cupuliform calyx, i.e., visible, c. 10–12 mm in diam., densely covered with short (c. 0.5 mm), appressed, light golden trichomes, crowned by the style/stigma remnant, cone-shaped, 2–4 mm tall, 2 mm in diam. at base, densely covered with shorter (c. 0.2 mm) semi-appressed darker golden trichomes.

Etymology. – The species epithet honors our colleague and good friend Cynthia Hong-Wa, who brought order to the large and complex genus *Noronhia* Stadtm. ex Thouars (*Oleaceae*).

Vernacular name. – “Ambavy” (*Hong-Wa 317*).

Distribution and ecology. – *Diospyros hongwae* is known from only three gatherings in dry forest on sandstone and alluvial soils along rivers south of Ambanja (MADAGASCAR CATALOGUE, 2020), at an elevation of 50–236 m.

Conservation status. – *Diospyros hongwae* has a restricted geographic range in the form of an EOO and AOO of 0.263 km². It is not known from within any protected area, and is threatened by forest clearing for agriculture, grazing, fire, and exploitation for firewood and construction material, all of which are projected to result in continuing decline. With respect to the principal threat of forest clearing for agriculture, it exists at two locations. Therefore, *D. hongwae* can be assessed for its risk of extinction as “Endangered” [EN B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v)].



Fig. 2. – *Diospyros hongwae* G.E. Schatz, Lowry & Phillipson. **A.** Fruiting branch; **B.** Detail of leaf venation (adaxial surface); **C.** Fruit; **D.** Female flower prior to anthesis; **E.** Schematic drawing of female flower with a portion of the calyx removed. [A–E: Hong-Wa 317, P] [Drawing: Alain Jouy]

Notes. – The collections *Humbert & Capuron 25932* and *Service Forestier 3075* represent a single gathering divided between two separate collection series. *Diospyros hongwae* can be distinguished from other members of the *Bernieriana* group by its large leaves with flat margins (weakly undulate in fresh material) and its subspherical fruit, the apex of which is slightly exserted above the prolonged cupuliform calyx and thus visible.

Paratypes. – MADAGASCAR. Reg. DIANA [Prov. Antsiranana]: Ambakirano, Behefaka, Anjahana, 13°20'55"S 49°10'45"E, 236 m, 7.VI.2005, fr., *Hong-Wa 317* (MO, P); *ibid. loco*, 13.XII.2018, fr., *Randrianaiivo et al. 3298* (MO, P, TAN); vallée de l'Ifasy, en aval d'Anaborano, grès et alluvions, [13°24'S 48°55'E], 50–200 m, 31.III.1951, ♀ fl., fr., *Humbert & Capuron 25932* (G, MO, P [2 sheets]).

4. *Diospyros ranirisonii* G.E. Schatz, Lowry & Phillipson, sp. nov. (Fig. 3).

Holotypus: MADAGASCAR. Reg. DIANA [Prov. Antsiranana]: forêt de Sahafary 20.II.1962, fr., *Service Forestier 20972* (P [P03974996]!; iso-: MO-6956009!, G [G00341734]!, K!, P [P00722703]!, TEF [TEF000892]!, W!).

Diospyros ranirisonii G.E. Schatz, Lowry & Phillipson can be distinguished from other members of the *Bernieriana* group by its linear to narrowly oblong leaves with strongly revolute margins, the abaxial surface of the lamina obscured on many leaves, its female flowers narrowly ellipsoid, 11–15 mm long, at least 2 times longer than wide, with the apex of the calyx lobed, and its mature fruit 12–16 × 7–10 mm, the lobes of the calyx 6–8 mm long.

Tree 5–10 m tall, to 30 cm DBH. Young stems initially densely covered with erect, very short (< 0.1 mm) gray trichomes and rufous, farinose trichomes, glabrescent. Leaves 0.9–4.4 × 0.3–0.8 cm, narrowly elliptic to linear, occasionally narrowly obovate, initially densely covered above and below with rufous farinose trichomes with a gray stellate/lepidote base, glabrescent, glossy above, base acute to cuneate, margin strongly revolute, the underside of the leaf often completely obscured, apex acute with the tip rounded, midrib slightly impressed above, raised below, covered with gray farinose trichomes, venation absent; petiole 2–4 mm, 0.8 mm diam., canaliculate, initially densely covered with rufous farinose trichomes and very short (< 0.1 mm), semi-appressed white trichomes, glabrescent. Male flowers solitary in axils of leaves, narrowly ovoid to narrowly ellipsoid; pedicels 2 mm long, 1 mm in diam., usually curved, densely covered with rufous farinose trichomes and very short (< 0.1 mm) semi-appressed, light golden trichomes; calyx tubular, 6 mm long, 2 mm in diam., densely covered with farinose trichomes and semi-appressed light golden trichomes 0.2 mm long; corolla tubular, 7 mm long, 2 mm in diam., basal half glabrous, distal half

densely covered with appressed trichomes < 0.1 mm, lobes 3, 3 × 2 mm, densely covered with light golden, appressed trichomes < 0.1. long outside, glabrous inside; stamens 9, adnate to corolla at the base, filaments 1.5 mm, adnate for 1 mm, free for 0.5 mm, anthers 0.8–1 × < 0.1 mm. Female flowers solitary in the axils of leaves and fallen leaves; pedicel 2–3 mm long, 2 mm diam., with 4 minute distichous bracteoles, densely covered with rufous farinose trichomes and very short (< 0.1 mm), erect, light golden to gray trichomes; flowers narrowly ellipsoid at anthesis, 10–11 mm long, 4–5 mm in diam., calyx adnate to receptacle, 8–10 mm tall, the apex with (3–)4 lobes, 2 × 2–3 mm, slightly reflexed, densely covered outside with rufous farinose trichomes and sparse semi-appressed light golden trichomes 0.5 mm long; calyx lobes rapidly expanding post anthesis, to 6–8 × 5–6 mm, succulent; corolla tubular, 10 mm long, tube 8 mm long, lobes 4, 2 × 2 mm, broadly triangular, densely covered with semi-appressed light golden trichomes; staminodia 9, filaments 1.2 mm, antherode 0.8 mm; ovary 3 mm long, 2 mm in diam., ellipsoid, basal third glabrous, upper 2/3 densely covered with short appressed light golden trichomes, stylar column narrowly conical, 3 mm. Pedicel in fruit expanding to 4–5 mm in diam. Fruit 12–16 mm long, 7–10 mm in diam., ellipsoid, initially enclosed within the prolonged calyx until it breaks off, glabrous to densely covered toward the apex with short (< 0.1 mm), appressed, light golden trichomes, crowned by the style/stigma remnant, cone-shaped, 2 mm tall, 1 mm in diam. at base.

Etymology. – The species epithet honors Patrick Ranirison, who made many important collections from the Loky Manambato protected area while pursuing his doctoral studies and played a leading role in the establishment of the new Ampasindava and Galoko-Kalobinono protected areas.

Vernacular name and uses. – “Mapingo” (*Andriambolonera & Bernard 275*). Wood is used for the manufacture of furniture (*Andriambolonera & Bernard 275*).

Distribution and ecology. – *Diospyros ranirisonii* is known from dry forest on sand in the far north in DIANA and SAVA regions from the Sahafary forest south to the Bobankora forest (MADAGASCAR CATALOGUE, 2020), at an elevation of 50–230 m.

Conservation status. – *Diospyros ranirisonii* has a geographic range in the form of an EOO of 760 km² and a minimum AOO of 32 km². It is present in the Loky-Manambato protected area. At other localities, it is threatened by fire, forest clearing for agriculture, grazing, and exploitation for firewood and construction material, all of which are projected to result in continuing decline. With respect to the principal threat of forest clearing for agriculture, it exists at seven locations.

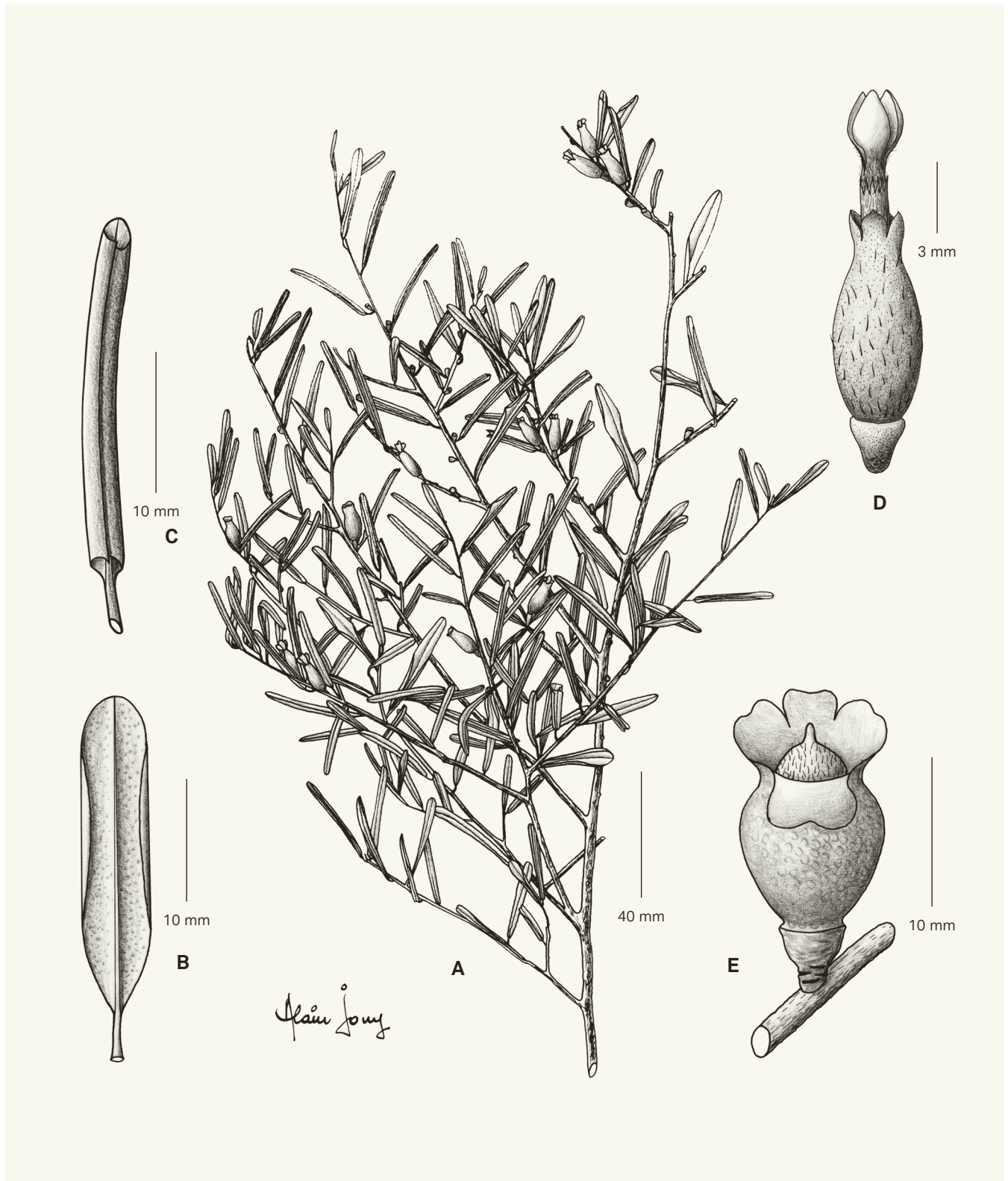


Fig. 3. – *Diospyros ranirisonii* G.E. Schatz, Lowry & Phillipson. **A.** Flowering branch; **B–C.** Leaves (abaxial surface); **D.** Detail of female flower; **E.** Nearly mature fruit.

[**A, D:** Service Forestier 24523, P; **B–C, E:** Service Forestier 20972, P] [Drawing: Alain Jouy]

Diospyros ranirisonii can therefore be assessed for its risk of extinction as “Vulnerable” [VU B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v)].

Notes. – *Diospyros ranirisonii* can be distinguished from other members of the *Bernieriana* group by its narrowly elliptic to linear leaves with strongly revolute margins, initially densely covered with rufous farinose indumentum, narrowly ellipsoid female flowers at least 2 times longer than wide, and lobed calyx enclosing the fruit, the lobes 6–8 mm long in fruit.

Paratypes. – **MADAGASCAR. Reg. DIANA [Prov. Antsiranana]:** forêt d'Analafondro, 26.II.1964, fr., *Service Forestier* 23322 (FHO, G, K, MO, P [2 sheets], TAN, TEF, US, W); *ibid. loco*, 7.II.1966, ♂ fl., *Service Forestier* 24522 (G, MO, P, TAN, TEF), *ibid. loco*, 7.II.1966, ♀ fl., *Service Forestier* 24523 (G, MO, P [2 sheets], TAN, TEF, W). **Reg. SAVA [Prov. Antsiranana]:** Ampondra, 3.X.2013, fr., *Rabarijaona et al.* 326 (K, MO, P, TAN); Loky Manambato AP, 27.IX.2013, ster., *Andriambololona & Bernard* 275 (MO, TAN); *ibid. loco*, 16.IV.2004, fr., *Ranirison* 668 (G, MO, P); *ibid. loco*, 14.IX.2013, fr., *Onjalalaina et al.* 21 (BR, K, MO, P, TAN); *ibid. loco*, 11.II.2004, fr., *Ranirison & Nusbaumer* 417 (G, MO); *ibid. loco*, 6.III.2003, fr., *Gautier et al.* 4241 (G, MO, P); *ibid. loco*, 9.III.2004, fr., *Gautier et al.* 4506 (G, MO, P).

5. *Diospyros silicea* G.E. Schatz, Lowry & Phillipson, **sp. nov.** (Fig. 4).

Holotypus: MADAGASCAR. **Region Atsimo-Andrefana [Prov. Toliara]:** forêt de Zombitsy (= Zombitse-Vohibasia) (Sakaraha), [22°52'52"S 44°41'22"E], 600–850 m, 26–29.III.1955, fr., *Humbert, Bégue & Capuron* 29598 (P [P03974999]!; iso-: G [G00341735]!, MO-6956010!, P [P00722704]!, TAN!, W!).

Diospyros silicea G.E. Schatz, Lowry & Phillipson can be distinguished from other members of the *Bernieriana* group by its leaves with distinctly undulate margins and its ellipsoid fruit with the apex exerted above the calyx.

Tree 5–10 m tall. **Young stems** initially covered with erect, very short (< 0.1 mm) gray trichomes, glabrescent. **Leaves** 2.4–7.8 × 1.2–2.7 cm, elliptic, glabrous above and below, base cuneate, margin distinctly undulate and somewhat revolute, apex acute to acuminate with the tip rounded, midrib slightly impressed above, raised below, venation weakly brochidodromous with 6 secondary veins per side, slightly raised and faintly visible above, completely obscure below; petiole 3–7 mm, 0.7 mm diam., canaliculate, initially covered with very short (< 0.1 mm), semi-erect white trichomes, glabrescent. **Male flowers** in fascicles of 3 or 4 in axils of leaves, ellipsoid, 4–5 mm long, 2.5–3 mm in diam. in bud; pedicels 1 mm long, 0.5 mm in diam, covered with very short (< 0.1 mm) erect, white trichomes, bearing several caducous bracts; calyx tubular, 4–5 mm long, 2–3 mm in diam., the apex with irregular shallow lobes, densely covered very short (< 0.1 mm) semi-appressed, white trichomes and the surface papillate outside, glabrous inside; corolla tubular, 7.5 mm long, 2.2 mm

in diam., basal half glabrous, distal half densely covered with very short (0.1 mm) appressed trichomes, lobes 5, 3 × 1.5 mm, narrowly ovate, imbricate, adaxially concave, densely covered with white, appressed trichomes c. 0.1 long outside, glabrous inside; stamens 10, adnate to corolla at the base, filaments 0.5–0.8 mm, anthers 2–2.2 mm. **Female flowers** not seen. **Pedicel** in fruit 2–3 mm long, to 4–5 mm in diam., covered with very short (< 0.1 mm) semi-appressed white trichomes; calyx extending 5–6 mm above fruit, apex with shallow irregular lobes, not completely enclosing the fruit, i.e., the apex of the fruit visible before the calyx lobes break off, glabrous outside, densely covered with very short (< 0.1 mm) erect, white trichomes inside. **Fruit** 15–18 mm long, 9–14 mm in diam., ellipsoid, the apex exerted above the calyx, glabrous to densely covered toward the apex with short (< 0.1 mm), appressed, light golden trichomes, crowned by the style/stigma remnant, cone-shaped, 2 mm tall, 1 mm in diam. at base.

Etymology. – The species epithet refers to the weathered siliceous sand substrate where the new species occurs.

Distribution and ecology. – *Diospyros silicea* is known from only two gatherings in subarid forest and thicket on siliceous sand from Zombitse-Vohibasia National Park south to Tsiombe (MADAGASCAR CATALOGUE, 2020), at an elevation of 250–850 m.

Conservation status. – *Diospyros silicea* has a restricted geographic range in the form of an AOO of 8 km². It is present from the Zombitse-Vohibasia National Park. At its other known locality, east of Tsiombe, it is threatened by grazing, fire, and exploitation for firewood and construction material, all of which are projected to result in continuing decline. With respect to the principal threat of grazing, it exists at two locations. Therefore, *D. silicea* can be assessed for its risk of extinction as “Endangered” [EN B2ab(iii)].

Notes. – The two collections *Humbert et al.* 29598 and *Service Forestier* 11918 represent a single gathering divided between two separate collection series. *Diospyros silicea* can be distinguished from other members of the *Bernieriana* group by its leaves with distinctly undulate margins, and its ellipsoid fruit exerted above the calyx with shallow irregular lobes.

Paratypes. – **MADAGASCAR. Reg. Androy [Prov. Toliara]:** env. E de Tsiombe, [25°18'45"S 45°30'15"E], 70 m, 14.XI.1967, buds, *Service Forestier* 27981 (MO, P, TEF). **Reg. Atsimo-Andrefana [Prov. Toliara]:** forêt de Zombitsy, à l'Est de Sakaraha, [22°52'52"S 44°41'22"E], [600–850 m], III.1955, fr., *Service Forestier* 11918 (G, MO, NY, P [2 sheets], TEF, US).

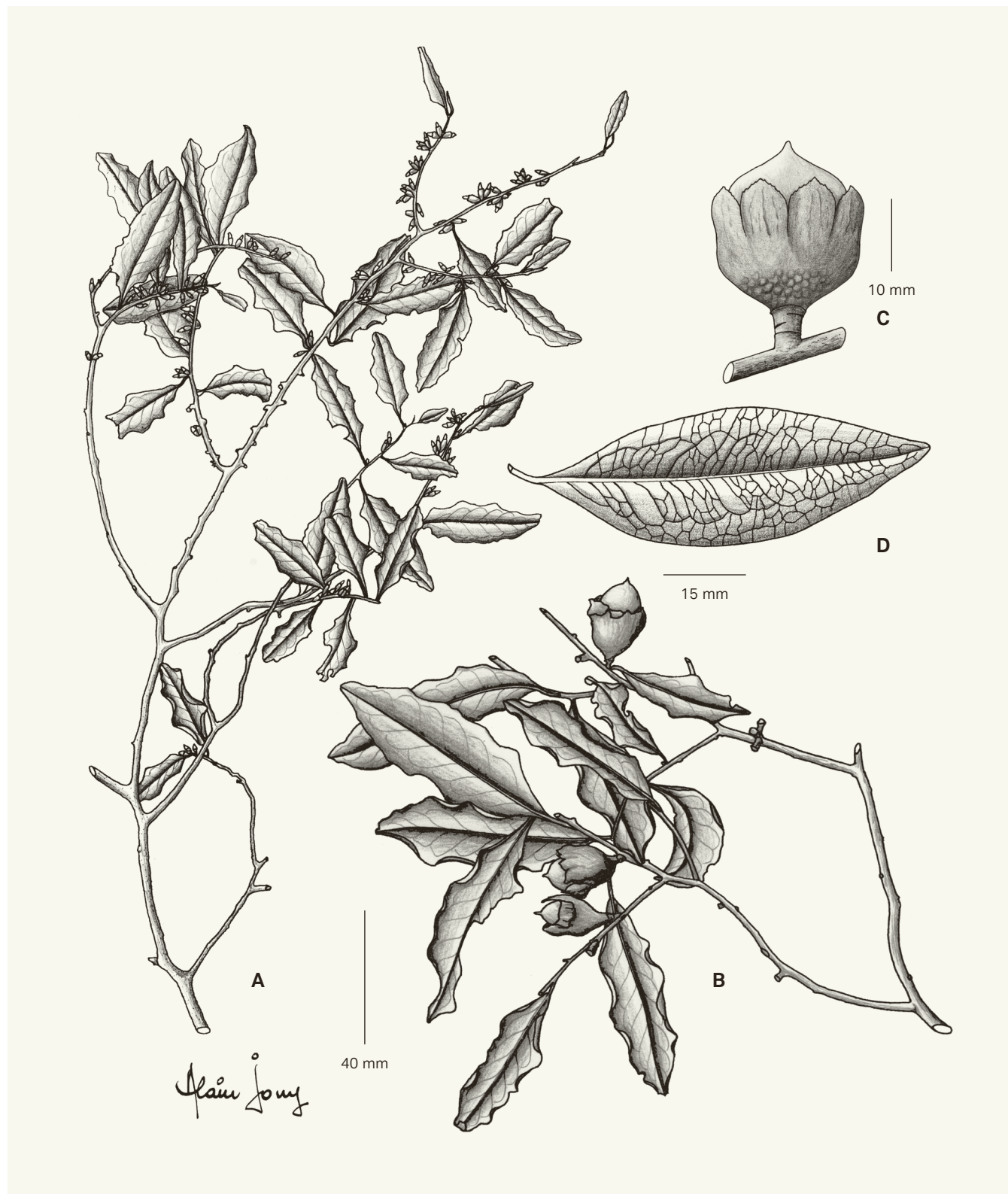


Fig. 4. – *Diospyros silicea* G.E. Schatz, Lowry & Phillipson. **A.** Flowering branch; **B.** Fruiting branch; **C.** Fruit; **D.** Detail of leaf venation (adaxial surface).

[**A:** Service Forestier 27981, P; **B–D:** Service Forestier 11918, P] [Drawing: Alain Jouy]

6. *Diospyros suarezensis* G.E. Schatz, Lowry & Phillipson, **sp. nov.** (Fig. 5, 6A–B).

Holotypus: MADAGASCAR. **Reg. DIANA [Prov. Antsiranana]:** forêt d'Orangea [Oronja], along the dirt track near the remains of the French fort on hill above Ramena, 12°15'01"S 49°21'39"E, 50 m, 20.I.2003, fr., Miller *et al.* 10724 (MO-6883922!; iso-: P [P01031025]!, G [G00341891]!, TAN!, W!).

Diospyros suarezensis G.E. Schatz, Lowry & Phillipson can be distinguished from other members of the *Bernieriana* group by its small (0.8–2.7 × 0.3–1.6 cm) elliptic to obovate leaves with revolute margins, the broadest blade less than 3 times longer than wide, the adaxial surface of the lamina glossy, the abaxial surface glabrous or initially with white farinose indument and then glabrescent, its female flowers obconical, with the apex of the calyx entire, the calyx strongly accrescent in fruit to 8–9 mm long.

Shrub to tree 1.5–5 m tall. *Young stems* densely covered with erect, very short (< 0.1 mm) gray trichomes. *Leaves* 0.8–2.7 × 0.3–1.6 cm, elliptic to obovate, glabrous and glossy above, glabrous or initially with white farinose indumentum and then glabrescent below, base acute to obtuse, margin revolute to strongly revolute and then obscuring much of the abaxial lamina surface, apex obtuse to rounded, the very tip rounded, midrib flat to slightly impressed above, slightly raised below, venation weakly brochidodromous with 3–4 secondary veins per side, flat to slightly raised above, only faintly visible above and below, tertiary venation indistinct; petiole 1–3 mm, 0.8 mm diam., canaliculate, densely covered with erect, very short (< 0.1 mm) gray trichomes. *Male flowers* not seen. *Female flowers* solitary in the axils of leaves and fallen leaves; pedicel 0.5–1 mm long, 0.7 mm diam., bearing several bracts densely covered with very short, appressed, light golden to gray trichomes; flowers obconical at anthesis, calyx fully fused, obconical, 4–5 mm long, 2 mm diam. at base to 3–3.5 mm in diam. at apex, the apex entire, densely covered with rufous farinose trichomes and very short, appressed light golden to gray trichomes outside, very densely covered with very short semi-appressed light golden trichomes inside, glabrescent outside; calyx rapidly expanding post anthesis, extending an additional 4–9 mm, with visible venation, the apex entire; corolla tubular to slightly obconical, 5 mm long, 2 mm in diam. at base to 2.5 mm diam. at apex, glabrous for basal 2/3, densely covered with very short appressed trichomes for apical 1/3, lobes 3 or 4, broadly ovate, 2.5 × 2 mm, apex obtuse, densely covered with very short, appressed trichomes outside, glabrous inside; staminodia 4, inserted toward the apex of corolla tube, filaments adnate to corolla, 3 mm, the, antherodes 1 mm, ovary obovoid to subspherical, 2 mm tall, 2 mm in diam., densely covered with short appressed trichomes, crowned by the cylindrical style, 2 mm tall, 0.5 mm diam., densely covered with

short appressed trichomes. *Pedicel* in fruit expanding to 2 mm long, 3–5 mm in diam. *Fruit* 9–12 mm in diam., subspherical, initially enclosed within the prolonged calyx until it breaks off, densely covered with short (c. 0.5 mm), appressed, light golden trichomes toward the apex, crowned by the style/stigma remnant, narrowly cone-shaped, 2 mm tall, 0.8 mm in diam. at base.

Vernacular names. – “Beando beravina” (Christian *et al.* 67); “Jaobiampototra” (Razafitsalama 593); “Kirandrambiavy madiniky” (Be *et al.* 126); “Sarimina” (Ratovoson 2105).

Distribution and ecology. – *Diospyros suarezensis* is known from dry forest on sand in the DIANA region from Oronja south to Irodo (MADAGASCAR CATALOGUE, 2020), at an elevation of 0–280 m.

Conservation status. – *Diospyros suarezensis* has a restricted geographic range in the form of an EOO of 439 km² and a minimum AOO of 68 km². It is present in the Ambodivahibe Marine Reserve and Oronja protected areas. Outside of protected areas, it is threatened by grazing, fire, and exploitation for firewood and construction material, all of which are projected to result in continuing decline. With respect to the principal threat of fire, it exists at 16 locations. Therefore, *D. suarezensis* can be assessed for its risk of extinction as “Near Threatened” [NT], as it nearly qualifies as “Vulnerable” under Criteria B1 and B2 (IUCN, 2012).

Notes. – *Diospyros suarezensis* can be distinguished from other members of the *Bernieriana* group by its small elliptic to obovate leaves with revolute margins, and its subspherical fruit enclosed within the accrescent calyx lacking lobes.

Paratypes. – MADAGASCAR. **Reg. DIANA [Prov. Antsiranana]:** Ambararata, 12°16'47"S 49°22'37"E, 72 m, 12.XII.2015, buds, Ratovoson 2105 (MO, P, TAN [+ 2 sheets]); *ibid. loco*, 12°16'36"S 49°22'07"E, 60 m, 13.II.2005, fl., Schatz 4234 (CNARP, MO, P, TAN); Ambodivahibe, forêt littorale d'Ampio, 12°23'4"S 49°26'23"E, 10 m, 19.V.2005, fr., Ramananjahary *et al.* 309 (MO, P, TAN); Andrafiabe, 3 km au NW d'Ambolobozokely, 12°25'59"S 49°30'07"E, 34 m, 16.VI.2005, fr., Be *et al.* 126 (MO, P, TAN); *ibid. loco*, [12°26'00"S 49°30'08"E, 16 m, 28.XII.2008, fr., Christian *et al.* 67 (CNARP, MO, TAN); *ibid. loco*, 4 km au N d'Ambolobozobe, 12°29'00"S 49°31'25"E, 10 m, 8.II.2005, fr., Ratovoson *et al.* 929 (G, MO, P, TAN); *ibid. loco*, 2 km au NW du village, 12°26'15"S 49°29'15"E, 11.XII.2007, fl., Rakotoarisoa 767 (K, TAN); Andrafiakely, Ambolobozokely, Ampasimena, à 2 km au NW du village, 12°26'15"S 49°29'39"E, 11.XII.2007, fr., Rakotonandrasana 1264 (MO, P, TAN); Ankaron-gana (Korangana), Irodo, Analafondro forest, 12°37'47"S 49°31'15"E, 55 m, 24.II.2006, ster., Birkinshaw *et al.* 1593 (MO, P, TAN); Ankoriakakely, rte Ramena, PK 10.5, 12°17'59"S 49°21'21"E, 5 m, 11.V.2005, fr., Ratovoson *et al.* 978 (G, MO, P, TAN); *ibid. loco*, 12°17'18"S 49°21'27"E, 0 m, 16.II.2005, fr. Schatz *et al.* 4337 (CNARP, MO, P, TAN); à l'E d'Antsiranana, [12°16'S 49°22'E], 22.II.1962, fr., Service Forestier 20941 (MO, P, TEF); *ibid. loco*, [12°16'00"S 49°22'00"E], 25.II.1964, fr., Service Forestier 23259 (MO, P [2 sheets], TEF); Baie des Dunes, 12°14'27"S 49°22'26"E, 10 m, 17.V.2004, fr., Razafitsalama *et al.* 593 (MO, P, TAN); forêt d'Analafondro, à la base du plateau de Sahafary



Fig. 5. – *Diospyros suarezensis* G.E. Schatz, Lowry & Phillipson. **A.** Fruiting branch; **B.** Mature fruit; **C.** Outline of leaves, showing revolute margins (abaxial surface); **D.** Detail of leaf venation (adaxial surface). [A–B, D: Miller et al. 10724, P; C: Ratovoson 978, P] [Drawing: Alain Jouy]

(sur la rive gauche du Rodo inf.), [12°37'S 49°29'E], 1.V.1966, fr., *Service Forestier 24710* (MO, P [2 sheets], TEF); forêt de Matsaborimaiky, 12°15'31"S 49°22'05"E, 22.I.2014, ♀ fl., *Randrianaivo et al. 2437* (BR, G, MO, TEF); forêt E de Diego-Suarez, 12°22'S 49°21'23"E, X.1975, *Rakotozafy 1517* (TAN); Irodo, 12°38'03"S 49°31'48"E, 53 m, 27.V.2005, fr., *Hong-Wa et al. 227* (MO, P, TAN); Oronjia, 12°14'11"S 49°21'51"E, 41 m, 27.I.2014, fr., *Rabarijaona et al. 526* (BR, K, MO, P, TAN); *ibid. loco*, [12°15'S 49°23'E], 27.IV.1963, fr., *Service Forestier 22727* (G, MO, P [2 sheets], TEF); *ibid. loco* (au S), près d'Ivovona, [12°19'S 49°23'E], 15.XII.1963, ster., *Service Forestier 22965* (MO, P, TEF); *ibid. loco*, 15.XII.1963, ♂ fl., *Service Forestier 22966* (G, MO, P, TEF, W); Ramena (2 km à l'E du village), 12°15'05"S 49°22'01"E, 12.I.2005, fr., *Randrianaivo et al. 1144* (G, MO, P, TAN); Sahafary, Sadjovato, Saharenana ambany, 12°35'05"S 49°27'22"E, 205 m, 5.XII.2006, fr., *Andriamibajariivo et al. 1036* (CNARP, MO, P, TAN); *ibid. loco*, 12°36'26"S 49°26'43"E, 280 m, 8.I.2007, ♂ fl., *Ratovoson et al. 1170* (MO, P, TAN); Tanneverse, PK 10, rte de Ramena, 12°17'58"S 49°21'20"E, 18.X.2013, fr., *Rakotoarisoa & Andriamahay 3258* (K, MO, P, TAN, TEF).

7. *Diospyros torquata* H. Perrier in Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 4: 112. 1952.

Lectotypus (designated by SCHATZ & LOWRY, 2011: 280): **MADAGASCAR. Reg. Boeny [Prov. Mahajanga]:** baie d'Amboanio, près de Majunga, II.1911, fr., *Perrier de la Bâthie 1823* (P [P00573702]!).

= *Diospyros torquata* var. *mabaoïdes* H. Perrier in Mém. Inst. Sci. Madag., sér. B, 4: 112 (1952). **Lectotypus** (designated by SCHATZ & LOWRY, 2011: 280): **MADAGASCAR. Reg. Boeny [Prov. Mahajanga]:** près de la mer, Majunga, I.1929, ♀ fl., fr., *Perrier de la Bâthie 13468* (P [P00573703]!); isolecto-: P [P00573704, P00573705]!).

Distribution and ecology. – *Diospyros torquata* is distributed in dry deciduous forest on sand from Boriziny south to the Kirindy forest north of Morondava (MADAGASCAR CATALOGUE, 2020), at an elevation of 0–242 m.

Vernacular names. – “Hazomalandy” (*Ramananjanahary 52*); “Hazomintina” (*Service Forestier 34798*); “Kehazalahy” (*Service Forestier 19040*).

Conservation status. – *Diospyros torquata* has a geographic range in the form of an EOO of 74,659 km² and a minimum AOO of 60 km². It is present in the Ankarafantsika National Park. At other localities, it is threatened by fire, forest clearing for agriculture, grazing, and exploitation for firewood and construction material, all of which are projected to result in continuing decline. With respect to the principal threat of forest clearing for agriculture, it exists at fourteen locations. *Diospyros torquata* can therefore be assessed for its risk of extinction as “Near Threatened” [NT], as it nearly qualifies for “Vulnerable” under criterion B2 (IUCN, 2012).

Notes. – *Diospyros torquata* can be distinguished from other members of the *Bernieriana* group by its flat lamina and fruit completely enclosed within the accrescent calyx (Fig. 6C), the portion extending above the fruit tubular to narrowly conical and unlobed. The var. *mabaoïdes* was described to accommodate 6-locular fruit, which nevertheless exhibited a 4-merous corolla, variation that PERRIER DE LA BÂTHIE (1952b) had observed within the population at the baie d'Amboanio, the type locality of *D. torquata*.

The type collection of *Diospyros torquata* was incorrectly cited in the protologue as *Perrier de la Bâthie 1923* (PERRIER DE LA BÂTHIE, 1952a).

Additional material examined. – **MADAGASCAR. Reg. Betsiboka [Prov. Mahajanga]:** Tsinainaondry, près Antalaha, 12.II.1958, fr., *Service Forestier 19040* (P [2 sheets]). **Reg. Boeny [Prov. Mahajanga]:** Ambatoboeny, Tsaramandroso, 18.IV.2007, fr., *Miandrimanana et al. 100* (MO, P, TAN); Ankarafantsika AP, 25.II.2019, ster., *Randrianaivo & Rakotovoao 3347* (DBEV, MO, P, TAN, ZT); *ibid. loco*, 4.IV.1933, fr., *Service Forestier 55* (P); *ibid. loco*, 30.III.1952, fr., *Service Forestier 5485* (P, TEF); Antsanitia, 7.I.2000, fr., *Rakotonasolo 130* (K, P, TAN); Benetsy, 1965, ster., *Service Forestier 24274* (G, MO, P, TEF); Mahajanga, 24.XI.1965, fr., *Service Forestier 24303* (P [3 sheets], TEF); *ibid. loco*, 24.XI.1965, ♂ fl., *Service Forestier 24298* (MO, P [2 sheets]); *ibid. loco*, 25.II.2019, ster., *Randrianaivo & Rakotovoao 3348* (DBEV, MO, P, TAN, ZT); Tsimaloto, Marovoay, 18.II.1997, *Service Forestier 34798* (TEF); Vallée du Menavava, XII.1905, fr., *Perrier de la Bâthie 8777* (P [2 sheets]). **Reg. Melaky [Prov. Mahajanga]:** Ankiloty, 22.II.1957, fr., *Service Forestier 16713* (MO, P, TEF); Beanka, 17.III.2012, fr., *Hanitrarivo et al. 356* (G, MO, P). **Reg. Menabe [Prov. Toliara]:** Kirindy Forest, 13.II.2010, fr., *Phillipson et al. 6146* (G, K, MO, P, TAN). **Reg. Sofia [Prov. Mahajanga]:** S de Boriziny, 16.XI.2004, fr., *Ramananjanahary 52* (MO, P, TEF).

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Fig. 6. – *Diospyros suarezensis* G.E. Schatz, Lowry & Phillipson: **A–B.** Nearly mature fruit with expanded calyx. *D. torquata* H. Perrier: **C.** Immature fruit with developing calyx.
[**A–B:** Randrianaivo et al. 2499; **C:** Phillipson et al. 6146] [Photos: **A–B:** R. Randrianaivo; **C:** P.B. Phillipson]

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