

# New Caledonian *Piliocalyx* transferred to *Syzygium* (Myrtaceae) with an updated conspectus of the species

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## Abstract

SNOW, N., J.W. BYNG, J. MUNZINGER, M.W. CALLMANDER & J.W. DAWSON (2017). New Caledonian *Piliocalyx* transferred to *Syzygium* (Myrtaceae) with an updated conspectus of the species. *Candollea* 72: 239–248. In English, English and French abstracts. DOI: <http://dx.doi.org/10.15553/c2017v722a1>

Members of *Piliocalyx* Brongn. & Gris (*Myrtaceae*) from New Caledonia are transferred to, or given new names in, *Syzygium* Gaertn., including: *Syzygium baudouinii* (Brongn. & Gris) N. Snow, Byng & J.W. Dawson, *Syzygium bullatum* (Brongn. & Gris) N. Snow & Byng, *Syzygium francii* (Guillaumin) N. Snow, Byng & Munzinger, *Syzygium ignambiense* (Baker f.) N. Snow & Byng, *Syzygium neoegenioides* (Guillaumin) N. Snow, Byng & J. W. Dawson, *Syzygium neolaurifolium* N. Snow & Byng, and *Syzygium vieillardii* N. Snow, Callm. & Byng. Diagnostic characters for all species, including *Syzygium lifuanum* Däniker and *Syzygium viriosum* Craven & Dawson, and a list of specimens confirmed for each species is included. Lectotypes are designated for *Syzygium baudouinii*, *Syzygium bullatum*, *Syzygium neoegenioides*, *Syzygium neolaurifolium*, and *Syzygium viriosum*. Field photographs are provided for five of the species.

## Résumé

SNOW, N., J.W. BYNG, J. MUNZINGER, M.W. CALLMANDER & J.W. DAWSON (2017). Les espèces du genre *Piliocalyx* Brongn. & Gris de Nouvelle-Calédonie transférées à *Syzygium* (Myrtaceae), avec une vue d'ensemble complète des espèces. *Candollea* 72: 239–248. En anglais, résumés anglais et français. DOI: <http://dx.doi.org/10.15553/c2017v722a1>

Les espèces du genre *Piliocalyx* Brongn. & Gris (*Myrtaceae*) de Nouvelle-Calédonie sont transférées à *Syzygium* Gaertn.: *Syzygium baudouinii* (Brongn. & Gris.) N. Snow, Byng & J.W. Dawson, *Syzygium bullatum* (Brongn. & Gris) N. Snow & Byng, *Syzygium francii* (Guillaumin) N. Snow, Byng & Munzinger, *Syzygium ignambiense* (Baker f.) N. Snow & Byng, *Syzygium neoegenioides* (Guillaumin) N. Snow, Byng & J.W. Dawson, *Syzygium neolaurifolium* N. Snow & Byng et *Syzygium vieillardii* N. Snow, Callm. & Byng. Nous donnons les caractères diagnostiques de toutes ces espèces y compris *Syzygium lifuanum* Däniker et *Syzygium viriosum* Craven & Dawson, ainsi qu'une liste de spécimens confirmés sont inclus. Des lectotypes sont désignés pour *Syzygium baudouinii*, *Syzygium bullatum*, *Syzygium neoegenioides*, *Syzygium neolaurifolium*, et *Syzygium viriosum*. Des images de terrain sont fournies pour cinq de ces espèces.

## Keywords

MYRTACEAE – *Syzygium* – *Piliocalyx* – New Caledonia – Nomenclature – Taxonomy

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## Introduction

We estimate that *Syzygium* Gaertn. (Myrtaceae) may comprise 1,500–1,800 species (SYZWG, 2016), which represents an upward revision from recent estimates (PARNELL et al., 2007; CRAVEN & BIFFIN, 2010; WILSON, 2011; WCSF, 2017). The newer figures are derived from recent study (primarily by JWB) of approximately forty-thousand herbarium specimens of *Syzygium* from across its geographical range, but especially of specimens from Malesia. The increased estimate also stems partially from newly described species (e.g., SHAREEF et al. 2012, 2013, 2014; BYNG et al., 2015, 2016; BYNG, 2016; BYNG & PAHLADSINGH, 2016; BYNG & SNOW, 2016; and others cited in SNOW et al., 2016), many known but undescribed species (Snow & Byng, unpubl. data), and those transferred here from *Piliocalyx* Brongn. & Gris.

As currently understood, eight of the ten species currently recognized in *Piliocalyx* Brongn. & Gris are from New Caledonia, all of which are endemic. One species (*S. concinnum* (A.C. Sm.) Craven & Biffin) is endemic to Fiji (CRAVEN et al., 2006) and another (*S. chanelii* S.H. Tuiwawa & Craven) endemic to Vanuatu (TUIWAWA et al., 2013). A member of tribe *Syzygieae* (WILSON et al. 2005; WILSON 2011), some authors (CRAVEN & BIFFIN, 2010) now treat *Piliocalyx* as *Syzygium* subg. *Acmena* (DC.) Craven & Biffin sect. *Piliocalyx* (DC.) Craven & Biffin, whereas others (WILSON, 2011) continue to recognize the genus as distinct. A previous comprehensive review of the family (BRIGGS & JOHNSON, 1979) recognized an informal sub-alliance of genera within *Syzygium* sensu lato called the *Acmena* sub-alliance, which included *Piliocalyx*. Molecular data (BIFFIN et al., 2006, 2007) thus far do not unequivocally support either the recognition of one large genus, *Syzygium*, or the segregate genera. As Wilson (2011) noted, although molecular data strongly support the monophyly of many of the segregate genera, the resolution between clades has been poor or non-existent.

Among characters putatively differentiating these lineages, BIFFIN et al. (2006) indicated a calyprate calyx as an important diagnostic generic trait previously used to segregate *Piliocalyx* (BIFFIN et al., 2006). WILSON (2011: 244) also suggested that *Piliocalyx* might be regarded “as merely a calyprate variant of *Acmena*”. Other characters cited by various authors to segregate *Piliocalyx* and other generic segregates from *Syzygium* have included: petals absent or minute and fused to the calyptra, biseriate anthers with divergent anther sacs, apical axile ovules, and some other characters that are typical of many *Syzygium* (DAWSON, 1999; BIFFIN et al., 2006; WILSON, 2011). The calycine calyptra of *Piliocalyx* is flattened, slightly rounded, and sometimes bears an acute umbo, but it is completely unlike the elongated and broadly tapered (turbinate) calyptras of the “Group I” species of *Syzygium* treated by DAWSON (1999), which also consistently have much larger, narrow hypanthium tubes.

Generic boundaries of *Piliocalyx* have been in doubt, however, with some authors following tradition in recognizing several genera closely related to *Syzygium* (e.g., DAWSON, 1999; WILSON, 2011), including *Piliocalyx*. In contrast, based on several molecular studies of Myrtaceae, which included relatively broad sampling within *Syzygium*, Lyn Craven (1945–2014) (CANB) and collaborators proposed merging satellite genera such as *Acmena* DC., *Acmenosperma* Kausel, *Cleistocalyx* Blume, *Piliocalyx*, and *Waterhousea* B. Hyland into a more broadly circumscribed *Syzygium* (CRAVEN, 1998, 2001, 2006; CRAVEN et al., 2006; BIFFIN et al., 2005; CRAVEN & BIFFIN, 2010). With specific regards to New Caledonia, molecular studies have shown up to four species of New Caledonian *Piliocalyx* to be embedded deeply in *Syzygium* s.l. (BIFFIN et al., 2006; CRAVEN & BIFFIN, 2010; THORNHILL et al., 2015), with the New Caledonian species themselves monophyletic within the larger groups (BIFFIN et al., 2006). THORNHILL et al. (2015) suggested from a biogeographical perspective that the New Caledonian species or their progenitors likely arrived by long-distance dispersal and establishment from Australia. Given these data, CRAVEN & BIFFIN (2010) reduced *Piliocalyx* to *Syzygium* subg. *Acmena* section *Piliocalyx*.

Embryological characters also have been used to justify distinct taxa at various ranks, although the characters have not been studied broadly or in depth across the putative genera. BIFFIN et al. (2006; Tables 1 and 4 therein) summarized these data. In particular, some taxa are said to lack a testa (seed coat) but instead have intercotyledonary intrusive tissue (BIFFIN et al., 2006). Unpublished observations of cross-sections through seeds of some species of *Piliocalyx* from New Caledonia by the fifth author (JWD) and Craven also indicate differentiation of tissues, including what was interpreted by JWD as a single cotyledon, an epicotyl, and a radicle and root cap, much of the latter of which is penetrated and surrounded by the fibrous (intrusive) material from what he believed to be the pericarp. HYLAND (1983) reported an “intercotyledonary inclusion” from the base or side of the seed in *Waterhousea*. WILSON (2011: 245) more recently summarized the situation for *Piliocalyx* by noting the apparent absence of a testa, and described the cotyledons as “ruminate and with an intercotyledonary inclusion ramifying from the apex of the seed.” Additional study of fruit and gross seed morphology may provide additional diagnostic traits for recognition of taxa and phylogenetic studies (BELSHAM & ORLOVICH, 2003; BIFFIN et al., 2006).

Despite the above-mentioned variation in characters and that some clades within *Syzygium* s.l. have received strong molecular support, no morphological (CRAVEN, 2001) or molecular studies (e.g., BIFFIN et al., 2006) thus far indicate a clean way to split *Syzygium* into segregate genera without leaving a paraphyletic residue of *Syzygium*. Thus at the present time we believe that transferring species of *Piliocalyx*

in *Syzygium* s.l. is warranted. The purpose of this paper is to formally transfer six species of New Caledonian *Piliocalyx* into *Syzygium*, transfer *Eugenia ignambiensis* into *Syzygium* (which is clearly misplaced in its current genus), and propose new names where needed. Included are notes regarding selection of lectotypes. Also included are the tentative diagnostic traits to separate species from others in New Caledonian *Syzygium* (Dawson, 1999), including those of leaves and branchlets, given that they are present year-round, but also including reproductive features. Descriptions are in approximate parallel for most characters and include those that we feel are reliably diagnostic based on variation known at the present time. Because several of the species previously were known from relatively few collections, or include specimens collected over the past few decades that have not been mentioned elsewhere in the literature, we cite all additional specimens seen. In contrast, specimens provisionally identified in *Piliocalyx* to generic or species level that we cannot currently corroborate are excluded pending further study.

## Taxonomy

*Syzygium baudouinii* (Brongn. & Gris) N. Snow, Byng & J.W. Dawson, **comb. nov.** (Fig. 1A-B).

= *Piliocalyx baudouinii* Brongn. & Gris in Bull. Soc. Bot. France 12: 186. 1865.

**Lectotypus** (designated here): NEW CALEDONIA. **Prov. Sud:** *sine loc.*, *Baudouin 288* (P [P05265340]!); isolecto-: P [P05265339]!).

*Shrubs* or trees, 1-12 m. *Bark* unknown. *Branchlets* terete or narrowly 4-winged (e.g., *Veillon 2255*), reddish to greenish. *Leaves* sessile or subsessile. *Leaf* blades c. 1.5-4 cm, ovate, base cordate and clasping, margin smooth to somewhat undulate, apex broadly acute to rounded. *Inflorescences* terminal, 12-28 × 15-20 mm, of simple or compound cymes, axes terete, green to yellow-green. *Hypanthium* c. 2 × 2.5 mm, infundibular to cupuliform, pinkish; perianth calyprate with a short, blunt umbo, whitish-pink. *Fruits* c. 1.5 × 1.5-2.5 cm, subglobose to globose, whitish, cream-colored or reportedly sometimes reddish.

*Notes.* – This relatively common species most closely resembles *S. jaffrei* J.W. Dawson, but the latter has strongly angular branchlets and more acute to acuminate leaf apices (Dawson, 1999: 111-113). The leaves of *S. capillaceum* (Brongn. & Gris) J.W. Dawson are similar as well, but are longer (3.5-6.5 cm) and not clasping at the base (Dawson, 1999: 121-123).

The protologue mentions only “Habitat in Nova Caledonia ad ripas rivorum circa Port-de-France [= Nouméa] (Baudouin, 1865)”, with no specimens cited. It probably is not possible to

know with certainty what constitutes the entirety of original material on which the description was based, but the lectotype and isolectotype assuredly were a part of that material and of the same gathering, based on the labels.

*Additional specimens examined.* – NEW CALEDONIA. **Prov. Nord:** Col d’Amos, 300 m, 9.VI.1956, *Mackee 4735* (K [K000771864], P [P05265320]). **Prov. Sud:** NE du Mt Mou, 31.XII.1869, *Balansa 2100* (P [P05265346, P05265347]); Dumbéa, *Baudouin 179* (P [P05265338, P05265343]); *ibid. loc.*, 16.V.1951, *Baumann-Bodenheim 13337* (L [L.3927702, L.4147734], P [P05265334], [Z-000056166]); *ibid. loc.*, 7.VIII.1882, *Brousmiche 672* (P [P05265329]); Yaté river at Yaté, 14.XII.1947, *Buchholz 1501* (P [P05265325]); Nondoué, XI.1906, *Franc 626A* (K [K000771862], P [P05265344]); à Prony, 20.I.1911, *Franc 1939* (G [2 sheets], K [K000771861], P [P05265345], Z [Z-000056168, Z-000056169]); Pente W des Mt Kouané-moa, 1.II.1951, *Hürlimann 823* (P [P05265332], Z [Z-000056167]); Vallée de Nondoué, 20.IV.1951, *Hürlimann 1433* (P [P05265333], Z [Z-000056165]); La Ouaménié, creek du Mt Do (propr. Caillard), 12.VI.1974, *Jaffré 1321* (NOU [NOU013786], P [P05265313, P05265316]); bord de la Nondoué, VI.1901, *Le Rat & Le Rat 238* (B, P [P05265348]); Nondoué, 21.II.1920, *Le Rat & Le Rat 1054* (P [P05265324, P05265328]); Bord de la Nondoué, IV.1905, *Le Rat & Le Rat 2567* (L [L.2518675], P [P05265342]); Dumbéa, Nondoué, Val fleuri, 2.VII.1955, *MacKee 2679* (L [L.2518673], P [P05265322]); forest ridge leading from Chapeau Gendarme to Koghi, 600-700 m, 22.IX.1956, *MacKee 5299* (K [K000771865]); Mamié, 21.VII.1981, *MacKee 39306* (P [P05265242]); Kuébini, 14.III.1982, *MacKee 40265* (NOU [NOU032427], P [P05265215]); Yaté, route cotière vers Touaourou, 2.VII.2004, *Munzinger & Dagostini 2167* (NOU [NOU003632]; P [P06669063]); Col de Mo, 22.VIII.2004, *Munzinger et al. 2322* (NOU [NOU003560], P [P06669071]); *sine loc.* *Pancher 45A* (P [P05265343]); Dumbéa, VIII.1949, *Sarlin 176* (P [P05265326]); Touaourou, 21.IX.1969, *Schmid 2988* (P [P05265235]); Zone tribale de Yaté, 20.IX.1978, *Suprin 427* (NOU [NOU009176], P [P06669073]); La Dumbéa, 26.VIII.1966, *Veillon 870* (NOU [NOU013799]); P [P04807655]; face W du Mt Do, 12.VIII.1968, *Veillon 1888* (NOU [NOU013781], P [P05265323]); région de Touaourou, IV.1971, *Veillon 2255* (MO-6450567, NOU [NOU013798], P [P00966387]); berges de la Ouenghi, propriété Caillard, 28.XI.1970, *Veillon 2486* (NOU [NOU013797]; P [P00966388]); M’bée, 1855-60, *Vieillard 475* (P [P05265335, P05265336, P05265337, P05265341]); bords de la Nondoué, 5.XI.1939, *Virot 237* (P [P05265318, P05265327]); *ibid. loc.*, 27.XI.1942, *Virot 886* (MO-6452861; P [P05265319, P01061000]); c. Yaté, baie de Yaté, 18.VIII.1968, *Webster & Hildreth 14860* (P [P04807652]); base of Mt Mou, 6.X.1923, *White 2074* (A, K [K000771866]).

*Syzygium bullatum* (Brongn. & Gris) N. Snow & Byng, **comb. nov.**

= *Piliocalyx bullatus* Brongn. & Gris in Bull. Soc. Bot. France 13: 470. 1866.

**Lectotypus** (designated here): NEW CALEDONIA. **Prov. Nord:** Wagap, *Vieillard 2177* (P [P00543883]!); isolecto-: P [P00543884, P00543885]!). **Syntypi:** NEW CALEDONIA: **Prov. Nord:** Wagap, *Vieillard 2177* (A [A00071209] image seen; G [G00341008]!; GH [GH00071208] image seen, K [K000800626]!; Z [Z-000056172]!).

*Trees* 7-30 m. *Bark* grayish, mostly smooth. *Branchlets* terete, becoming grayish. *Leaves* sessile. *Leaf* blades c. 7-22 × 4.5-6.0 cm, oblong to narrowly oblong or narrowly ovate, base



**Fig. 1.** – Living *Syzygium* P. Browne ex Gaertn. **A-B.** *Syzygium baudounii* (Brongn. & Gris) N. Snow, Byng & J.W. Dawson; **C.** *Syzygium francii* (Guillaumin) N. Snow, Byng & Munzinger; **D.** *Syzygium ignambiense* (Baker f.) N. Snow & Byng; **E.** *Syzygium neoeugenioides* N. Snow & Byng; **F.** *Syzygium neolaurifolium* N. Snow & Byng.

[**B:** Munzinger & Dagostini 2167; **C:** Munzinger 5600; **D:** Munzinger 2221; **E:** Munzinger 4915; **F:** Munzinger 2416]  
 [Photos: **A-B, D-F:** J. Munzinger; **C:** P. Lowry]

cordate to subcordate, margin revolute, apex obtuse, venation moderately to conspicuously bullate. *Inflorescences* terminal, paniculate, multi-branched, 5-19 × 4-8 cm (sometimes c. 2 × length of subtending leaves); axes laterally compressed beneath branching points, light yellowish green. *Hypanthium* 1.8-2 × c. 2.5 mm, whitish; filaments whitish to magenta. *Fruits* 1.2-2.2 × 1.3-2.3 cm; globular to subglobular, base rounded to somewhat tapered, maturing whitish, cream-colored or yellowish.

*Notes.* – The protologue indicated only *Vieillard 2176* from Wagap, which is an error because the marked (“type”) specimen clearly indicates *2177*, and because *2176* is listed from the same locality as the type of *Piliocalyx wagapensis* Brongn. & Gris in the same publication on the next page. The specimen marked with a “type” tag at P for *Syzygium bullatum* (*Vieillard 2177*), selected here as the lectotype, is indisputably representative of that taxon. Specimens of the same number are at G, K, and Z but these bear different labels. We thus cannot be certain that these remaining syntypes are of the same gathering, which was made when the concept of types did not exist as we know it today. We thus follow a conservative treatment in designating a lectotype with remaining syntypes rather than citation of a lectotype with isolectotypes (McNEILL, 2014).

The leaf blades of *McPherson 5090* south of col d’Amieu are markedly narrower than other specimens, but other diagnostic aspects of the leaf (e.g., bullate texture, widely diverging and spacing of secondary veins) and the whitish fruit accord with our concept of this species.

A specimen at P previously labeled as this taxon (*MacKee 13401*) is *S. dawsonianum* N. Snow, S.L. Young & Callm. (SNOW et al., 2016). Comments concerning fresh material (above) are based in part on a color photograph that was sent to Odile Poncy (MNHN) formerly in the possession of Craven, which shows a mature flowering specimen of *S. bullatum*, although it is neither labeled as such nor refers to a voucher.

*Additional specimens examined.* – NEW CALEDONIA. **Prov. Nord:** Poami (the Temala), 1.IX.2010, *Hequet et al. 3880* (NOU [NOU080968]); Haute Amoa, 26.XII.1968, *MacKee 20048* (NOU [NOU013794], P [P04776435, P05265291, P05265299]); Poindimié, 14.V.1973, *MacKee 26701* (NOU [NOU013791], P [P00500688]); Tiwaka, Moindi, 31.VI.1978, *MacKee 35228* (NOU [NOU013790], P [P05265221]); Aoupinié, 15.X.2008, *Munzinger et al. 5191* (NOU [NOU050169]); Mandjélie, 10.I.2009, *Munzinger et al. 5842* (NOU [NOU053515], P [P06669059]); La Guen, 20.XI.2010, *Munzinger et al. 6384* (NOU [NOU063546], P [P00805948]). **Prov. Sud:** Crête au N du col d’Amieu, 24.IX.1965, *MacKee 13471* (NOU [NOU013793], P [P04633434]); col d’Amieu, X.1979, *MacKee 37447* (P [P06603439, P04633434]); near Mt. Rembai, south of Col d’Amieu, 7.XI.1982, *McPherson 5090* (MO-3233405, NOU [NOU013795], P [P04884357]).

*Syzygium francii* (Guillaumin) N. Snow, Byng & Munzinger, **comb. nov.** (Fig. 1C).

≡ *Piliocalyx francii* Guillaumin in Bull. Mus. Nat. Hist. Paris ser. 2, 10: 625-626. 1939.

**Typus:** NEW CALEDONIA. **Prov. Sud:** bords de la Tontouta, *Franc 2427* (holo-: P, not found).

*Shrubs* or trees, 3-16 m. *Bark* unknown. *Branchlets* terete, greenish. *Petioles* 1-8 mm. *Leaf blades* 4-8 × 2-3.5 cm, obovate to narrowly elliptic, base long-attenuate, margin flat (yellowish green and matching color of midvein), apex rounded to acute. *Inflorescences* mostly axillary, 1.6-4 × 1.2-2 cm. *Hypanthium* c. 1.5-2 mm, cupuliform, color unknown. *Fruits* 1.5-2.5 × 1.5-3.0 cm, subglobular to globular, green maturing to pale red.

*Notes.* – The type specimen at P of *Piliocalyx francii* sent on loan 90/100 to WELTU (prior to barcoding) was photocopied and is in the working notes of JWD, but the specimen remains missing despite our attempts to relocate it. It was marked “type” with a type label evidently written in Guillaumin’s hand. Given that the information (locality, collector, number, year) on the specimen label matches exactly the same information in the protologue (GUILLAUMIN, 1939: 625-626), and because no other specimens with that number were found at P, we do not hesitate to refer to that specimen as a holotype.

One atypical specimen, tentatively placed here, has some obovate leaves with a retuse apex (*Veillon 2888*).

*Additional specimens examined.* – NEW CALEDONIA. **Prov. Sud:** Réserve de Nodéla, 29.I.2008, *Dagostini & Barrabé 1557bis* (NOU [NOU048988]); Plateau de Dogny, 29.X.1959, *Thorne 28318* (P [P06603483]); Farino, parc des Grandes Fougères, 7.IV.2009, *Dagostini (leg. Apiazari & Nigote) 1671* (NOU [NOU050105]); col d’Amieu (versant de Canala), 24.VIII.1965, *MacKee 13338* (MO-6452864, P [P01032003, P05265288, P01032004]); Farino, forêt de Mépéo, 22.II.1966, *MacKee 14424* (NOU [NOU013819], P [P05265277, P01029350, P01048166]); Ouroué (Embouchure de la Dothio), 8.VIII.1966, *MacKee 15481* (P [P04633431]); vallée de la Dumbéa, XII.1979, *MacKee 37663* (NOU [NOU013803], P [P00805946, P00805947]); Thy River valley, c. 12 air-km NE of Nouméa, 1.XII.1979, *McPherson 2176* (NOU [NOU013817]; P [P04807648]); along Tontouta River and its tributary, the Kalouéhola, 20.X.1981, *McPherson 4230* ([NOU013815], P [P01060994, P01060995]); valley of the Dothio River, 5.XI.1981, *McPherson 4316* (NOU [NOU013814]); Ninga, 21°45'22"S, 166°8'57"E, 10.XII.2008, *Munzinger et al. 5600* (MO-6153881, NOU [NOU049622], NSW, P [P06669056]); col d’Amieu, forêt de Pumbai, 5.XI.1980, *Suprin 836* (P [P04884376]); Berge de la Kalouéhola, V.1973, *Veillon 2888* (NOU [NOU013812]); W slopes near summit of Mt Dzumac, 7.VIII.1968, *Webster 14628 & Hildreth* (P [P04884374]).

***Syzygium ignambiense*** (Baker f.) N. Snow & Byng, **comb. nov.** (Fig. 1D).

= *Eugenia ignambiensis* Baker f. in J. Linn. Soc. Bot. 45: 315. 1921.

**Typus:** NEW CALEDONIA. **Prov. Nord:** Ignambi, 30.VII.1914, *Compton 1512* (holo-: BM [BM001119178]).

*Shrubs* or trees, 4–18 m. *Bark* unknown. *Branchlets* terete or sometimes weakly quadrangular, emerging maroon but becoming greenish-yellow. *Petioles* 3–5 mm. *Leaf* blades 3–6.5 × 1.5–2.5 cm, narrowly elliptic, base cuneate, margin slightly revolute, apex obtuse to acute, pale yellowish on emergence. *Flower* in bud obpyriform, cream-colored. *Inflorescences* ramiflorous, terminal or axillary, in fasciculate clusters, to c. 1.5 cm. *Hypanthium* 1.5–2 × 1.8–2.5 mm, obpyriform, cream-colored, calyprate, slightly umbonate or not. *Fruits* 0.7–1.3 × 0.7–1.5 cm, globular, often sessile to sub-sessile, greenish-white to reddish.

*Notes.* – This species remains incompletely characterized. However, specimens collected since the original description generally agree with the protologue.

*Additional specimens examined.* – NEW CALEDONIA. **Prov. Nord:** Mandjéla, above Pouébo, 13.XI.1981, *McPherson 4373* (NOU [NOU013808], P [P04807654]); N end of Panié Massif, 26.XI.1983, *McPherson 6059* (MO, NOU [NOU013807]); La Guen, Parcelle 2, 19.XI.2010, *Munzinger et al. 6359* (NOU [NOU063540], P [P00805949]). **Prov. Sud:** Table Unio, N of Col d'Amieu, 10.V.1984, *McPherson 6550* (MO-3216417, NOU [NOU013809], P [P05265251], WELTU-14484).

***Syzygium lifuanum*** Däniker in Vierteljahrsschr. Naturf. Ges. Zürich 78, Beibl. 19: 302. 1933.

**Typus:** NEW CALEDONIA. **Prov. Iles Loyauté:** Képénéhé auf Lifou, 6.XI.1925, *Däniker 2391* (holo-: Z [Z-000025269] image seen; iso-: Z [Z-000025270] image seen, P [P04807649]).

= *Piliocalyx wagapensis* Brongn. & Gris in Bull. Soc. Bot. France 13: 471. 1866. **Typus:** NEW CALEDONIA. **Prov. Nord:** Wagap, *Vieillard 2176* (holo-: P [P00522307]!, iso-: BM [BM001015420]!, G [G00340991], G00340993]!, GH [GH00071216] image seen, K [K000800627, K000771860]!, L.2518619!, L.2518621!, L.2518622!], MPU [MPU015307]!, P [P00522308, P00522309]!, Z [Z-000092842]!), **syn. nov.**

*Trees* 6–11 m. *Bark* unknown. *Branchlets* terete, sometimes slightly quadrangular, maroon. *Petioles* 6–19 mm, thicker at base. *Leaf* blades 5–13 × 2.4–4 cm, elliptic, base broadly cuneate or rounded, margins broadly sinuous, apex acute to acuminate. *Inflorescences* terminal and axillary, 5–20 ×

4–8 cm, axes terete, yellowish-green or magenta. *Hypanthium* 1.5–2 × 2–2.5 mm, cupuliform, fresh color unconfirmed. *Fruits* c. 0.8–1.3 cm, globose, white or reddish at maturity.

*Vernacular names.* – “Aouteha” (*Deplanche 53*); “Tu” (*MacKee 26591*).

*Notes.* – The specific epithet is already used in *Syzygium* (*S. wagapense* Brongn. & Gris), and the chosen replacement name is the next available name for this taxon (McNEILL et al., 2012; Art. 6 and 41).

The diagnostic characters above are largely based on fresh material. The leaves often are strongly discolorous (dark green adaxially, yellowish-green abaxially). The secondary veins are obscure above and prominent (but not projecting) below. The branches of the inflorescence tend to diverge widely from one another.

*Additional specimens examined.* – NEW CALEDONIA. **Prov. Iles Loyauté:** Lifu, 1865, *Deplanche 53* (P [P04633326, P04633327, P04633328, P04633316]). **Prov. Nord:** Mé Aoui, 6.II.1951, *Baumann et al. 10174* (L [L4147559], Z [Z-000092841]); *ibid. loc.*, *Baumann et al. 10177* (P [P04633336]); *ibid. loc.*, 7.II.1951, *Baumann et al. 10244* (P [P04633342], Z [Z-000092840]); Kapuidea Forêt (Poya), 16.XII.2009, *Hequet (leg. Butin) 3823* (NOU [NOU031347]); *ibid. loc.*, 16.XII.2009, *Hequet (leg. Butin) 3833* (NOU [NOU052819]); hauteurs de Goa, 7.II.2001, *Hequet et al. 3897* (NOU [NOU081003]); vallée de Paoué, 20.IV.1951, *Hürlimann 1278* (A, P [P04633335], Z [Z-000092839]); vallée de la Tipindjé, *Hürlimann 1314* (P [P04633339], Z [Z-000092838]); Haute Népoui, VIII.1967, *MacKee 17398* (NOU [NOU073251], P [P01060584, P01060585, P05265276]); Haute Tiwaka, Bopope, 17.X.1967, *MacKee 17756* (P [P05265246]); Haute Amoa, 15.VII.1968, *MacKee 19219* (NOU [NOU031480], P [P046333443, P05265287]); Canala, Sentier Ciu-Koindé, VIII.1969, *MacKee 20643* (CANB [CANB-519567], L [L3917608]), NOU [NOU073248], P [P00150701]); Tiwaka, Bobetio, 13.II.1973, *MacKee 26251* (NOU [NOU073257]); P [P04633352]); Ponerihouen, pente E du Mt Aoupinié, 27.IV.1973, *MacKee 26591* (NOU [NOU031488]); P [P04633347]); Tiwaka entre Bobope et Pombei, V.1973, *MacKee 26675* (NOU [NOU073247], P [P05265282]); Ponerihouen, pente E du Mt Aoupinié, 26.III.1974, *MacKee 28375* (NOU [NOU073249]); vallée de Neavin, 14.VI.1974, *MacKee 28809* (NOU [NOU031482], P [P01060961, P01060962, P04776437, P05265286]); Ponerihouen, Mt Aoupinié, 23.IV.1974, *MacKee 31112* (NOU [NOU073250], P [P02089964]); hauteurs de Goa, 27.IX.1977, *MacKee 33875* (NOU [NOU073270], P [P05265220]); Pouébo, Ouangati, 20.X.1978, *MacKee 35970* (P [P04884386]); *MacKee 36211* (NOU [NOU073245], P [P00785986, P04884388, P05265220]); Tchamba River valley, c. 15 air-km NW of Ponerihouen, c. 40 m, 18.VII.1979, *McPherson 1764* (MO-3226118; NOU [NOU073253]); 5 km E of Col de Crève-Cœur on road between Canala and Thio, c. 350 m, 27.IX.1979, *McPherson 1904* (MO-3229866; NOU [NOU073255]); grottes d'Adio, east of Poya, c. 200 m, 11.VIII.1982, *McPherson 4846* (MO-3210889; NOU [NOU031476], P [P05265257]); along road from Canala to La Foa, c. 10 km west of Canala, c. 300 m, 22.XII.1979, *McPherson 2267* (MO-3226033, NOU [NOU031485]); valley of the Amoa River, 25°59'15"S, 165°19'02"E, 120 m, 22.IV.2002, *McPherson & Lowry 18477* (MO-4481727, NOU [NOU013359], P [P04682352]); *ibid. loc.*, *McPherson & Lowry 18483* (MO-4481726, NOU [NOU013357]); Mt. Goroaté, 21°01'12"S, 165°09'48"E, 18.XI.2002, *Munzinger et al. 1592* (MO-04728461; NOU

[NOU002788]; P [P00354401]); entre Monéo et la Tchamba, 18.VIII.1966, *Nothis* 271 (NOU [NOU073259]); Ouéholle, 18.VIII.1967, *Nothis* 435 (NOU [NOU073258]); Pompei, Col des Roussettes, VIII.1951, *Sarlin* 353 (P [P04633331]); Amoa, 20.VII.1975, *Schmid* 454 (NOU [NOU073426]); plateau de Tango, près de piste forestière, 17.III.2014, *Vandrot* 816 (NOU [NOU083672]); *ibid. loc.*, 22.X.1981, *Veillon* 4679 (P [P05265232]); Montagnes de Balade, *Vieillard* 477 (P [P04633340]); c. Canala, Chiamoué ridge, NE flank of Mt Canala, 20.VIII.1968, *Webster & Hidreth* 14925 (A, P [P040807650, P040807651, P04080765]). **Prov. Sud:** Ile des Pins, *Anon. s.n.* (P [P04633332]); Pic Malaoui, VI.1900, *Bernier* 1227 (P [P04633333, P04633334]); Koghis juste après l'auberge, 3.IV.2009, *Dagostini* 1663 (NOU [NOU050097]); Réserve du col d'Amieu, 13.I.2009, *Grignon et al.* 119 (NOU [NOU049681], P [P06668988]); Dothio River valley, c. 50–100 m, 26.I.1983, *McPherson* 5398 (MO-3222313; NOU [NOU073252], P [P00152929]); *ibid. loc.*, c. 50 m, 27.I.1983, *McPherson* 5418 (MO-3212736, NOU [NOU011798], P [P04633329]). **Sine loc.:** *Lécard s.n.* (A, P [P04633337]); *Lécard* 193 (P [P04633338]); *Le Rat & Le Rat s.n.* (P [P04633341]); *Le Rat & Le Rat* 670 (P [P04633344]).

***Syzygium neoegenioides*** N. Snow, Byng & J.W. Dawson, **nom. nov.** (Fig. 1E).

= *Piliocalyx eugenoides* Guillaumin in Bull. Soc. Bot. France 85: 651. 1938 [non *Syzygium eugenoides* (Merr. & L.M. Perry) Biffin & Craven].

**Lectotypus** (designated here): **NEW CALEDONIA. Prov. Sud:** Bosquet situé à l'E du Pont-des-Français, IV.1870, *Balansa* 2871 (P [P00543888]!). **Syntypi:** 1868–1872, *sine loc.*, *Balansa* 94 (A [A00071213] image seen, P [P00543886, P00543887, P06603434, P06603438]!); *sine loc.*, *Balansa* 2103 (P [P00543887, P06603427, P06603435]!); *sine loc.*, *Balansa* 2871 (A [A-00071210] image seen, L [L.2518677] image seen, P [P00543889]!); bosquets situés près de l'embouchure de la Dumbéa, V.1870, *Balansa* 2871a (A [A-00071211] image seen, P [P00522322, P06603428]!); *Pancher* 27 (A [A-00071212] image seen, BM [BM001119179]!, K [K000771867]!, L [L.2518678]!, P [P06603429, P06603430]!).

*Trees* 5–18 m, sometimes with dense branching and foliage. *Bark* somewhat rough or irregular (but not furrowed), sometimes flaking in chocolate brown patches. *Branchlets* sometimes quadrangular, emerging light yellowish-green. *Petioles* 1–2 mm (leaves sometimes appearing subsessile). Leaves sometimes emerging maroon but maturing to bright green. *Leaf* blades 3.7–5.5 × 1.5–3.0 cm, elliptic, bases rounded to slightly cordate, margins irregularly and (sometimes broadly) sinuous, apex rounded. *Inflorescences* terminal and often numerous, 4–7 × 2.5–4 cm, of many-flowered compound cymes. *Hypanthium* 1.8–2.5 mm, infundibuliform, yellowish-green and often pinkish beneath the calyptra, umbo prominent and narrow. *Fruits* 0.8–1.5 × 0.9–1.5 cm, globose, light green turning whitish at maturity.

**Notes.** – The leaves are thinly coriaceous and slightly discolorous. The secondary (and often tertiary) veins are faint but visible above and below and are more prominent in dried

material. The secondaries arise c. 60–70° from the midvein. The stamens are light purple.

The new name is needed because the epithet of the basionym is already occupied by *Syzygium eugenoides* (Merr. & L.M. Perry) Biffin & Craven (Biffin et al., 2005), a species from Fiji. The specimen chosen as the lectotype has abundant flowering material, is in excellent condition, and has “type” hand-written at a later time on one of the labels.

We have not yet located *Mackee* 32958, which Veillon indicated he thought was the same species as *Veillon* 7094. A specimen at P (P00522321) may be a remaining syntype given the words “type de fruit” on one of the labels, and that Guillaumin included information in the protologue about the fruit; however, additional information on the other labels (e.g., “Vallées boisées”) does not correspond to any of the specimens cited in the protologue.

The species occurs in dry forests and is locally common at Pointe Maa. A bumble bee was noted visiting a specimen at Pointe Maa; this and several other images can be seen at the “Endemia” website [<http://endemia.nc/flore/fiche4247.html>].

*Additional specimens examined.* – **NEW CALEDONIA. Prov. Sud:** Pointe Maa, propriété Schmidt, 4.IV.2007, *Hequet et al.* 3666 (NOU [NOU017093], P [P06669058]); *ibid. loc.*, 15.V.2007, *Hequet et al.* 3679 (CANB, NOU, P [P06669057], WELTU); *ibid. loc.*, 24.XI.2007, *Munzinger et al.* 4915 (NOU [NOU030781], P [P04776466]); La Foa, Karopin, *Munzinger* 6645 (CANB, KSP [KSP012215], MPU, MO-6642467, P [P00819240, P00871531]); Nakutakoin, versant SW du Pic Jacob, 1.VIII.1989, *Veillon* 7094 (NOU [NOU081734]); Pic Jacob, versant W, 5.IV.1992, *Veillon* 7476 (NOU [NOU031479], P [P05265223]); **Sine loc.:** “Vallées boisées”, *Anon. s.n.* (P [P00522321]).

***Syzygium neolaurifolium*** N. Snow & Byng, **nom. nov.** (Fig. 1f).

= *Piliocalyx laurifolius* Brongn. & Gris in Bull. Soc. Bot. France 12: 186. 1865 [non *Syzygium laurifolium* (DC.) N.P. Balakr.].

**Lectotypus** (designated here): **NEW CALEDONIA:** *sine loc.*, *Deplanche* 523 (P [P00522320]!). **Syntypi:** **NEW CALEDONIA:** Kanala, *Vieillard* 525 (P [P00522318, P00634228, P00634229]!).

*Shrubs* to trees 3–15 m. *Bark* gray or brown, rough. *Branchlets* terete, greenish, sometimes becoming olive-green or with some shades of magenta. *Petioles* 7–17 mm. *Leaf* blades (5.5–) 8–15 × (3.5–) 4.5–7.8 cm, elliptic or broadly elliptic to ovate, base attenuate, margins mostly flat or slightly revolute, apex broadly acute to rounded. *Inflorescences* terminal, axillary or ramiflorous, 1–3 × 1–2 cm, cymose to paniculate. *Hypanthium* 2–3 mm, cupuliform, calyptrate, apically rounded but without an umbo. *Fruits* to c. 5 × 5 cm, globular, pink to reddish, the surface often somewhat rough.

*Notes.* – The adaxial leaf surface is sometimes glossy. The outer wall of the fruit can be up to c. 3 mm thick.

The epithet *neolaurifolium* is chosen because it is already occupied by the Bangladesh species *Syzygium laurifolium* (DC.) N. Balakr.

Two numbers are mentioned in the protologue (*Deplanche 523, Vieillard 525*). Of these, *Deplanche 523* is represented by four sheets at P, but given three different types of labels affixed to the various sheets it is probable that they represent more than one gathering. The specimen selected as the lectotype has a red “TYPE” label affixed by previous workers and in our view is representative of the species.

*Additional specimens examined.* – NEW CALEDONIA. **Prov. Nord:** Haut Diahot, XII.1968, *MacKee 19992* (NOU [NOU073256]); Houailou, Ho, IX.1969, *MacKee 20838* (MO-6452978; NOU [NOU073234], P [P00805953]); Canala, IX.1970, *MacKee 22559* (NOU [NOU073233]); Ponerihouen, XI.1972, *MacKee 25769* (NOU [NOU073421], P [P00785987, P05265268]); Hauteurs du Cap Bocage, XII.1978, *MacKee 36252* (NOU [NOU073235], P [P00872553]); Nakéty: Ouen Fémala, forêt de Thalweg, 29.IX.1989, *MacKee 44650* (P [P05265211], NOU [NOU073239]); along access roads to dam on Néaoua River S of Houailou, 8.V.1994, *McPherson 6529* (MO-3215239); Roches de la Ouaième, Panié, Wayem, 4.XI.2010, *Munzinger et al. 6172* (NOU [NOU063349]); *ibid. loc.*, 19.XI.2010, *Munzinger et al. 6356* (G, NOU [NOU063537], P [P00805950]). **Prov. Sud:** Mt. Koghis, VI.1906, *Gandoger s.n.* (MO-700704); amont de la Rivière Blanche, X.1980, *Hoff 2691* (NOU [NOU073237]); plateau de la Montagne des Sources, 10.I.1965, *MacKee 11946* (NOU [NOU073230]); Plateau de Dogny, I.10.1966, *MacKee 15716* (NOU [NOU073232]); Vallée de Mamié, 7.X.1966, *MacKee 15762* (NOU [NOU073236], P [P04633435]); Rivière Blanche, XI.1959, *MacKee 37579* (MO-541798, carpo.; NOU [NOU073231], P [P00805944, P00805945, P04776438]); Route de la Yaté: Les Dalmates, 15.III.1989, *MacKee 44266* (NOU [NOU073240], P [P05265206]); Thy River valley, c. 12 air-km SE of Nouméa, 5.I.1980, *McPherson 2299* (MO-3226026, WELTU-14106); Forêt Cachée, 3.X.2004, *Munzinger et al. 2416* (NOU [NOU006277]).

***Syzygium vieillardii* N. Snow, Callm. & Byng, nom. nov.**

= *Piliocalyx micranthus* Brongn. & Gris in Bull. Soc. Bot. France 12: 186. 1865 [non *Syzygium micranthum* Thwaites].

**Typus:** NEW CALEDONIA: Balade, *Vieillard 519* (holo-: P [P00522316]!; iso-: P [P00522315]!).

*Shrubs* to trees, up to 15 m. *Bark* unknown. *Branchlets* terete, emerging maroon. *Petioles* 8–11 mm. *Leaf* blades 5.0–8.5 × 3–5 cm, obovate to elliptic, bases cuneate, margins strongly sinuose and sometimes slightly revolute, apex acute to acuminate. *Inflorescences* c. 0.3–0.5 cm, few-flowered, terminal, axillary, sessile or subsessile. *Hypanthium* shape and length unconfirmed. *Fruit length* unconfirmed, cylindrical to obovoid, light green maturing to deep maroon.

*Etymology.* – This species is named in honour of Eugène Vieillard (1819–1896), a French naturalist and surgeon with

the navy. He boarded a vessel to Tahiti in 1854 (LIGNIER, 1905) and later to New Caledonia where he met Emile Deplanche (1824–1875) (McKee & McKee, 1981). During his stay in New Caledonia between 1855 and 1867, he collected thousands of specimens, many of which are types (e.g., MORAT, 2010). Vieillard was a respected botanist, published several works on the New Caledonian flora, and was appointed director of the Caen Botanical Garden after he came back to France, where he served from 1871 to 1895 (LIGNIER, 1905).

*Notes.* – The petioles are quite thin and sulcate adaxially; the leaf blades can be irregularly folded upon drying (as in type material) and the secondary veins are obscure in fresh material.

Only one gathering is mentioned in the protologue and the specimen indicated above as holotype is marked as “type” at P, whereas the specimen indicated as isotype is not so marked. Both specimens bear the same handwriting and thus appear to be of the same gathering. We have no hesitation in calling these the holotype and isotype. Another specimen cited below with the same number, which bears a different label with somewhat different handwriting, was annotated by Guillaumin in 1938, but is not considered an isotype [P04633323].

In our view, *Syzygium vieillardii* resembles most closely *S. concinnum* (A.S. Sm.) Craven & Biffin (e.g., *Smith 4373* [P00364630]!), a Fijian endemic. SMITH (1971) provided a detailed discussion of how that species differed from *Piliocalyx wagapensis* (= *Syzygium lifuanum* herein). In the absence of fresh material of *S. concinnum* for comparative purposes we maintain the two species as distinct.

Because the species is known from relatively few collections, more collections are badly needed. Little reliable locality information is provided with most specimens.

*Additional specimens examined.* – NEW CALEDONIA. **Prov. Nord:** Glähenwald am Ignambigipfel, 6.VI.1925, *Däniker 1797* (P [P04633321], U [U.1452575], Z [Z-000092835, Z-000092836]); Canala, Sentier Ciu-Coindé, 28.VIII.1969, *MacKee 20639* (MO-6452987, NOU [NOU013805]); Mandjéla, along lumber road S of radio tower, 5.X.1980, *McPherson 3206* (MO-3225921, NOU [NOU013818]); Mt Aoupinié, 31.VIII.1978, *Tirel 1361* (MO-6452865). **Prov. Sud:** bords de la Ouénaoué, 1904, *Le Rat & Le Rat 2373* (P [P04633324, P04633325]); Mts Koghis, 20.VII.1982, *McPherson 4685* (MO-3220436, NOU [NOU031507]). **Sine loc.:** *Vieillard “A.C. 762”* (P [P04633320, P04633322]); *Vieillard 762* (P [P04633322]).

***Syzygium viriosum* Craven & J.W. Dawson in Blumea 55: 98. 2010.**

= *Piliocalyx robustus* Brongn. & Gris in Bull. Soc. Bot. France 12: 185. 1865 [non *Syzygium robustum* Miq.].

**Lectotypus** (designated here): NEW CALEDONIA: **Prov. Nord:** Balade, *Vieillard 529* (P [P00522310]!; isolecto-: P [P04633317]!). **Syntypi:** Balade, 1855–60, *Vieillard 529, 530* [label indicates both numbers] (A [A00071214] image seen, P [P00522311, P00522312, P00522313]!).



Trees to 6 m. Branchlets laterally compressed but expanded prominently below nodes, glabrous. Leaves sessile. Leaf blades 6–12 × 4–7 cm, elliptic to ovate, base cordate and clasping, margin flat to undulate and sometimes revolute, apex obtuse to rounded. Inflorescences terminal, 7–11 × 6–8 cm, many-branched, main axes flattened and swollen beneath branching points, violet. Flowers in bud c. 2–3 mm. Hypanthium c. 2.5–3 × 3–4 mm, campanulate, pinkish to white. Fruits 1.3–2 × 1.3–2 cm, globose, maturing white.

Notes. – In addition to the sessile leaves, the broadly diverging secondary veins (80–85°) are a good diagnostic character of this species. Additional diagnostic traits include: calyptra c. 3–4 mm diameter, with pronounced umbo; stamens 1–3 mm, whitish; anther c. 0.2 mm; style 3–4 × c. 0.6 mm (relatively stout).

The protologue listed three syntypes: *Vieillard 529*, *Vieillard 530* and *Pancher s.n.* collected in 1860. However, some specimens indicate both numbers of Vieillard (see below). The specimen selected as the lectotype previously was given a red “type” label by an unknown worker.

The species resembles *Syzygium bullatum* but differs by its flat (non-bullate) leaf texture, leaf bases that often are clasping and cordate, and laterally compressed branchlets that are swollen beneath the nodes (e.g., *Barrabé et al. 855*).

Additional specimens seen. – NEW CALEDONIA. **Prov. Nord**: forêt au S de Canala, *Balansa 2105* (P [P04633319]); Réserve de l'Aoupinié, route de l'antenne, 15.I.2009, *Barrabé 855* (NOU [NOU033956], P [P06669074], WELTU); upper Tchamba River Valley, Poindei forest, along road to Wao Uni, 21°00'25"S 165°14'27"E, 500 m, 27.IV.2002, *Lowry et al. 5683* (NOU [NOU013330], MO-04771356, P [P04682341]); crête entre haute Tchamba et haute Ahoa, 600 m, *MacKee 13696* (P [P04633429], P05265306); *ibid. loc.*, *MacKee 15663* (P [P04633436]); Pouébo, crête entre Mandjéla et Salandane, 600 m, 26.II.1970, *MacKee 21631* (NOU [NOU031496]; P [P04633439]); contrefort NW du Mt. Canala, 700–800 m, *MacKee 24015* (P [P04633444]); Pouébo, Mt Mandjéla, 650 m, 17.II.1977, *MacKee 32834* (P [P05265222]); Ponerihouen, Mt Aoupinié, 1000 m, 30.V.1978, *MacKee 35208* (NOU [NOU013119], P [P05265219]); Haute Diahot, 600 m, 12.V.1983, *MacKee 41465* (P [P05265204]); Aoupinié, 900–1000 m, *Morat 7975* (NOU [NOU031491], P [P04776436]); Balade, 1860, *Pancher 759* (K [K000800629], P [P00522314]); Aoupinié, 2.IX.1981, *Suprin 1347* (NOU [NOU073271, NOU031497]); Balade, *Vieillard s.n.* (P [P04633318]); **Prov. Sud**: Farino, Forêt M'épéou, 13.VII.1965, *MacKee 13003* (G, MO-5813368, L [L.4158636], NOU [NOU013792], P [P05265300, P06603440]).

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