



Novitates neocaledonicae. IX. Taxonomic notes on New Caledonian Diospyros (Ebenaceae) with new synonymy and the description of two new species

Authors: Schatz, George E., and Porter, P. Lowry

Source: Candollea, 73(1) : 91-100

Published By: The Conservatory and Botanical Garden of the City of Geneva (CJBG)

URL: <https://doi.org/10.15553/c2018v731a8>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Novitates neocaledonicae. IX. Taxonomic notes on New Caledonian *Diospyros* (Ebenaceae) with new synonymy and the description of two new species

George E. Schatz & Porter P. Lowry II

Abstract

SCHATZ, G.E. & P.P. LOWRY II (2018). Novitates neocaledonicae. IX. Taxonomic notes on New Caledonian *Diospyros* (Ebenaceae) with new synonymy and the description of two new species. *Candollea* 73: 91-100. In English, English and French abstracts. DOI: <http://dx.doi.org/10.15553/c2018v731a8>

A review of the taxonomy of *Diospyros* L. (Ebenaceae) in New Caledonia results in the description of two new species and the placement in synonymy of six species previously recognized in the treatment of *Ebenaceae* for the *Flore de la Nouvelle-Calédonie et Dépendances*. *Diospyros hequetiae* G.E. Schatz, Lowry & Fleurot and *Diospyros rufotomentosa* G.E. Schatz & Lowry are described and illustrated with line drawings and field photographs, accompanied by a distribution map. Risk of extinction assessments indicate that *Diospyros hequetiae* is “Endangered” and *Diospyros rufotomentosa* is “Near Threatened”. A lectotype is designated for *Diospyros samoensis* A. Gray.

Résumé

SCHATZ, G.E. & P.P. LOWRY II (2018). Novitates neocaledonicae. IX. Notes taxonomiques sur les *Diospyros* (Ebenaceae) de Nouvelle-Calédonie avec de nouveaux synonymes et la description de deux nouvelles espèces. *Candollea* 73: 91-100. En anglais, résumés anglais et français. DOI: <http://dx.doi.org/10.15553/c2018v731a8>

Une révision de la taxonomie du genre *Diospyros* L. (Ebenaceae) en Nouvelle-Calédonie permet la description de deux nouvelles espèces et la mise en synonymie de six espèces reconnues dans le traitement des *Ebenaceae* pour la *Flore de la Nouvelle-Calédonie et Dépendances*. *Diospyros hequetiae* G.E. Schatz, Lowry & Fleurot et *Diospyros rufotomentosa* G.E. Schatz & Lowry sont décrites et illustrées, accompagnées de dessins au trait, de photos prises sur le terrain et d'une carte de répartition. Une évaluation du risque d'extinction indique que *Diospyros hequetiae* est «En danger» et que *Diospyros rufotomentosa* est «Quasi-menacé». Un lectotype est désigné pour *Diospyros samoensis* A. Gray.

Keywords

EBENACEAE – *Diospyros* – New Caledonia – New species – New synonyms

Addresses of the authors:

GES: Missouri Botanical Garden, P.O. Box 299, St. Louis, MO, 63166-0299, USA. E-mail: george.schatz@mobot.org

PPL: Missouri Botanical Garden, P.O. Box 299, St. Louis, MO, 63166-0299, USA and Institut de Systématique, Évolution et Biodiversité (ISYEB), Unité Mixte de Recherche 7205, Centre National de la Recherche Scientifique/Muséum National d'Histoire Naturelle/École Pratique des Hautes Études, Université Pierre et Marie Curie, Sorbonne Universités, C.P. 39, rue Cuvier 57, 75231 Paris CEDEX 05, France.

Submitted December 8, 2017. Accepted on April 16, 2018.

First published online on June 25, 2018.

ISSN: 0373-2967 – Online ISSN: 2235-3658 – *Candollea* 73(1): 91-100 (2018)

© CONSERVATOIRE ET JARDIN BOTANIQUES DE GENÈVE 2018

Introduction

The final capstone in Frank White's (1927-1994) extensive systematic studies of *Ebenaceae* was his account of the family for the *Flore de la Nouvelle-Calédonie et Dépendances* (WHITE, 1993b), in which he recognized 31 indigenous species of *Diospyros* L., 30 of which were considered endemic, and 19 of which he had newly described while preparing the floristic treatment (WHITE, 1993a). As a necessary precursor to an assessment of the risk of extinction of the New Caledonian species of *Ebenaceae* according to the IUCN Red List Categories and Criteria (IUCN, 2012), which has been conducted by the New Caledonia Plant Red List Authority, we examined all material in the herbaria at BM, FHO, G, K, MO, NOU, P, US and WU (acronyms according to INDEX HERBARIORUM, 2017), to evaluate the existing taxonomy according to WHITE (1993b), and thereby establish the geographic ranges of accepted species based on the totality of primary occurrence data.

Our review of the c. 1,150 collections with specimens deposited in one or more of these nine herbaria has led us to the conclusion that several of the species described by WHITE (1993a) based either on a single specimen (*D. fastidiosa* F. White, *D. inexplorata* F. White and *D. neglecta* F. White), only two specimens (*D. nebulosa* F. White), or several specimens (*D. erudita* F. White) belong to more frequently collected, widely spread species and should therefore be placed in synonymy. We have also concluded that *D. olen* Hiern, long recognized as a New Caledonian endemic species, cannot be distinguished from the more widespread *D. samoensis* A. Gray. Moreover, our reevaluation of *D. parviflora* (Schltr.) Bakh., which White referred to as a highly variable and widespread "ochlopecies", has revealed that his circumscription included material of no fewer than seven distinct species: *D. impolita* F. White, *D. parviflora*, *D. revolutissima* F. White, *D. trisulca* F. White, *D. yaouhensis* (Schltr.) Kosterm., and two previously unrecognized species, which we describe below.

As a result of our reevaluation of WHITE'S (1993b) taxonomic treatment, we therefore propose the following new synonymy and new species, bringing the total of indigenous species of *Diospyros* recognized in New Caledonia to 28, of which 26 species are endemic. In addition, we have detected both in the field and in the herbarium what we hypothesize to be interspecific hybrids, including the following: *D. minimifolia* F. White x *D. pustulata* F. White (Chambery & Turner 24, Lowry et al. 7466); *D. minimifolia* x *D. revolutissima* (Hequet 3659, 3791, 3792); *D. parviflora* x *D. revolutissima* (Balansa 3344, MacKee 30427, Veillon 2703, Veillon 3663); *D. perplexa* F. White x *D. yaouhensis* (Guillaumin 9233, 9326, Hequet et al. 3699, 3700, Veillon 7134); *D. pustulata* x *D. revolutissima* (Hequet 3639, Veillon 6664); and *D. pustulata* x *D. yaouhensis* (Chambery 12, 21). In all cases, the two presumed parental species of the putative hybrids are known to occur in close proximity.

All of the identifications made during our review are reflected in the SONNERAT (2018) and TROPICOS (2018) databases, which contain comprehensive records of the material in the respective herbaria. For collections lacking geo-coordinates, these were assigned *post facto*, when possible, and are indicated in square brackets in the specimens cited. A series of recent papers (DUANGJAI et al., 2009; TURNER et al., 2013a, 2013b, 2016; PAUN et al., 2016) have utilized molecular data to explore the phylogenetics, biogeography, and evolution of New Caledonian *Diospyros*, revealing four independent colonization events and rapid radiation of the species in *Diospyros* sect. *Maba* (J.R. Forst. & G. Forst.) Hiern. Some of the results of those analyses might now be reinterpreted in light of the re-circumscriptions proposed herein as well as changes to the identification of numerous voucher specimens, particularly with regard to the formerly disparate *D. parviflora* and the recognition of the new species it previously contained.

Synonymy and lectotypification

Diospyros calciphila F. White in Bull. Mus. Natl. Hist. Nat., B, Adansonia 14: 206. 1993.

Holotypus: NEW CALEDONIA. **Prov. des Îles:** Lifou, Hapétra, [20°57'33"S 167°14'00"E], 5.IX.1965, fr., Schmid 661 (P [P00057303]!; iso-: NOU [NOU00572]!, P [P00057304, P00057305]!).

= *Diospyros inexplorata* F. White in Bull. Mus. Natl. Hist. Nat., B, Adansonia 14: 190. 1993. **Holotypus:** NEW CALEDONIA. **Prov. Sud:** Kuébini, Île Nou, [22°15'36"S 167°01'58"E], 2 m, 29.X.1970, fr., MacKee 22791 (P [P00057308]!; iso-: K [K000792722]!), **syn. nov.**

Notes. – *Diospyros inexplorata*, based on a single specimen from Île Nou, corresponds in all respects to *D. calciphila*, including its occurrence on limestone of coral origin. The fruits on the type of *D. inexplorata* are only slightly larger than those normally encountered throughout the range of *D. calciphila*, which occurs primarily on limestone substrate in the Îles Loyauté, and less commonly on ultramafic substrate on the l'Île des Pins (WHITE, 1993a, 1993b).

Diospyros glans F. White in Bull. Mus. Natl. Hist. Nat., B, Adansonia 14: 190. 1993.

Holotypus: NEW CALEDONIA. **Prov. Sud:** col de Petchicara, [21°34'35"S 166°05'22"E], 30.XI.1973, fr., Schmid 4831 (P [P00057302]!; iso-: NOU [NOU005819]!).

= *Diospyros neglecta* F. White in Bull. Mus. Natl. Hist. Nat., B, Adansonia 14: 188. 1993. **Holotypus:** NEW CALEDONIA. **Prov. Nord:** Cap Bocage, 10.VII.1914, y. fr., Compton 1400 (BM [BM001015991]!), **syn. nov.**

Notes. – *Diospyros neglecta* was based on a single collection made in 1914 on Cap Bocage, which falls within the range of *D. glans*. The type of *D. neglecta* exhibits the characteristic thick-walled, non-reflexed, “acorn”-like fruiting calyx of *D. glans* and corresponds to it in all other aspects.

Diospyros revolutissima F. White in Bull. Mus. Natl. Hist. Nat., B, Adansonia 14: 192. 1993.

Holotypus: NEW CALEDONIA. **Prov. Nord:** Néhoué, [20°25'20”S 164°13'04”E], 20.X.1982, fr., *Veillon 5272* (P [P00057331]!; iso-: NOU [NOU005811]!).

= *Diospyros erudita* F. White in Bull. Mus. Natl. Hist. Nat., B, Adansonia 14: 194. 1993. **Holotypus:** NEW CALEDONIA. **Prov. Nord:** Pouembout, contrefort W du Plateau de Tiéa, [21°10'57” 164°52'43”E], 100-350 m, 8.VI.1967, fr., *MacKee 16836* (P [P00057298]!; iso-: P [P00057299]!), **syn. nov.**

Notes. – WHITE (1993a) described *D. erudita* from dry maquis vegetation on the Plateau de Tiéa and Mt. Kopéto, distinguishing it from *D. revolutissima* by its smaller, less revolute leaves with a lustrous upper surface. However, based on material from the Vavouto peninsula, individual specimens of which exhibit leaves similar to those from the Plateau de Tiéa along with others typical of *D. revolutissima* in their size, degree of revoluteness, and upper surface glossiness, we conclude that *D. erudita* represents a form of *D. revolutissima* adapted to particularly dry conditions.

Diospyros samoensis A. Gray in Proc. Amer. Acad. Arts 5: 326. 1861.

Lectotypus (designated here): SAMOA: Tutuila and Savaii, Samoan or Navigators’ Islands, s.d., fr., *Wilkes Exploration Expedition s.n.* (US [US00113486]!; isolecto-: GH [GH00015718] image seen, K [K000792813]!, NY [NY00334804] image seen, US [US00113485]!).

= *Diospyros olen* Hiern in Trans. Cambridge Phil. Soc. 12: 246. 1873. **Lectotypus** (designated by WHITE, 1993a): NEW CALEDONIA. **Prov. des Îles:** Lifou, s.d., *Deplanche 31* (K [K000792731]!; isolecto-: L [L0006035] image seen, P [P00151306, P00151307, P00151308]!), **syn. nov.**

= *Diospyros sebertii* Guillaumin in Bull. Soc. Bot. France 69: 66. 1922. = *Diospyros montana* Pancher & Sébert, in Sébert, Rev. Marit. Colon. 40: 503. 1874 [non *Diospyros montana* Roxb.]. **Lectotypus** (designated by WHITE, 1993b): NEW CALEDONIA: *sine loco*, s.d., *Sébert & Fournier 18* (P [P00151399]!; isolecto-: P [P00151289]!), **syn. nov.**

= *Diospyros austrocaledonica* Hiern in Proc. Linn. Soc. New South Wales 46: 211. 1921. **Holotypus:** NEW CALEDONIA: *sine loco*, s.d., *Le Boucher 1529* (leg. *Cribbs*) (NSW, not seen), **syn. nov.**

= *Diospyros leroyi* Kosterm. in Blumea 23: 460. 1977. **Typus:** NEW CALEDONIA. **Prov. Sud:** “ad septentrionem tribus Koindé”, 3.VIII.1965, fr., *Bernardi 9961* (L [L0005991] image seen; iso-: K [K000792729]!, P [P00151296]!, S [S09-33764] image seen), **syn. nov.**

Notes. – As indicated by WHITE (1993b), *D. olen* is part of a series of closely allied species extending from southern India and Sri Lanka to Australia, New Caledonia, Fiji, Samoa, Tonga, and Vanuatu, which includes also *D. ebenum* J. Koenig, *D. hebecarpa* A. Cunn. ex Benth., *D. insularis* Bakh., *D. novoguineensis* Bakh., and *D. samoensis*. Our review of material from New Caledonia has shown that *D. olen* is indistinguishable from material of *D. samoensis* collected in Fiji, Samoa, and Vanuatu, prompting us to place *D. olen* in synonymy. Further study of the complex may reveal that most or all of the species in the series can be accommodated within *D. ebenum*, one of the ebony species of commerce. Of the two sheets of the type of *D. samoensis* (*Wilkes Exploration Expedition s.n.*) at US, the sheet with fruit [US00113486] is here chosen as the lectotype.

Diospyros vieillardii (Hiern) Kosterm. in Blumea 23: 473. 1977.

= *Maba vieillardii* Hiern in Trans. Camb. Phil. Soc. 12: 124. 1873.

Lectotypus (designated by KOSTERMANS, 1977): NEW CALEDONIA: Canala, Gatope, etc., s.d., *Vieillard 897* (BM [BM001015981]!; isolecto-: MPU [MPU022737] image seen, P [P00057341]!).

= *Maba glauca* Montr. in Mém. Acad. Imp. Sci. Lyon 10: 230. 1860. = *Diospyros neocaledonica* Kosterm. in Blumea 23: 464. 1977 [non *D. glauca* Rottl.] **Syntypi:** NEW CALEDONIA: *sine loco*, s.d., *Montrouzier 140* (LY, not found); *sine loco*, s.d., *Montrouzier 321* (LY, not found).

= *Diospyros fastidiosa* F. White in Bull. Mus. Natl. Hist. Nat., B, Adansonia 14: 202. 1993. **Holotypus:** NEW CALEDONIA. **Prov. Nord:** pente E du Mt. Aoupinié, exploitation forestière Devillers, [21°09'25”S 165°19'00”E], 500-600 m, 27.IV.1972, ♀ fl., *MacKee 25369* (P [P00151056]!; iso-: FHO!, NOU!), **syn. nov.**

= *Diospyros nebulosa* F. White in Bull. Mus. Natl. Hist. Nat., B, Adansonia 14: 202. 1993. **Holotypus:** NEW CALEDONIA. **Prov. Nord:** Mt. Panié, 1500 m, 29.IX.1966, fr., *Schmid 1523* (P [P00057321]!; iso-: NOU [NOU005815]!), **syn. nov.**

Notes. – WHITE (1993a) described *D. fastidiosa* from a single flowering specimen from Aoupinié and *D. nebulosa* from two fruiting specimens from Mt. Panié. In addition to the type specimen of *D. fastidiosa*, two additional recent flowering specimens from Aoupinié (Munzinger 6632, 7249) show the characteristic inflorescence structure of *D. vieillardii*, albeit with slightly larger flowers. Moreover, the fruiting specimens of *D. nebulosa* from Mt. Panié are identical to those of *D. vieillardii*. Although *D. vieillardii* occurs nearly exclusively on ultramafic soils, which are not found on either Aoupinié or Mt. Panié, the leaves of material assigned to both *D. fastidiosa* and *D. nebulosa* conform exactly to those of *D. vieillardii* in their complete absence of any visible venation on the lower surface. We therefore consider *D. fastidiosa* and *D. nebulosa* to be geographic outliers of *D. vieillardii* growing on non-ultramafic soils.

New species

Diospyros hequetiae G.E. Schatz, Lowry & Fleurot, **spec. nova** (Fig. 1, 2).

Distinguished from other New Caledonian species of Diospyros by its small, coriaceous, flat, elliptic to orbicular leaves with the upper surface glabrous and shiny, and with obscure or barely visible venation, and the lower surface very sparsely covered with appressed black or white trichomes.

Holotypus: NEW CALEDONIA. **Prov. Nord:** Entrance to Presqu'île de Muéo, on road from Col de Muéo to Népoui, partially disturbed maquis above road, serpentinite, 21°17'52"S 165°00'30"E, 55 m, 6.XII.2016, y. fr., Lowry, Schatz & Fleurot 7460 (P [P00580362]!; iso-: G [G00341727]!, MO [3034508]!, NOU!, W!).

Shrub to small tree 2–3 m, stems densely covered with appressed, short (0.2–0.3 mm), whitish golden trichomes. *Leaves* elliptic to broadly elliptic, occasionally slightly obovate or orbicular, (0.8–)2–3.9 × (0.7–)1.2–2.6 cm, coriaceous, base rounded to acute, margin micro-thickened to slightly micro-revolute, drying darker than the blade, apex acute to rounded to rarely emarginate, midvein flat above, flat at the apex and progressively more raised towards the base below, venation weakly brochidodromous, secondary veins 4 or 5 per side, barely visible and flat to very slightly raised above, evident to barely evident to completely obscure below, tertiary veins reticulate, upper surface glabrous and shiny, lower surface very sparsely covered with appressed, black or white trichomes 0.1–0.2 mm long; petiole 2–3 mm, 1 mm in diam., densely covered with appressed, short (0.2–0.3 mm), golden trichomes, drying black. *Male flowers* in subsessile fascicles of 2 or 3 borne in the axils of leaves, 3-merous; peduncle and pedicel together 1–1.5 mm; flowers subtended by a narrowly ovate bract, to 2.5 × 1.5 mm, adaxially concave, moderately densely covered with

semi-appressed light brown trichomes 0.5 mm long; calyx in bud narrowly ovoid to narrowly ellipsoid, the distal half cylindrical at anthesis, c. 4 mm tall, 2.5 mm in diam., lobes triangular, 1 × 1 mm, moderately densely covered with semi-appressed light brown trichomes 0.5 mm long; corolla exerted beyond calyx, cylindrical, 7 mm tall, 1 mm in diam., lobes triangular, 1 × 1 mm, densely covered with semi-appressed light brown trichomes 1.5 mm long, shorter and less dense towards the lobes, the margins of the lobes glabrous. *Female flowers* solitary and subsessile, borne in the axils of leaves, 3-merous; flower subtended by 2 or 3 elliptic bracts, 4 × 2.5 mm, adaxially concave, moderately covered with semi-appressed light brown trichomes 1 mm long; calyx urceolate, to 5.5 mm tall, 4 mm in diam., the lobes triangular, 2 × 2 mm, densely covered with semi-appressed light brown trichomes 1 mm long; corolla exerted beyond calyx, cylindrical, to 5.5 mm tall, the lobes narrowly triangular, 2.5 × 2 mm, densely covered with appressed light brown trichomes 1 mm long. *Fruits* ellipsoid to spherical, to 14 mm in diam., crowned by the style/stigma remnant to 1 mm long, moderately densely covered with appressed light brown trichomes 0.5 mm long; calyx in fruit accrescent, cupuliform, appressed to the fruit, 11 mm tall, to 20 mm in diam. overall, lobes broadly triangular, 6–7 × 8–15 mm, c. 1.5 mm thick at the base to < 1 mm thick at the margins, apex of lobes rounded, not to slightly reflexed, margins becoming weakly revolute toward the apex, moderately densely covered with appressed light brown trichomes 0.5 mm long outside, more densely covered inside. *Seeds* spherical wedge-shaped, 8 × 3.5 mm, glabrous, surface wrinkled when dry, brown.

Etymology. – The species epithet honors our colleague Vanessa Hequet (*Institut de Recherche pour le Développement*, Nouméa), with whom we have had particularly informative discussions about New Caledonian *Diospyros*. She first encountered the new species at its type locality during her extensive field work in the context of the project on the conservation of the dry forests of western New Caledonia.

Distribution and ecology. – *Diospyros hequetiae* occurs in dry maquis on ultramafic (serpentinite) soils at three locations in northwestern Grande Terre, from 55 to 350 m elevation (Fig. 3).

Conservation status. – *Diospyros hequetiae* has a geographic range in the form of an Extent of Occurrence (EOO) of 48 km² and a minimum Area of Occupancy (AOO) of 12 km², and exists at 3 locations with respect to the principal threats of fire and deer, both of which result in continuing decline in habitat quality. It therefore qualifies as «Endangered» [EN B1ab(iii)+2ab(iii)] using the IUCN Red List Categories and Criteria (IUCN, 2012).



Fig. 1. - *Diospyros hequetiae* G.E. Schatz, Lowry & Fleuret. **A.** Fruiting branch; **B.** Lower leaf surface; **C.** Upper leaf surface; **D.** Fruit. [Lowry, Schatz & Fleuret 7460, P] [Drawings: R.L. Andriamiarisoa]



Fig. 2. - *Diospyros hequetiae* G.E. Schatz, Lowry & Fleurot. **A.** Upper leaf surfaces; **B.** Lower leaf surfaces, females flowers, and fruit; **C.** Fruit. [Lowry, Schatz & Fleurot 7460] [Photos: P.P. Lowry II]

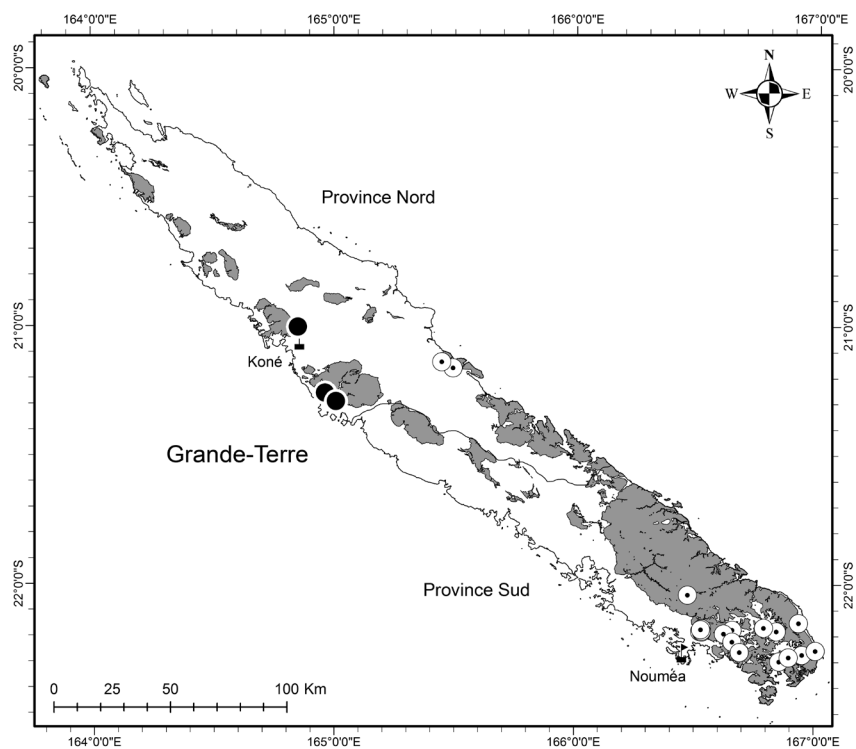


Fig. 3. - Distribution of *Diospyros hequetiae* G.E. Schatz, Lowry & Fleurot (solid circles) and *D. rufotomentosa* G.E. Schatz & Lowry (open circles with dot).

Notes. – *Diospyros hequetiae* is distinctive among other dry forest species on ultramafic substrate by its small, flat, elliptic to orbicular leaves with white or black appressed trichomes on the lower surface, vs strongly revolute margins and glabrous lower surface of the leaves of *D. revolutissima*. Leaves in some material of *D. minimifolia* can resemble somewhat those of *D. hequetiae* in their size, shape and flatness, but the fruits of *D. minimifolia* are considerably smaller and, moreover, *D. minimifolia* occurs only on black clay soils.

Paratypes. – NEW CALEDONIA. **Prov. Nord:** Pic aux hirondelles, fr., 21°15'56"S 164°57'48"E, 64 m, 1.X.2017, y. fr., *Fleurot 398* (G, MO, NOU, P); 21°15'56"S 164°57'49"E, 68 m; *ibid. loco*, fr., *Fleurot 399* (NOU); *ibid. loco*, y. fr., *Fleurot 400* (MO, NOU, P); *ibid. loco*, 21°15'55"S 164°57'50"E, 76 m, y. fr., *Fleurot 401* (NOU, P); *ibid. loco*, 21°15'55"S 164°57'50"E, 77 m, fr., *Fleurot 402* (NOU, P); Pic aux hirondelles, 10 km au S de Pouembout, 6.III.2007, fr., *Hequet 3659* (NOU); entrée de Népoui, 20.XI.2007, fr., *Hequet 3791* (NOU); *ibid. loco*, ♂ fl., *Hequet 3792* (MO, NOU); entrance to Presqu'île de Muéo, on road from Col de Muéo to Népoui, 21°17'52"S 165°00'30"E, 55 m, 6.XII.2016, fr., *Lowry, Schatz & Fleurot 7459* (MO, NOU, P); pente SE du Mt. Koniambo, [21°00'32"S 164°51'06"E], 350 m, 23.VIII.1966, fr., *MacKee 15499* (K, NOU, P).

Diospyros rufotomentosa G.E. Schatz & Lowry, **spec. nova** (Fig. 4, 5).

Distinguished from all other New Caledonian species of Diospyros by the densely rufous tomentose indumentum on stems, leaves, floral bracts, flowers, calyces in fruit, and fruits.

Holotypus: NEW CALEDONIA. **Prov. Sud:** Kwé Binyi River, S of Yaté, forest along old road along N side of estuary, just E of old river crossing, at new water plant, ultramafic substrate, 22°15'25"S 167°00'20"E, 2-10 m, 7.XII.2016, fr., *Lowry & Schatz 7469* (P [P00580363]); iso-: G [G00341728]!, K!, MO [MO3034511]!, NOU!, NY!, US!, W!).

Shrub to tree 3-13 m, to 25 cm dbh, stems densely rufous tomentose. *Leaves* narrowly to broadly elliptic, occasionally slightly ovate or obovate, (1.6-)4-12.4 × (0.8-)2.2-5.7 cm, coriaceous, base rounded to acute, margin flat to revolute, apex acute to rounded, midvein flat to slightly sunken above, distinctly raised below, venation weakly brochidodromous, secondary veins 6 or 7 per side, often obscure above and below, occasionally evident and flat above, raised and evident below when indument wears off, tertiary veins reticulate, upper surface initially sparsely rufous tomentose, soon glabrescent except remaining sparsely whitish tomentose along midvein, lower surface densely rufous tomentose, occasionally glabrescent; petiole 2-13 mm, 0-8-1.5 mm in diam., densely rufous tomentose. *Male flowers* in fascicles of 3 or 4 borne in the axils of leaves, 3-merous; peduncle 3-4 mm long, 3 mm in diam.; flowers sessile, occasionally with a subtending oblong bract, 7 × 2.5 mm, densely rufous tomentose; calyx oblong, 8-9 mm long, 3-4 mm in diam., lobes triangular to broadly

triangular, 1.5-2.5 × 1-1.5 mm, densely rufous tomentose; corolla exerted beyond calyx, tubular, 9-10 mm long, 2 mm in diam., lobes narrowly triangular, 2 × 1 mm, densely rufous hirsute outside, glabrous inside, yellow *in vivo*. *Female flowers* solitary in leaf axils, 3-merous; pedicel 2 mm long, 1-2 mm in diam., densely rufous tomentose, bearing 4-6 distichously arranged, cucullate bracts, 3-6 × 3 mm, densely rufous tomentose; calyx urceolate, 9 mm long, 6 mm in diam., lobes triangular, 2.5 × 4 mm, densely rufous tomentose; corolla tubular, 7 mm long, 3.5 mm in diam., lobes narrowly triangular, 2 × 0.5 mm, densely rufous tomentose outside, glabrous inside, pale yellow *in vivo*. *Fruits* depressed globose to ovoid, 13-18 mm tall, 13-20 mm in diam., densely rufous tomentose and whitish sericeous-hirsute, glabrescent, the stigma remnant apiculate; calyx in fruit only slightly accrescent, expanding in thickness to 1.5-2 mm, apex of lobes slightly reflexed, margins weakly to strongly revolute, densely rufous tomentose. *Seeds* spherical wedge-shaped, 8-11 × 5-6 mm, glabrous, black.

Distribution and ecology. – *Diospyros rufotomentosa* occurs in humid forest, apparently exclusively on ultramafic substrates (or nearly so), primarily in southern Grande Terre, with a few populations recorded somewhat farther north (Mt. Arago and the lower Monéo and Néavin valleys) (Fig. 5). It ranges from sea level to 600 meters elevation.

Conservation status. – *Diospyros rufotomentosa* has a geographic range in the form of an Extent of Occurrence (EOO) of 3,230 km² and a minimum Area of Occupancy (AOO) of 72 km², and exists at 15 locations with respect to the threats of fire and mining, which result in continuing decline in habitat quality. As it nearly meets the thresholds for Vulnerable, *D. rufotomentosa* is assigned the category of "Near Threatened" [NT] using the IUCN Red List Categories and Criteria (IUCN, 2012). The species is currently known from the protected areas of Forêt du Grand Kaori and Rivière Bleue.

Notes. – As mentioned above, among the disparate elements WHITE (1993a) included in *D. parviflora*, he noted a form in the extreme south with generally large leaves and the presence of a "tomentum roux". With the transfer of anomalous specimens previously identified by White as *D. parviflora* to various other species (*D. impolita*, *D. revolutissima*, *D. trisulca*, *D. yaouhensis*, as well as the two new species we here recognize), *D. parviflora* is now much more coherently circumscribed as a species occurring on mostly non-ultramafic (volcano-sedimentary) soils in the northeast (with the occasional outlier on ultramafic soils in the northwest and on the Belep islands of Ile Art, Ile Baaba, Ile Belabio, and Ile Yandé), whereas the newly described species *D. rufotomentosa* occurs on ultramafic substrates primarily in the south.



Fig. 4. - *Diospyros rufotomentosa* G.E. Schatz & Lowry. A. Female flowering branch; B. Male flowers; C. Female flower; D. Fruiting branch; E. Fruit. [A, C: Lowry & Schatz 7470, P; B: Lowry & Schatz 7471, P; D-E: Lowry & Schatz 7469, P] [Drawings: R.L. Andriamiarisoa]



Fig. 5. - *Diospyros rufotomentosa* G.E. Schatz & Lowry. **A.** Upper leaf surfaces; **B.** Male flowers; **C.** Female flowers; **D.** Fruit. [A, D: Lowry & Schatz 7469; B: Lowry & Schatz 7470; C: Lowry & Schatz 7471] [Photos: A-C: P.P. Lowry II; D: G.E. Schatz]

Paratypes. – NEW CALEDONIA. **Prov. Sud**: près de Bourail, 11.IV.1869, y. fr., *Balansa 1459* (P); Haute Couvélée, 1.V.1951, fr., *Baumann 13040* (P); Haute Rivière Blanche, Mois de Mai, [22°07'24"S 166°31'27"E], 300 m, 21.VI.1951, fr., *Baumann 14183* (P); forêt au dessus du Carénage, [22°10'59"S 166°39'50"E], s.d., st., *Blanchon 1069* (NOU, P); Thy, [22°11'02"S 166°31'27"E], 320 m, 30.IV.1980, fr., *Brinon 685* (NOU, P); Thy, upper western track, [22°10'27"S 166°31'53"E], 520 m, 20.XI.1981, fr., *Brinon 1164* (NOU); E shore of the mouth of Yaté river, [22°09'26"S 166°57'04"E], 10.X.1947, fr., *Buchholz 1499* (P, US); Prony, Sebertville, X.1903, fr., *Cribbs 1388* (P); *sine loco*, s.d., fr., *Franc s.n.* (P); Prony, X.1915, fr., *Franc 20* (K, MO, P, US); *sine loco*, VII.1913, fr., *Franc 1517 Ser. A* (K, P); *sine loco*, VII.1914, ♀ fl., *Franc 1696 Ser. A* (P); *sine loco*, s.d., fr., *Franc 1796* (K [2 sheets]); rivière des Pirogues, 350–400 m, 9.IX.1981, st., *Gentry & McPherson 34619* (MO); Mt. Arago, 1910, fr., *Godefroy (herb. d'Alleizette) 526* (P); Thy, [22°11'08"S 166°31'26"E], 500 m, 23.VII.2009, fr., *Grignon et al. 383* (NOU); Mt. Dzumac, [22°02'40"S 166°28'17"E], 29.II.1979, fl., *Hoff 442* (NOU); Plaine des Lacs, [22°16'23"S 166°56'59"E], 15.V.1968, fr., *Jaffré 27* (NOU, P); Prony, s.d., fr., *Le Rat 654* (P); *sine loco*, s.d., fr., *Le Rat 1573* (P); Kwé Binyi River, S of Yaté, forest along old road along N side of estuary, just E of old river crossing, at new water plant, ultramafic substrate, [22°15'25"S 167°00'20"E], 2–10 m, 7.XII.2016, ♂ fl., *Lowry & Schatz 7470* (G, MO, NOU, P, W); *ibid. loco*, 7.XII.2016, fr., *Lowry & Schatz 7471* (MO, NOU, P); *ibid. loco*, 7.XII.2016, ♀ fl., *Lowry & Schatz 7472* (MO, NOU, P); Le Carénage (Baie de Prony), 100 m, 25.I.1966, ♀ fl., *MacKee 14276* (MO, P); Plaine de Lacs, haute Rivière Blanche, forêt "les Électriques", [22°10'45"S 166°39'32"E], 200 m, 8.XII.1966, fr., *MacKee 16037* (K, NOU, P); basse Néavin, [21°10'05"S 165°29'35"E], 2 m, 5.XII.1978, ♂ fl., *MacKee 36176* (K, MO, NOU, P); basse Monéo, [21°08'41" 165°26'46"E], 100 m, 26.IV.1979, ♂ fl., *MacKee 36837* (NOU, P); Thy River valley, [22°11'15"S 166°31'53"E], 9.IV.1979, fr., *McPherson 1537* (MO, NOU, P); *ibid. loco*, 30.IV.1980, fr., *McPherson 2626* (MO, NOU, P); along Nou-

méa-Yaté road, Fausse Yaté, [22°10'12"S 166°47'21"E], 2 m, 5.IX.1981, fr., *McPherson 4163* (MO, NOU, P); *sine loco*, s.d., *Petit 44* (P); Kuébini, [22°15'25"S 167°00'20"E], 11.V.2004, fr., *Munzinger & Lowry 2037* (MO, NOU, P); Forêt Desmazures, [22°11'41"S 166°37'24"E], 22.III.2005, ♀ fl., *Munzinger 2708* (NOU, P); Forêt du Grand Kaori, [22°17'00"S 166°53'39"E], 22.III.2005, fr., *Munzinger 2781* (MO, NOU, P); *sine loco*, s.d., fr., *Sébert & Fournier 44* (P); Col de Mouirange, [22°13'30"S 166°39'32"E], 10.IX.1980, y. fr., *Suprin 640* (NOU, P); Forêt de la Thy, [22°10'42"S 166°31'37"E], 460 m, 20.XI.1981, fr., *Suprin 1501* (NOU); Rio des Pirogues, 27.X.1923, y. fr., *C.T. White 2245* (K, P).

Acknowledgments

We are very grateful to our friend and colleague Dominique Fleurot, who has extensively explored northern New Caledonia, locating populations of many species of *Diospyros*, and with whom we had the pleasure of seeing ten species and one putative hybrid during just three days in the field. We also thank Roger Lala Andriamiarisoa for the excellent line drawings, Jérôme Munzinger for preparing the map, Ehoarn Bidault for assistance with data entry, and an anonymous reviewer for helpful suggestions. We are grateful to the Curators of the following herbaria for providing access to their collections: BM, K, NOU, P, US and WU. The *Direction de l'environnement, Province Sud*, and the *Direction du développement économique et de l'environnement, Province Nord*, kindly provided permission to conduct field work and to collect specimens. The Franklinia Foundation provided financial support for the Global Ebony Assessment.

References

- DUANGJAI, S., R. SAMUEL, J. MUNZINGER, F. FOREST, B. WALLNÖFER, M.H.J. BARFUSS, G. FISCHER & M.W. CHASE (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. *Mol. Phylogenet. Evol.* 52: 602-620.
- INDEX HERBARIORUM (2017). *Index Herbariorum, a global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium [<http://sweetgum.nybg.org/science/ih>].
- IUCN (2012). *IUCN Red List Categories and Criteria: Version 3.1*. Ed. 2. IUCN Species Survival Commission, Gland & Cambridge.
- KOSTERMANS, A.J.G.H. (1977). Notes on Asiatic, Pacific, and Australian *Diospyros*. *Blumea* 23: 449-474.
- PAUN, O., B. TURNER, E. TRUCCHI, J. MUNZINGER, M.W. CHASE & R. SAMUEL (2016). Processes driving the radiation of a tropical tree (*Diospyros*, Ebenaceae) in New Caledonia, a biodiversity hotspot. *Syst. Biol.* 65: 212-227.
- SONNERAT (2018). *Base de données des collections du Muséum national d'Histoire naturelle*. MNHN, Paris [<http://science.mnhn.fr/institution/mnhn/collection/p/item/search/form>].
- TROPICOS (2018). Missouri Botanical Garden, Saint Louis [<http://www.tropicos.org>].
- TURNER, B., J. MUNZINGER, S. DUANGJAI, E.M. TEMSCH, R. STOCKENHUBER, M.H.J. BARFUSS, M.W. CHASE & R. SAMUEL (2013a). Molecular phylogenetics of New Caledonia *Diospyros* (Ebenaceae) using plastid and nuclear markers. *Mol. Phylogenet. Evol.* 69: 740-763.
- TURNER, B., O. PAUN, J. MUNZINGER, S. DUANGJAI, M.W. CHASE & R. SAMUEL (2013b). Analyses of amplified fragment length polymorphisms (AFLP) indicate rapid radiation of *Diospyros* species (Ebenaceae) endemic to New Caledonia. *BMC Evol. Biol.* 13: 269.
- TURNER, B., O. PAUN, J. MUNZINGER, M.W. CHASE & R. SAMUEL (2016). Sequencing of whole plastid genomes and nuclear ribosomal DNA of *Diospyros* species (Ebenaceae) endemic to New Caledonia: many species, little divergence. *Ann. Bot.* 117: 1175-1185.
- WHITE, F. (1993a). Twenty-two new and little-known species of *Diospyros* (Ebenaceae) from New Caledonia with comments on section Maba. *Bull. Mus. Natl. Hist. Nat., B, Adansonia* 14: 179-222.
- White, F. (1993b). Ebenaceae. In: MORAT, P. & H.S. MACKEE (ed.), *Fl. Nouvelle-Calédonie et Dépendances* 19: 3-89.