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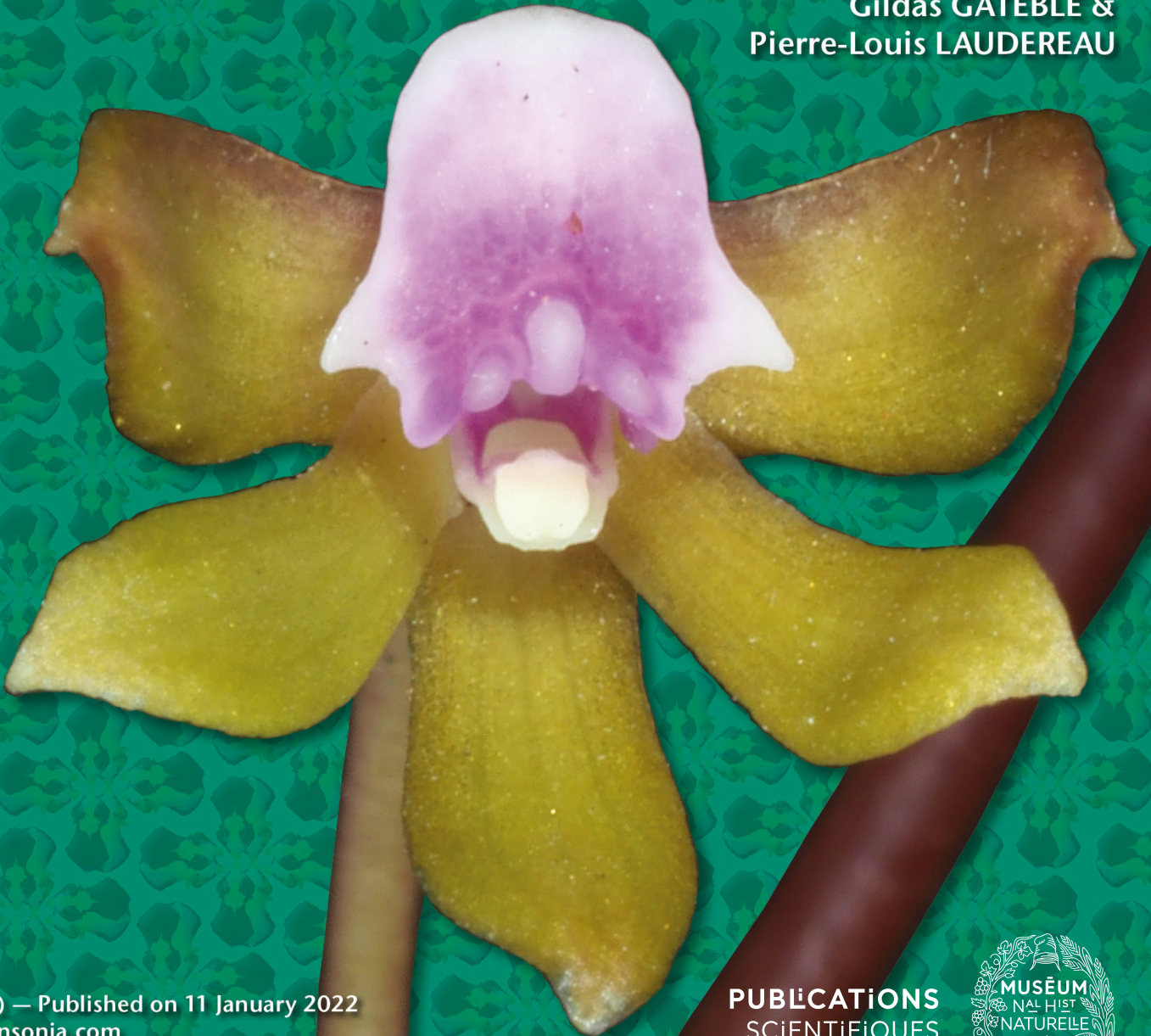
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***Dendrobium petrophilum* (Kraenzl.) Garay ex N.Hallé, a well-named species describing its unusual chasmophytic ecology**

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ABSTRACT

Dendrobium petrophilum (Kraenzl.) Garay ex N.Hallé was a species only known from the type specimen and was considered doubtful. Since it has been recently relocated in its type locality and in its surrounding areas, we were able to compare it to the endemic closely related and well known species, *Dendrobium oppositifolium* (Kraenzl.) N.Hallé. We confirm *D. petrophilum* as a distinct species based on its morphology and its very special ecology. Both species are fully described, compared, and illustrated. Comparative tables are given in English and French. We also discuss their ecology, distribution, phenology and confirm the IUCN assessments made by the local Endemia Red List Authority.

KEY WORDS
New Caledonia,
Dendrobium,
Macrocladium section,
ecology,
IUCN conservation status.

RÉSUMÉ

Dendrobium petrophilum (Kraenzl.) Garay ex N.Hallé, le bien nommé et son écologie inhabituelle de chasmophyte.

Dendrobium petrophilum (Kraenzl.) Garay ex N.Hallé était une espèce connue uniquement par le spécimen type et était considérée comme douteuse. Comme elle a été récemment retrouvée dans sa localité type et dans ses environs, nous avons ainsi pu la comparer à l’espèce *Dendrobium oppositifolium* (Kraenzl.) N.Hallé, endémique, étroitement apparentée et bien connue. Nous sommes en mesure de confirmer que *D. petrophilum* est une espèce distincte sur la base de sa morphologie et de son écologie très particulière. Les deux espèces sont entièrement décrites, comparées et illustrées. Des tableaux comparatifs sont donnés en anglais et en français. Nous discutons également de leur écologie, de leur répartition, de leur phénologie et nous confirmons les évaluations de l’UICN faites par l’association Endemia.nc, l’autorité locale de la liste rouge.

MOTS CLÉS
Nouvelle-Calédonie,
Dendrobium,
section *Macrocladium*,
écologie,
statut de conservation
UICN.

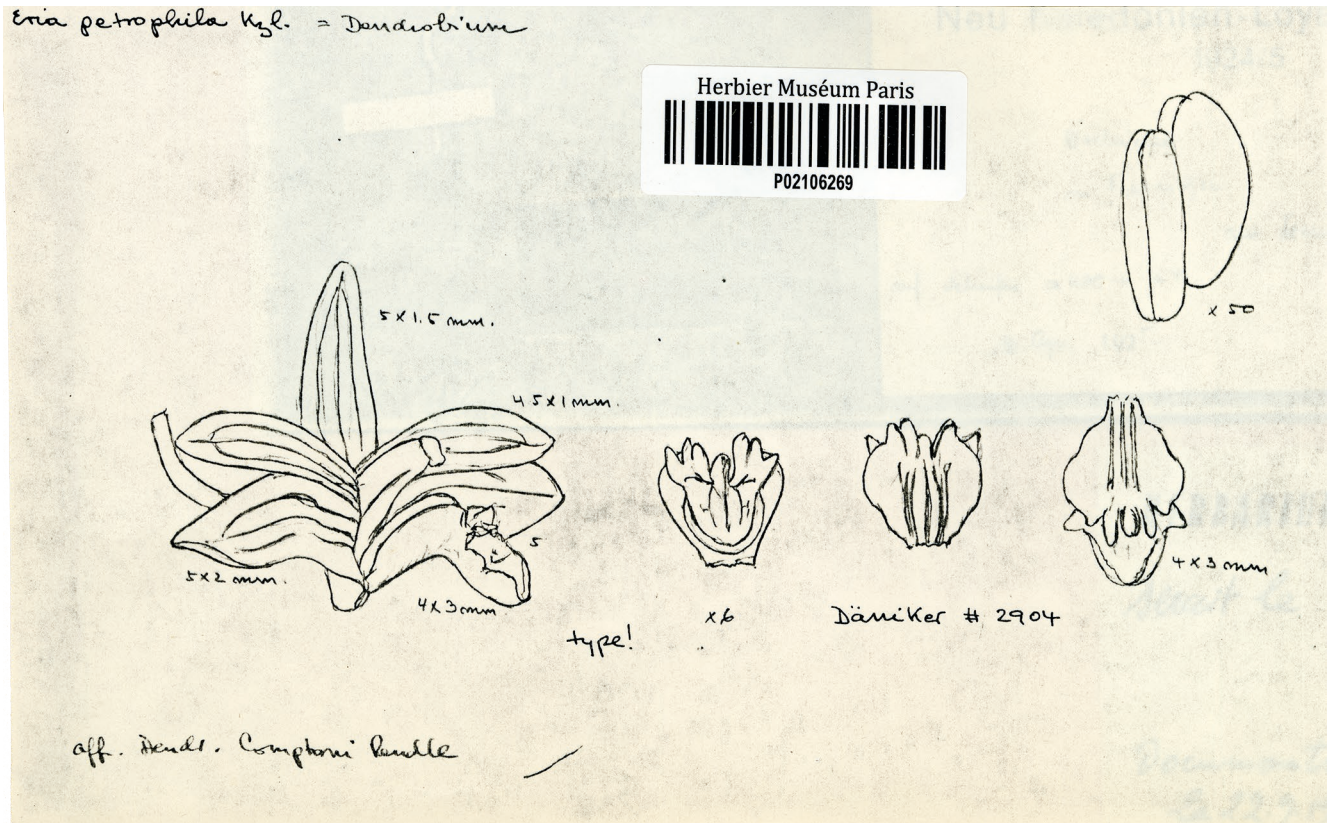


FIG. 1. — Drawing of the type of *E. petrophila* Kraenzl. by L.A. Garay completing the photocopy of the type kept at Z.

INTRODUCTION

The generic delimitation of *Dendrobium* Sw. has been and is still under debate among specialists because it is a non-monophyletic genus with over 1500 species (Adams 2011 ; Clements 2003 ; Clements 2006 ; Schuiteman 2011 ; Schuiteman & Adams 2011). *Dendrobium* section *Macrocladium* Schltr. delimited by Pridgeon *et al.* (2014) contains mainly New Caledonian species (15). However, narrower delimitations, *Eria* Lindl. sect. *Tetrodon* Kraenzl. have been proposed by Kränzlin (1929), and *Dendrobium* section *Tetrodon* (Kraenzl.) Ormerod by P. Ormerod (1996), and more recently by Clements & Jones (1998) who raised Kränzlin's section at the genus level (*Tetrodon* (Kraenzl.) M.A.Clem. & D.L.Jones). Because this debate is beyond the scope of this note, we will follow the broad circumscription of the genus *Dendrobium* adopted by Hallé (1977) and more recent authors (e.g., Burke *et al.* 2008; Pridgeon *et al.* 2014).

There are several doubtful species in the New Caledonian Orchidaceae flora. Among the species of *Dendrobium* or *Eria* described by Kränzlin, four (viz. *D. arthrobulbum* Kraenzl., *D. kanakorum* Kraenzl., *D. minutiflorum* Kraenzl. and *D. petrophilum* (Kraenzl.) Garay ex N.Hallé) were cited as insufficiently known in the treatment of Hallé (1977). The type of *Dendrobium kanakorum* was relocated in Hamburg (HBG) by Christenson (1994) who traced the fate of Kränzlin's material and the type of *D. petrophilum* was known to

be at Zürich (Z). Christenson pointed out that a portion of Kränzlin's personal herbarium had not been deposited in Berlin (B) and had therefore not been lost. Unfortunately, the B herbarium does not contain the type material of the two other described insufficiently known *Dendrobium* species from New Caledonia by Kränzlin. Types of *Dendrobium arthrobulbum* and *D. minutiflorum* conserved at B, were most probably destroyed during the Second World War, with little hope of finding duplicates specimens in other institutions. According to Ormerod *et al.* (2021) and based on description of the protologue, *D. minutiflorum* is a synonym of *Appendicula reflexa* Blume. Furthermore, the synonymy of *D. arthrobulbum* with *Eria karikouyensis* Schltr. (now *Porpax karikouyensis* (Schltr.) Schuit, Y.P.Ng & H.A.Pedersen) is likely (Ormerod, pers. com.)

During expeditions in the extreme North of New Caledonia's Grande Terre in 2018 while looking for *Leichhardtia oubatchensis* (Schltr.) Liede, Gâteblé & Meve (Liede-Schumann *et al.* 2020), an ecologically atypical *Dendrobium* that could match *D. petrophilum* was found growing in sympatry with this *Leichhardtia* R.Br.. Originally described with uncertainty in the genus *Eria* Lindl. by Kränzlin (1929) from extremely poor material (cited as "matériel misérable" in Hallé 1977: 150), Hallé combined the name under the genus *Dendrobium*. Despite this poor material, Garay was able to produce a fairly accurate drawing (P02106269 in herb., reproduced here in Fig. 1). The holotype of *D. petrophilum*, the only existing

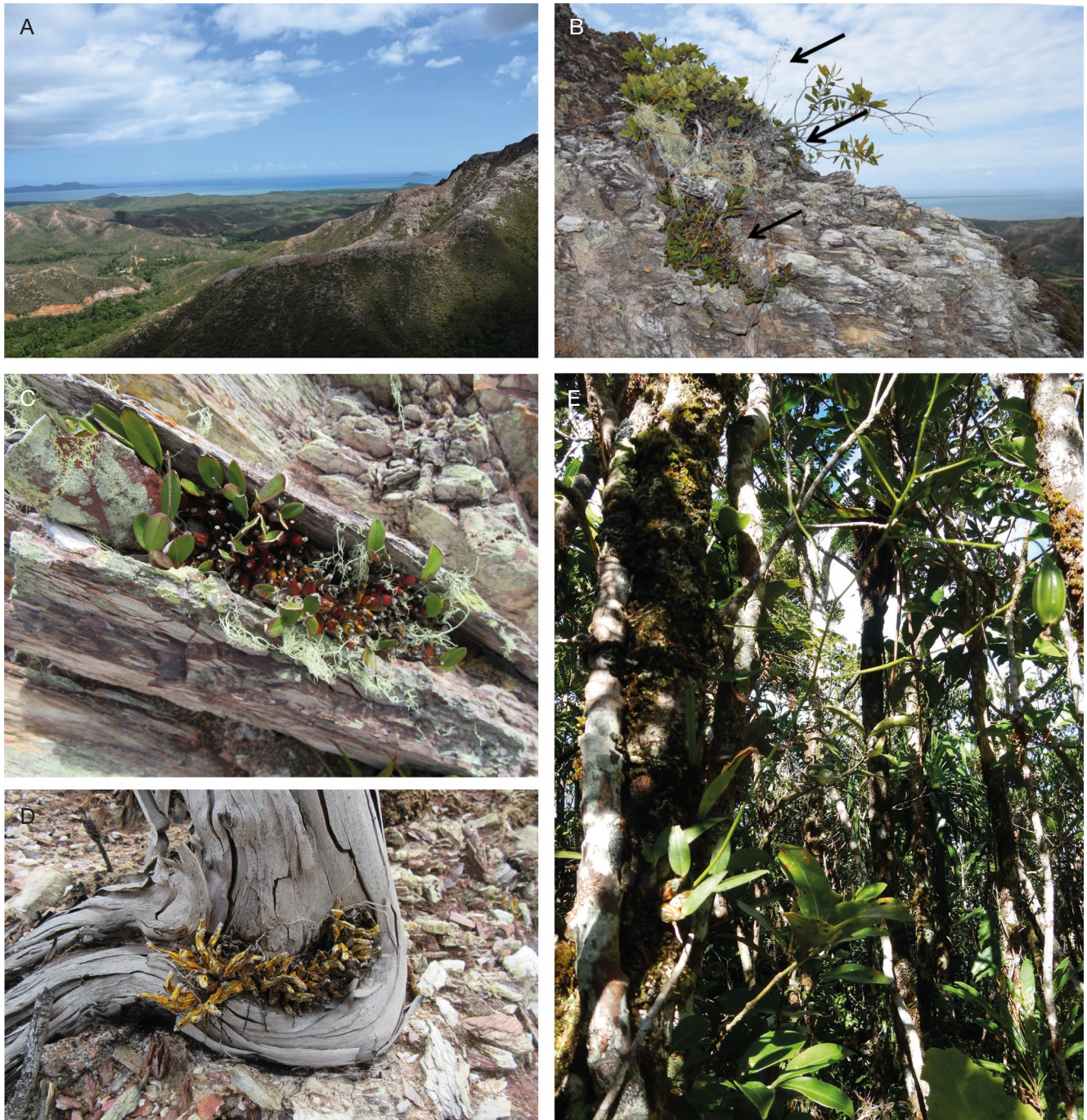


FIG. 2. — *Dendrobium petrophilum* (A-D) habitat, ecology and threat compared to *D. oppositifolium* (E) habitat: **A**, the type locality at Arama pass crest; **B**, three plants (arrows) at the Arama pass siliceous crest exposed to full sun and prevailing wind; **C**, typical chasmetophytic microhabitat within the cracks of the siliceous rocks; **D**, anthropogenic fire threat showing a burnt colony at the base of a dead burnt trunk of the microendemic *Tristaniopsis ninndoensis* J.W.Dawson; **E**, epiphytic habit in a high altitude (c. 1200 m) and open canopy montane forest at Mont Panié. **A**, Arama pass, 27.VIII.2019; **B**, Arama pass, 30.IX.2018; **C**, **D**, Vache Crevée, 14.XI.2020; **E**, Mont Panié (Pwê Taa), 31.V.2014. Photos from: A, B, E, G. Gâteblé; C, D, D. Fleurot.

specimen conserved in Zürich (Z), was considered by Hallé (1977) as very similar to the New Caledonian endemic *Dendrobium oppositifolium* (Kraenzl.) N.Hallé and raised doubts about the existence of a distinct species.

Observations and new collections by two of the authors (C.L. and G.G.), as well as Dominique Fleurot and Hervé Vandrot (pers. comm.) during the past three years of a saxicol-

ous *Dendrobium* in *D. petrophilum* type locality at the Arama pass in Northern province (col d'Arama, province Nord) may allow a comparison based on recent and fresh material. Other observations were recorded in Vallée de Paris (Poum) and in new localities in the extreme North of the Grande Terre during the “Mission PUM 2021” supported by the Poum City Council (Dominique Fleurot & Patrick Dayé, pers. comm.).

In this study, we analyse the variable morphological characters between both taxa in order to validate or not the relevance of these two species.

This publication is the fifth produced by a working group aiming at the revision of the New Caledonian orchids.

MATERIAL AND METHODS

For this study, we examined 57 collections of *D. petrophilum* and *D. oppositifolium* kept in the herbaria of Paris (P) and Nouméa (NOU), as well as the scans available from the Zürich herbarium (Z). Old localities were georeferenced *a posteriori* in order to calculate their area of occupancy (AOO) and their extent of occurrence (EOO) for their conservation assessments. In addition to herbarium specimens, field observations were integrated from the Endemia.nc website (<http://endemia.nc/>). More than 600 measurements were carried out on the images of the RECOLNAT infrastructure with the Annotate tool, available online and that can be downloaded at: <https://www.recolnat.org/fr/annotate>.

RESULTS

Family ORCHIDACEAE Juss.
Subfamily EPIDENDROIDEAE Kostel.
Tribe *Malaxideae* Lindl.
Subtribe *Dendrobiinae* Pfitzer
Genus *Dendrobium* Sw.
Section *Macrocladium* Schltr.

Dendrobium petrophilum (Kraenzl.) Garay ex N.Hallé
(Figs 1; 2A-D; 3A-E; 4)

Flore de la Nouvelle-Calédonie et Dépendances 8: 150 (Hallé 1977). — *Eria petrophila* Kraenzl., *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich* 74: 90 (Kränzlin 1929). — *Tetrodon petrophilus* (Kraenzl.) M.A.Clem. & D.L.Jones, *Orchadian* 12: 311 (Clements & Jones 1998). — Type: New Caledonia. In Felsritzen am Sommet Arama, auf Schiefer *c.* 400 m ü. M. [rock cleft at the Arama summit, on schist *c.* 400 m], fl., 16.IV.1925. *A.U. Däniker 2904* (holo-, Z[Z-000016414] image seen.).

ADDITIONAL MATERIAL EXAMINED. — Province Nord: Poupou, fente de rocher au sommet Arama, 400 m, 16.IV.1925, *A.U. Däniker 1904*, P[P02106269] photocopy of the type with an additional drawing of the flower by L.A. Garay!. — Poupou, Golone, 88 m, végétation basse, schiste dégradé, 16.V.2020, *D. Fleurot et P. Dayé 714* (NOU[NOU091019]!). — Poupou, Niap (Mts Ninndo), 214 m, maquis très ouvert, crête de schiste siliceux érodé, 25.VII.2020, *D. Fleurot 763* (NOU[NOU091249]!). — Poupou, Vache Crevée, 158 m, maquis très ouvert, crête de schiste siliceux érodé, 14.XI.2020, *D. Fleurot 796* (NOU[NOU091248]!). — Poupou, Arama, 25.X.2018, *C. Laudereau 1173*, NOU[NOU091351]!. — Poupou, Arama, 13.IX.2019, *C. Laudereau 1294* (NOU[NOU091402]!; P!). — Poupou, Arama : Mts. Ninndo, 22.VI.1972, *H.S. MacKee 25584* (P[P00115081]!). — Poupou, Col d'Arama, 6.VI.2019, *H. Vandrot et J. Girardi 1508*, NOU[NOU106730]!.

ETYMOLOGY. — The epithet refers to the words “petros” in Greek which refers to rock and “philus” which refers to like, appreciate.

PHENOLOGY. — From herbarium specimens, flowers have been recorded from April through November (except in August) and fruits have been recorded all the year.

ECOLOGY. — The epithet is very well fitting the ecology of this species usually living on rocks (saxicolous) and especially the cracks of the rocks (chasmophyte), Fig. 2C. However, *Dendrobium petrophilum* is also able to grow at the base of trees and shrubs (but not truly epiphytic, Fig. 2D) where it can get some shelter from the harsh natural environmental conditions (extreme drought, strong prevailing wind, full sun, rocks with no or little soil) encountered in this type of “acidic maquis” (Fig. 2A) which is very different from the typical New Caledonian “ultramafic maquis”. The bedrock is a siliceous schist and its derived soil (if any) is a kind of ferric Acrisol (Latham 1975). Some other species like *Codia microphylla* Vieill. ex Guillaumin, *Homalium buxifolium* Däniker, *Leichhardtia oubatchensis*, *Phyllanthus golonensis* M.Schmid and *Tristaniopsis ninndoensis* J.W.Dawson are well adapted to this type of maquis.

CONSERVATION STATUS. — A first IUCN assessment was made on 29 January 2016 by the local Red List Authority (RLA Endemia) which proposed the species as Data Deficient (DD) because of too much taxonomic uncertainty. This assessment has been published in 2020 on the IUCN Red List Portal (Butin *et al.* 2020a). Since, the species has been rediscovered in 2018 in the type locality (*locus classicus*) by two of the authors of this note, and in other places by other people, since then, we have been able to clarify its taxonomic status. A second IUCN assessment by the RLA Endemia took place on 20 November 2020 and proposed the species as EN B1ab(iii,v)+2ab(iii,v). We fully agree with this proposed status because of the very high fire threat. According to some observations (*D. Fleurot pers. comm.*), after a rapid fire event, the pseudobulbs are drying out and can be observed several years after the event (Fig. 2D). In addition, the species is protected in the Province Nord (Northern province).

DESCRIPTION

Saxicolous plant of (17-)26-34(-39) cm. Pseudobulbs bifoliate, ovoid, tubular to conical, (23-)32-40(-74) × (4-)6-8(-13) mm, with 3 internodes, bright orange on ageing organs and on dry specimens, covered with 3 deciduous, large papery, translucent and 7-veined cataphylls applied to the pseudobulb. Leaves: gutter-shaped pseudopetiole canaliculate, 3 mm long, blade (19-)26-41(-58) × (6-)8-10(-12) mm, obovate to elliptic oblong, apex obtuse, asymmetrical. Inflorescence subterminal, (70-)260-320(-380) × 1 mm, erect, slender and multiflorous, flower non resupinate, sometimes with a ramification, (9-)10-13(-21) flowers. Flower: Peduncle (5-)6-8(-9) × 0.6-1 mm, white. Tepals greenish-yellow. Median sepal lanceolate, (4.9-)5.4-6.3(-6.8) × (1.4-)1.5-2.7(-5.1) mm. Lateral sepals triangular falciform, (5.1-)6-6.5(-8) × (1.6-)1.7-2(-2.4) mm. Petals spatulate, (4.7-)5.3-6.2(-6.5) × (1.4-)1.5-1.8(-1.9) mm, slightly deflexed. Lip, 5.1 × 2.8 mm, 3-lobed. Hypochile and mesochile thick with a gibbous callus, white, obscurely tricarinate, the keels extended by 3 flattened, slightly divergent extensions, pink, 1 mm long and 0.7 mm wide (median extension), 0.4 mm wide (lateral extensions). Lateral lobes oriented upward, 2.5 × 0.9 mm, light pink striped with dark pink, roughly trilobular, the proximal lobule, small, rounded, 0.44-0.47 wide, the median lobule, ovate, 1.4 × 0.8 mm, the distal lobule, triangular, 0.8 × 0.4 mm, ending in a white tip. Median lobe trilobulate, 2.4 × 2.9 mm, white, lateral lobules, triangular,



FIG. 3. — Comparison of the flowers of *Dendrobium petrophilum* (Kraenzl.) Garay ex N.Hallé (A-E) and *D. oppositifolium* (Kraenzl.) N.Hallé (F-J): **A**, flower (front side); **B**, column, profile side (p) and front side (f); **C**, column and lip, profile side; **D**, lip, ventral side; **E**, lip spread out, ventral side (f) and backside (d); *Dendrobium oppositifolium*: **F**, flower (front side); **G**, column, profile side (p) and front side (f); **H**, column and lip, profile side; **I**, lip, ventral side (f) and backside (d); **J**, lip, ventral side (f). Photographs of *D. petrophilum* are from expeditions at Arama (Northern province), photos C. Laudereau. Photographs of *D. oppositifolium*, Plateau de Dogny, photos C. Laudereau. Olympus EM1MarkII, 30.V.2020, combined as a board. Scale bars: A, 3 mm; B-E, G-J, 5 mm; F, 4 mm.

non-deflected, 0.8 × 0.7 mm, greenish-white, median lobule rounded, 2.3 × 2 mm, white, obscurely carinate. Column white, except the edge of the stigma which is pinkish, 4.5 × 1.3 mm with a 2 mm long mentum, and 1.5 mm deep at the point of attachment to the ovary. Androecium: anther cap (connective appendage), white, 0.6 mm wide and 0.6 mm high, pollinia, 2, yellow, obovoid, 0.5 × 0.2 mm. Gynoeceum: stigma rectangular, 0.9 mm wide and 0.6 mm high, ovary, 2-3 × 0.9 mm, reddish. Fruit obovoid to spherical, 13-15(-17) × (7-)8-10 mm, greenish with purple strips.

NOTES

In 1972, H.S. MacKee collected a sterile orchid at Arama (*MacKee 25584*, Monts Ninndo, P00115081) and apparently sent some pseudobulbs of it to P for greenhouse cultivation, presumably because MacKee was thinking this orchid was interesting and worthwhile further *ex situ* examination and flowering. At P, the first author did not find any record of its cultivation and flowering in the archives of Service des Cultures. Hallé (1974, mss. in herb) identified this specimen as *D. multilobatum* Guillaumin and later, synonymized this name under *D. oppositifolium* in his New Caledonian flora of Orchidaceae (Hallé 1977: 122). Another interesting and related specimen (*MacKee 21630*) was collected fertile in 1970 and a plant was sent to Paris Museum greenhouses where it flowered on 30 May 1974. Hallé collected the inflorescence of it at P and added it to the original specimen (P00115083). Because the original specimen was also initially determined as *D. multilobatum* by Hallé, we have checked in detail the flowers of the cultivated specimen (that are slightly smaller than the ones of the *in situ* plant) to confirm labels of *MacKee 21630* and *25584* have not been mixed in P greenhouses. We conclude both the *in situ* and *ex situ* flowers belong to *D. oppositifolium* so labels were most probably not mixed. It is to be noted that many New Caledonian orchids and particularly *Dendrobium* have been exported to P and other Europeans institutions and nurseries for *ex situ* cultivation (Gâteblé 2015: 24-27, 294).

Dendrobium oppositifolium (Kraenzl.) N.Hallé
(Figs 2E; 3F-J; 4)

Flore de la Nouvelle-Calédonie & Dépendances 8: 119 (Hallé 1977). — *Eria oppositifolia* Kraenzl., Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich 74: 90 (Kränzlin 1929). — *Tetradon oppositifolius* (Kraenzl.) M.A.Clem. & D.L.Jones, *Orchadian* 12: 310 (Clements & Jones 1998). — Type: **New Caledonia**. Auf den Araucarien auf dem Plateau des Koniambo, Koné, [on the Araucaria on the Plateau de Koniambo], fl., 18.I.1925, *A.U. Däniker 894* (holo-, Z[Z-000016413], image seen).

Dendrobium multilobatum Guillaumin, *Mémoires du Muséum national d'Histoire naturelle, série B, Botanique* 8: 36 (1957). — Type: **New Caledonia**. Bord de forêt de montagne près de la côte, 500 m de la route de la Mgne [Montagne] des Sources, fl., 29.XII.1950, *Hürlimann 468* (holo-, Z[Z-000016357], image seen; iso-, P[P001212111] fragment).

ETYMOLOGY. — The epithet refers to the leaves which are opposite.

PHENOLOGY. — The species flowers mainly during the hottest season between October and March but from herbarium specimens, flowering has also been observed in July. Fruits have been recorded all the year (based on herbaria and field observations).

ECOLOGY. — This species lives as an epiphyte on trees, usually in rainforests, forest edges and sometimes in more open vegetation conditions (*Araucaria* spp.) at higher altitudes. Most of the observations and specimens are from open or low forests ranging from 200 to 1200 m above sea level. Because *Dendrobium oppositifolium* seems to favour semi-shaded conditions, it has been rarely observed in dense rainforests where it might occur within the difficult to access canopy of the large and highest trees.

CONSERVATION STATUS. — It is a common endemic species distributed from the South to the North of mainland Grande Terre and even on Île des Pins [Isle of Pines]. Even if some plants and populations are threatened by anthropogenic fires and by illegal removal (the species is protected in the Northern province) from plant and orchid hunters, the species is globally not threatened. It has been successfully cultivated in Paris museum greenhouses as well as by local orchid growers, but remains very difficult to maintain. We agree with the RLA Endemia assessment made on 29 January 2016 (Butin *et al.* 2020b) classifying the species as Least Concern (LC).

ADDITIONAL MATERIAL EXAMINED. — **New Caledonia**. Province Nord, Ouégoa, Mandjélia, 780 m, forêt, 4.I.1978, *P.R.J. Bamps 6123* (P[P00115105]!). — Kone, Plateau de Kaniambo, Koné, 18.I.1925, *A.U. Däniker 894* (P[P02106271] photocopy with an additional drawing of the flower by N. Hallé!). — Ouégoa, Crête au Sud du Col d'Amos, 17.III.1966, *H.S. MacKee 14573* (P[P00115093]!). — Hienghène, Massif de Ton-Non: Roches Ouaième, 10.I.1968, *H.S. MacKee 18246* (P[P00115091]!). — Pouembout, Mt. Paéoua, 15.II.1968, *H.S. MacKee 18427* (P[P00115087]!). — Ouégoa, Haute Diahot: Tendé (Expl. For. Frouin), 500-660 m, 12.III.1968, *H.S. MacKee 20003* (NOU[NOU003683]!; P[P00115086]!). — Ouégoa, Pouébo: Crête entre Mandjélia/ Salandané, 15.III.1969, *H.S. MacKee 21281* (P[P00115085]!). — Ouégoa, Pouébo: Mandjélia/ Salandané, 26.II.1970, *H.S. MacKee 21630* (P[P00115083]!). — Poya, Ponérihouen: Contrefort E Mt. Aoupinié, 26.IV.1972, *H.S. MacKee 25330* (P[P00115097]!). — Poya, Pente S Mt. Boulinda, 30.VII.1973, *H.S. MacKee 27014* (P[P00115080]!). — Pouébo, Pouébo, 24.VII.1974, *H.S. MacKee 28970* (P[P00115104]!). — Hienghène, Panié, 12.I.1976, *H.S. MacKee 30664* (P[P00115079]!). — Poya, Ponérihouen: Crête sommet Mt. Aoupinié, 10.V.1976, *H.S. MacKee 31199* (P[P00115096]!). — Kaala-Gomen, Crête SW Mt. Taom, 13.VII.1979, *H.S. MacKee 37144* (P[P00115112]!). — Pouébo, Pouébo: Oumbarinien, 9.I.1981, *H.S. MacKee 38553* (P[P00115111]!). — Hienghène, Pente E Mt. Panié, 11.II.1981, *H.S. MacKee 38737* (P[P00115110]!). — Houailou, Bourail: Mé Jéjéhari, 5.II.1985, *H.S. MacKee 42444* (P[P00115114]!). — Mt Colnett: Versant Est, 800 m, forêt humide, Schistes, 2.II.2003, *A. Mouly, G. McPherson & U. Svenson 94* (P[P00591695]!). — Poindimié, Massif du Tchinguou, face Est, 29.III.2001, *J. Munzinger 572* (P[P00239087]!). — Pouembout, Paéoua Mt 800-1100m, 1100 m, forêt à *Nothofagus*, 26.I.2010, *J. Munzinger 6021* (NOU[NOU053561]!). — Hienghène, Dawenia (zone), 929 m, 14.II.2010, *J. Munzinger et al. 6319* (NOU[NOU063498]!). — Hienghène, La Guen, cascade (Panié), 910 m, forêt basse, 23.II.2010, *J. Munzinger (Leg. Butin, J.-P.) 6468* (NOU[NOU063648]!). — Mt Panié, 500-900m, 14.II.2006, *Y. Pillon 294* (NOU[NOU010843]!). — Mont Panié, forêt basse, 14.II.2006, *Y. Pillon, J. Munzinger, I. Spir & al. 9486* (P[P00684671]!). — Kaala-Gomen, Taom Mt (zone), 900 m, 24.III.1982, *B. Suprin 1731* (NOU[NOU003688]!). — Tipindjé: Mont Cantaloupai (versant N), 16.IX.1983, *B. Suprin 2295* (P[P00115107]!). — Kouaoua: décharge Montmartre, 750 m, 14.II.1978, *J.-M. Veillon 3524* (NOU[NOU003684]!; P[P00115109]!). — Houailou, Mt Menazi, crête vers 900 m versant nord, 6.VII.1989, *J.-M. Veillon 7075* (NOU[NOU003685]!). — Wagap, 1861-1867, *E. Vieillard*

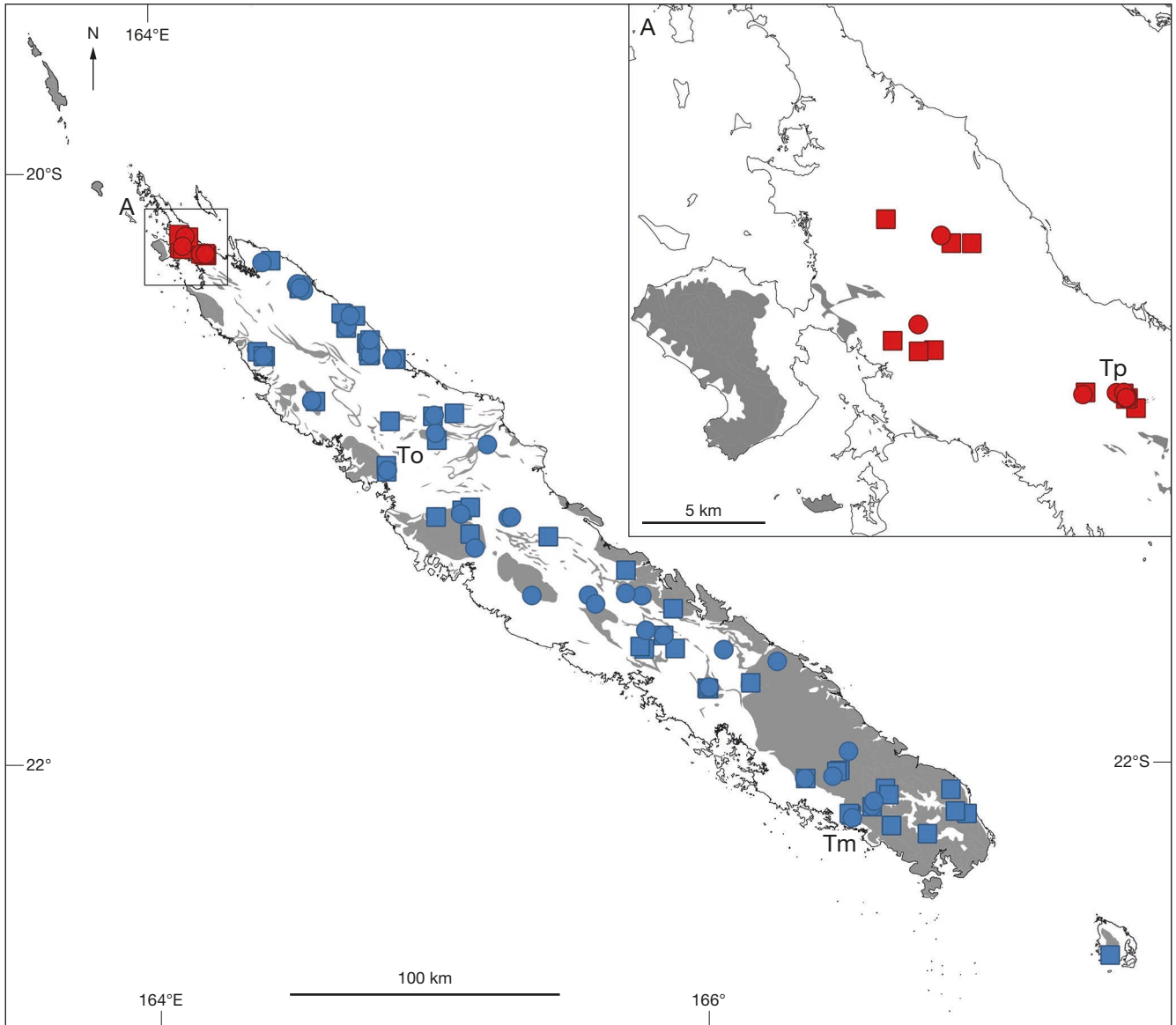


FIG. 4. — Distribution of *Dendrobium oppositifolium* (Kraenzl.) N.Hallé (**blue**) and *D. petrophilum* (Kraenzl.) Garay ex N.Hallé (**red**) in New Caledonia (La Grande Terre and Île des Pins): **A**, focus in the Poum area. **Grey shaded areas** represent ultramafic outcrops. **Circles** correspond to herbarium specimens while **squares** correspond to *in situ* observations from various authors and compiled by Endemia.nc. **Tm**, **To** and **Tp** represent respectively the type localities of *D. multilobatum* Guillaumin, *D. oppositifolium* and *D. petrophilum* names.

3284 (P[P00115101]!). — Kaala-Gomen, près du sommet du Mont Kaala, 1000 m, 2.I.1943, *R. Viro*t 1402 (P[P00115098]!). — Province Sud: Sarraméa, Mé Améri, 700 m, 29.II.1950, *A. Guillaumin* 8996 (P[P00115094]!). — Boulouparis, Mt Do (zone), sous-bois de forêt, 16.I.1982, *M. Hoff* 4423 (NOU[NOU003687]!). — Bordure de forêt de montagne, près de la côte, 500 m de la route pour la Montagne des Sources, 29.III.1950, *H. Hürlimann* 468 (P[P00121211]!). — Boulouparis, Mont Do, 13.IX.2019, *C. Laudereau* 269 (NOU[NOU091401]!). — Païta, Dzumac, 13.IX.2019, *C. Laudereau* 281 (NOU[NOU091400]!). — Yaté, Plateau de la Montagne des Sources, 31.III.1967, *H.S. MacKee* 18200 (P[P00115092]!). — Bourail, Maoya Mé: contrefort S Djiaouma, 11.II.1970, *H.S. MacKee* 21554 (P[P00115084]!). — Boulouparis, Plateau sommet Mt. Do, 26.I.1972, *H.S. MacKee* 24898 (P[P00115082]!). — Bourail, 4 km à l'W Mé Aoui, 14.II.1976, *H.S. MacKee* 32265 (P[P00115078]!). — Boulouparis, Mt. Do, 22.II.1976, *H.S. MacKee* 32288 (P[P00115095]!). — Païta, Mt. Mou, 27.V.1979, *H.S. MacKee* 36940 (P[P00115113]!). — Sar-

raméa, Col Amieu: Mt. Pembai, 1.III.1982, *H.S. MacKee* 40302 (P[P00115115]!). — Along old lumber road to top of Mt Mé Ori, above Katrikoin, 900 m, 7.IX.1980, *G. McPherson* 3054 (P[P00115106]!). — Thio, Mont Nakada, 18.IV.2001, *J. Munzinger* 801 (P[P00217010]!). — Thio, Forêt de Sailles, 4.III.2001, *J. Munzinger* 1194 (P[P00239729]!). — Yaté, Massif du Kouakoué, bassin de la Haute Ni, 950 m, 30.IV.2004, *M. Pignal, J. Munzinger et P. Lowry* 2438 (P[P00465755]!). — Mont Do, c. 900-1000 m, en lisière de forêt, très souvent sur *Araucaria laubenfelsii*, 1020 m, 1.II.1972, *J.-M. Veillon* 2511 (NOU[NOU003686, NOU003686]; P[P00115102, P00115103, P00115108]!). — Mont-Dore, Haute Boulari camp no. 3, 500 m, V.1938, *R. Viro*t s.n. (P[P00115099]!).

DESCRIPTION

Epiphytic plant. Pseudobulbs bifoliate, ovate to turbinate, 8-(20-28)-44 × 4-(6-8)-25 mm, with 4-5 internodes, bright orange on dry material, covered with 3 deciduous, broad,

TABLE 1. — Comparaison des caractères morphologiques entre *Dendrobium petrophilum* (Kraenzl.) Garay ex N.Hallé et *D. oppositifolium* (Kraenzl.) N.Hallé. Les caractères indiqués par * sont basés sur plus de 600 mesures et sont présentés selon la convention (min-) quartile 1-quartile 3 (-max).

	<i>Dendrobium petrophilum</i>	<i>Dendrobium oppositifolium</i>
Écologie	lithophyte/chasmophyte	épiphyte
Pseudobulbe (mm)*	(23-)32-40(-74) × (4-)6-8(-13)	(8-)20-28(-44) × (4-)6-8(-25)
Limbe (mm)*	(19-)26-41(-58) × (6-)8-10(-12)	(16-)27-39(-72) × (7-)10-13(-27)
Inflorescences (mm)*	plutôt dressées, (70-)260-320(-380)	plus ou moins retombantes, (80-)140-240(-420)
Fleurs/infl.*	(9-)10-13(-21)	(2-)4-7(-18)
Fleurs	Tépales jaunes et labelle rose pâle bordé de blanc, lobes latéraux roses	Tépales jaunes et labelle rose soutenu, à lobes latéraux du labelle orangés
Tépales	moins de 7 mm	plus de 15 mm
Sépale médian	lancéolé	linéaire linéaire-lancéolé
Sépales latéraux	peu recourbés à la base	très recourbés à la base
Pétales	peu recourbés à la base	très recourbés à la base
Labelle	c. 5 mm de long environ, extensions peu divergentes de 1 mm de long, mésophile à gibbosités de 0,7 mm d'épaisseur, lobe médian trilobulé de moins de 2,5 mm de longueur	c. 10 mm de long environ, extensions très divergentes de plus de 2 mm de long, mésophile verruqueux, lobe médian panduriforme de plus de 5 mm de longueur
Stigmate	rectangulaire à ouverture à peu près aussi haute que large, bordé de rose pâle	rectangulaire à ouverture manifestement plus haute que large, bordé de rose foncé
Fruit* (mm)	obovoïde à sphérique, (13-)13-15(-17) × (7-)8-10, verdâtre avec des bandes violettes	obovoïde, (16-)19-23(-26) × (5-)6-8(-10), verdâtre

TABLE 2. — Comparison of morphological characters between *Dendrobium petrophilum* (Kraenzl.) Garay ex N.Hallé and *D. oppositifolium* (Kraenzl.) N.Hallé. Characters indicated by * are based on more than 600 measurements and are presented as (min-) quartile 1-quartile 3 (-max).

	<i>Dendrobium petrophilum</i>	<i>Dendrobium oppositifolium</i>
Ecology	lithophytic/chasmophytic	epiphytic
Pseudobulb (mm)*	(23-)32-40(-74) × (4-)6-8(-13)	(8-)20-28(-44) × (4-)6-8(-25)
Leaf blade (mm)*	(19-)26-41(-58) × (6-)8-10(-12)	(16-)27-39(-72) × (7-)10-13(-27)
Inflorescences (mm)*	rather erect, (70-)260-320(-380)	more or less falling down, (80-)140-240(-420)
Flowers/infl*	(9-)10-13(-21)	(2-)4-7(-18)
Flowers	tepals yellow and lip pale pink edged with white; lateral lobes pink	tepals yellow and lip dark pink; lateral lobes orange
Tepals	less than 7 mm	more than 15 mm
Median sepal	lanceolate	linear lanceolate
Lateral sepals	slightly curved at the base	strongly curved at the base
Petals	slightly curved at the base	strongly curved at the base
Lip	c. 5 mm long, slightly divergent extensions of 1 mm in length, mesochile with gibbosity of 0.7 mm thick, median lobe trilobular, less than 2.5 mm long	c. 10 mm long, very divergent extensions of more than 2 mm in length, mesochile warty, median lobe panduriform more than 5 mm long
Stigma	rectangular with an opening about as high as it is wide, edged with pale pink	rectangular with an opening that is clearly higher than wide, bordered with dark pink
Fruit* (mm)	obovoid to spherical greenish with purple strips (13-)13-15(-17) × (7-)8-10	obovoid, greenish (16-)19-23(-26) × (5-)6-8(-10)

papyraceous and translucent cataphylls applied to the pseudobulb. Leaf : gutter-shaped pseudopetiole canaliculate, 2-4 mm, blade coriaceous ovate to elliptic 16-(27-39)-72 × 7-(10-13)-27 mm, apex obtuse. Inflorescence, 80-(140-240)-420 mm, with 2-(4-7)-18 flowers, sometimes once branched, flower non resupinate, borne in a subterminal position of the pseudobulb, more or less hanging. Flower: Peduncle, 10 × 0.9 mm. Tepals yellow to brownish green. Median sepal, linear lanceolate, 18.7 × 4 mm, 5 visible veins. Lateral sepals lanceolate, curved proximally, 16.5 × 4.6 mm. Petals spatulate, curved proximally, 17 × 4.3 mm. Lip, 3-lobed, 10 × 5 mm. Hypochile thick, warty, greenish-white, thickened in the centre, extended by 3 very divergent flattened extensions, white with dark pink

stains, 2.2-2.3 mm long and 0.6 mm wide. Lateral lobes erect, 3.3 × 1.9 mm, longitudinally striated dark pink, white proximally and bright orange distally, ovate, with a very attenuated tooth on the side showing the proximal lobule of *D. petrophilum*. Median lobe 3-lobulate, curved, 6 × 5 mm, greenish-white in the centre with a triangular central verrucous crest. Lateral lobules, triangular, slightly deflected, 1 × 1.2 mm, dark pink with greenish-white tip, panduriform median lobule with rounded apex, curved at the tip making it appear emarginate, 5.8 × 6 mm, dark pink. Column white, except the edge of the stigma which is dark pink (protruding 1 mm down), 6 × 2.5 mm with a 4 mm long mentum, and 1.9 mm deep at the point of attachment to the ovary. Stamen: anther cap (connective appendage)

white, 1.1 mm wide and 1.4 mm high. Pollinia, 2, yellow, obovoid, 0.9 mm long. Stigma rectangular 1.3 mm wide and 1.6 mm high. Ovary, 4.5 × 1.4 mm. Fruit obovoid, (16-)19-23(-26) × (5-)6-8(-10) mm.

The vegetative system of the two species is very similar. However, the flowers as well as fruits have notable differences in size, shape and colour as summarised in Tables 1 and 2.

CONCLUSION

Despite their morphological and probably phylogenetic proximity, we are convinced that *D. petrophilum* and *D. oppositifolium* constitute two distinct species. The former occurs in the northern tip of New Caledonia and its distribution does not overlap with that of the latter whose area is located on the rest of the Grande Terre and the Île des Pins. From an ecological point of view, *D. petrophilum* is saxicolous or at the base of isolated trees, and depends on a rocky and sunny environment, whereas *D. oppositifolium* is strictly epiphytic and lives in an open forest environment. Morphologically, the vegetative habit is similar in both species, but the flowers are twice as large in *D. oppositifolium*. The lip has a rather different callus on the mesochile, rounded in *D. petrophilum*, more elongated in *D. oppositifolium*. Finally, the lateral lobes of the lip are pink in the first species, whereas they are orange in the second. The fruit is generally more spherical in *D. petrophilum*.

Finally, although the data on *D. petrophilum* have been greatly improved and the species has been found on its *locus classicus* and beyond, it is still to be sought in the neighbouring massifs.

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