



HAL
open science

Reinstatement of the endemic New Caledonian genus *Thiollierea* Montrouz. (Rubiaceae) necessitated by the polyphyly of *Bikkia* Reinw. as currently circumscribed

Laure Barrabé, Arnaud Mouly, Porter P. Lowry, Jérôme Munzinger

► To cite this version:

Laure Barrabé, Arnaud Mouly, Porter P. Lowry, Jérôme Munzinger. Reinstatement of the endemic New Caledonian genus *Thiollierea* Montrouz. (Rubiaceae) necessitated by the polyphyly of *Bikkia* Reinw. as currently circumscribed. *Adansonia*, 2011, 33 (1), pp.115-134. 10.5252/a2011n1a8. hal-00617107

HAL Id: hal-00617107

<https://hal.science/hal-00617107>

Submitted on 29 May 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Copyright

Reinstatement of the endemic New Caledonian genus *Thiollierea* Montrouz. (Rubiaceae) necessitated by the polyphyly of *Bikkia* Reinw. as currently circumscribed

Author(s): Laure Barrabé, Arnaud Mouly, Porter P. Lowry II and Jérôme Munzinger

Source: *Adansonia*, 33(1):115-134. 2011.

Published By: Muséum national d'Histoire naturelle, Paris

DOI: <http://dx.doi.org/10.5252/a2011n1a8>

URL: <http://www.bioone.org/doi/full/10.5252/a2011n1a8>

BioOne (www.bioone.org) is a nonprofit, online aggregation of core research in the biological, ecological, and environmental sciences. BioOne provides a sustainable online platform for over 170 journals and books published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Web site, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/page/terms_of_use.

Usage of BioOne 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.

Reinstatement of the endemic New Caledonian genus *Thiollierea* Montrouz. (Rubiaceae) necessitated by the polyphyly of *Bikkia* Reinw. as currently circumscribed

Laure BARRABÉ

Institut de Recherche pour le Développement, UMR AMAP,
Laboratoire de Botanique et d'Écologie végétale appliquées,
Herbarium NOU, BPA5, F-98848 Nouméa (New Caledonia)
laure.barrabe@ird.fr

Arnaud MOULY

Université de Franche-Comté, UMR CNRS 6249 Chrono-Environnement,
IUFM de Franche-Comté,
16 route de Gray, F-25030 Besançon (France)
arnaud.mouly@univ-fcomte.fr

Porter P. LOWRY II

Missouri Botanical Garden,
P.O. Box 299, St. Louis, MO, 63166-0299 (USA)
pete.lowry@mobot.org
and Muséum national d'Histoire naturelle,
Département Systématique et Évolution, UMR 7205,
case postale 39, 57 rue Cuvier, F-75231 Paris cedex 05 (France)
lowry@mnhn.fr

Jérôme MUNZINGER

Institut de Recherche pour le Développement, UMR AMAP,
Laboratoire de Botanique et d'Écologie végétale appliquées,
Herbarium NOU, BPA5, F-98848 Nouméa (New Caledonia)
jerome.munzinger@ird.fr

Barrabé L., Mouly A., Lowry II P. P. & Munzinger J. 2011. — Reinstatement of the endemic New Caledonian genus *Thiollierea* Montrouz. (Rubiaceae) necessitated by the polyphyly of *Bikkia* Reinw. as currently circumscribed. *Adansonia*, sér. 3, 33 (1): 115-134. DOI: 10.5252/a2011n1a8.

ABSTRACT

The genus *Bikkia* Reinw. as currently circumscribed comprises 20 species distributed throughout the western Pacific Ocean, with a center of diversity in New Caledonia (11 species, all but one endemic). Two recent phylogenetic studies based respectively on molecular and morphological data have shown that *Bikkia* s.l. is polyphyletic, comprising two lineages: coastal *Bikkia* from the western Pacific (including the type species of the genus, *B. tetrandra* (L.f.) A.Rich.) and endemic New Caledonian *Bikkia*, a situation that necessitates the resurrection

KEY WORDS

Rubiaceae,
Bikkia,
Thiollierea,
 New Caledonia,
 endemic genus,
 polyphyly,
 taxonomic
 reinstatement,
 new combinations.

of the generic name *Thiollierea* Montrouz., the oldest available for the second of these groups. An emended description is provided for *Thiollierea* as well as a summary of the features that distinguish it from *Bikkia* s.s., and seven new combinations are proposed (*T. kaalaensis* (N.Hallé & Jérémie) Barrabé & Mouly, *T. lenormandii* (N.Hallé & Jérémie) Barrabé & Mouly, *T. neriifolia* (Brongn.) Barrabé & Mouly, *T. pachyphylla* (Guillaumin) Barrabé & Mouly, *T. parviflora* (Schltr. & K.Krause) Barrabé & Mouly, *T. retusiflora* (Brongn.) Barrabé & Mouly and *T. tubiflora* (Brongn.) Barrabé & Mouly).

RÉSUMÉ

Rétablissement taxonomique du genre Thiollierea Montrouz. (Rubiaceae) endémique de Nouvelle-Calédonie, nécessité par la polyphylie de Bikkia Reinw. tel qu'actuellement défini.

Le genre *Bikkia* Reinw. s.l. tel qu'il est défini actuellement comporte 20 espèces réparties sur l'ensemble du Pacifique ouest. Son centre de diversité se trouve en Nouvelle-Calédonie avec 11 espèces, dont 10 endémiques de l'archipel. Deux études phylogénétiques récentes obtenues respectivement à partir de données moléculaires et morphologiques, ont démontré la polyphylie de *Bikkia* s.l., ainsi que l'existence de deux lignées évolutives : les *Bikkia* côtiers du Pacifique ouest (incluant l'espèce type du genre, *B. tetrandra* (L.f.) A.Rich.) et les *Bikkia* endémiques néo-calédoniens. Il convient désormais de rétablir le nom de genre *Thiollierea* Montrouz., le plus ancien des noms valides et disponibles, pour les espèces du second groupe. Des descriptions formelle et diagnostique sont ainsi proposées pour caractériser le genre *Thiollierea* et le distinguer du genre *Bikkia* s.s. Sept nouvelles combinaisons sont effectuées (*T. kaalaensis* (N.Hallé & Jérémie) Barrabé & Mouly, *T. lenormandii* (N.Hallé & Jérémie) Barrabé & Mouly, *T. neriifolia* (Brongn.) Barrabé & Mouly, *T. pachyphylla* (Guillaumin) Barrabé & Mouly, *T. parviflora* (Schltr. & K.Krause) Barrabé & Mouly, *T. retusiflora* (Brongn.) Barrabé & Mouly et *T. tubiflora* (Brongn.) Barrabé & Mouly).

MOTS CLÉS

Rubiaceae,
Bikkia,
Thiollierea,
 Nouvelle-Calédonie,
 genre endémique,
 polyphylie,
 rétablissement
 taxonomique,
 combinaisons nouvelles.

INTRODUCTION

The genus *Bikkia* Reinw. as currently circumscribed comprises *c.* 20 species and occurs throughout the Western Pacific, with half its members found in New Caledonia and the remainder shared among Micronesia, Melanesia, Polynesia and Indonesia. The type species, *B. tetrandra* (L.f.) A.Rich., was based on a specimen from the Savage Islands (= Niue) originally described as *Portlandia tetrandra* L.f. (Linnaeus 1782), expanding the range of this genus, which was initially based on material from Jamaica (Browne 1756). Reinwardt's (1825) protologue of *Bikkia* included a single species, *B. grandiflora* Reinw. ex Blume, whose type is the same specimen used

by Linnaeus fil. for *Portlandia tetrandra*, making *B. grandiflora* a superfluous name (McNeill *et al.* 2006). Five years later, Richard (1830) transferred the Linnaean entity to *Bikkia* in order to distinguish it from the Caribbean taxon recognized by Browne (Richard 1830). Some subsequent 19th century authors such as Montrouzier (1860) and Brongniart (1865) distinguished two morphological groups within *Bikkia*. The first of these includes coastal species with a broad distribution whose members are restricted to littoral sites on limestone. Various authors have recognized from three to ten species in this group, whose taxonomic history has been very complex. Rafinesque-Schmaltz (1820) first used the name *Cormigonus* Raf. for the entity now known as

Bikkia, but he did not associate any species with it. The later and more widely used name *Bikkia* was recently accepted for conservation against *Cormigonus* (McNeill *et al.* 2006). Another generic name, *Bikkiopsis* Brongn., described in 1865 for a single New Caledonian species (*Bikkiopsis pancheri* Brongn., a member of the coastal group), was placed in synonymy under *Bikkia* by some authors (Guillaumin 1909; Jérémie & Hallé 1976) but retained by others (Brongniart 1865; Baumann-Bodenheim 1989).

The second group of species currently included in *Bikkia* comprises ten species endemic to New Caledonia, all restricted to ultramafic substrates (Jaffré *et al.* 1994) and occurring at various elevations, from lowland sites to the highest mountains. Several generic names have been published to accommodate members of this second group: *Thiollierea* Montrouz., initially based on a single species, *T. artensis* Montrouz. (Montrouzier 1860), to which two more species were added later (Baumann-Bodenheim 1989); *Tatea* Seem. for another species (Seemann 1865-1873); and *Grisia* Brongn. for eight species (Brongniart 1865; Brongniart & Gris 1871), all of which were subsequently included in *Bikkia* by various authors (Schumann 1891; Schlechter 1905, 1906; Guillaumin 1909, 1930; Guillaumin & Beauvisage 1913; Jérémie & Hallé 1976). A total of 17 names is validly published for the 10 currently recognized species of *Bikkia* restricted to New Caledonia (Jérémie & Hallé 1976).

In a molecular study of the Catesbaeae-Chiococceae Complex (CCC) based on nuclear and chloroplast DNA data (*trnL-F* and ITS), Motley *et al.* (2005) sequenced seven of the 20 species of *Bikkia* recognized by Jérémie & Hallé (1976). While their analyses did not fully resolve relationships within the complex, the results suggest that *Bikkia*, as currently circumscribed, is not monophyletic, with members belonging to two distinct, well-supported clades. One of these, the coastal *Bikkia* clade, includes samples of three littoral taxa (the type species of the genus, *B. tetrandra*, along with *B. pancheri* (Brongn.) Guillaumin and *B. palauensis* Valetton) and is sister to another Pacific genus, *Badusa* A.Gray (Gray 1859; Ridsdale 1982; Smith & Darwin 1988) that currently encompasses three species ranging from Fiji to Micronesia. The second *Bikkia* clade comprises the four endemic New Caledonian species

sampled by Motley *et al.* (2005: 317, appendix) (*viz.* *B. artensis* (Montrouz.) Guillaumin, *B. macrophylla* (Brongn.) K.Schum., *B. neriifolia* (Brongn.) Schltr. and *B. tubiflora* (Brongn.) Schltr.), along with a single sampled species of *Morierina* Vieill. The latter taxon is a genus of two species likewise endemic to New Caledonia (Vieillard 1865; Brongniart & Gris 1871; Guillaumin 1948). The clade comprising the New Caledonian endemic *Bikkia* and *Morierina* in turn is sister to the monospecific genus *Siemensia* Urb., endemic to Cuba.

A second phylogenetic study based on morphological data (Barrabé 2006), which included all endemic New Caledonian members of the genus, likewise revealed two monophyletic groups that are fully congruent with those identified by Motley *et al.* (2005). The morphological phylogeny placed the ten endemic New Caledonian species within a clade that is sister to a clade comprising representatives of the previously recognized tribe Chiococceae, and these two clades are in turn sister to the genus *Morierina*. The coastal species of *Bikkia*, on the other hand, form a monophyletic group, although its position was unresolved. The phylogenetic analyses of Motley *et al.* (2005) and Barrabé (2006) both suggest that in order to maintain monophyly at the generic level, the views of earlier workers (Montrouzier 1860; Brongniart 1865; Seemann 1865-1873; Brongniart & Gris 1871) may have to be re-adopted by excluding the New Caledonian endemics from *Bikkia*. As the type of *Bikkia* (*B. tetrandra*) belongs to the coastal *Bikkia* clade, which thus comprises *Bikkia* s.s., it appears necessary to place the members of the New Caledonian endemic clade in a separate genus, for which several names are available, *viz.* *Grisia*, *Tatea*, and *Thiollierea*, the latter of which, described by Montrouzier in 1860, has priority.

In this paper we 1) review the characters traditionally used to recognize *Bikkia* as currently circumscribed in its broad sense and compare the morphology of members of the two clades identified in the phylogenetic studies of Motley *et al.* (2005) and Barrabé (2006); 2) re-establish the genus *Thiollierea* to accommodate the species currently placed in *Bikkia* that do not belong to the coastal clade; 3) provide additional diagnostic features and ecological attributes to re-define *Thiollierea*; and 4) present

TABLE 1. — Diagnostic characters distinguishing *Bikkia* Reinw. s.s. and *Thiollierea* Montrouz.

Character	<i>Bikkia</i> s.s.	<i>Thiollierea</i>
Texture of dry leaf blade	granular	smooth, not granular
Stipule fusion	free	sheathing
Stipule apex	acuminate	truncate
Inflorescences habit	erect	drooping
Merosity of flowers	4	4 or 5
Calyx lobes fusion	free	united to form a sheath
Inner basal corolla indument	present	absent
Anthers shape at anthesis	not twisted	twisted
Inner basal filament indument	present	absent
Inner staminal disc indument	present	present
Ovule shape	globose	flat
Ovules arrangement	quincuncial	imbricate or not, never quincuncial
Ovules orientation	horizontal	acro- and/or basipetal
Number of ovules series per placental arm	7 to 8	1 to 3
Number of ovules per locule	> 500	< 75
Seeds type	angular and diamond-shaped	flat and round

a revised taxonomy for the species of *Thiollierea* that is consistent with phylogenetic relationships, making the seven new combinations that are required.

MATERIAL AND METHODS

Observations of morphological characters were made primarily in the herbaria of the Muséum national d'Histoire naturelle in Paris (P) and at the Institut de Recherche pour le Développement in Nouméa (NOU), supplemented with field observations. We examined a total of more than 400 dried collections from New Caledonia, 33% more than were available when Jérémié & Hallé (1976) published their revision of *Bikkia*, encompassing material of all the endemic taxa from New Caledonia. A list detailing the material studied is presented in the Appendix, with the species identification of all herbarium specimens examined.

DISCUSSION

MORPHOLOGY

The morphology of *Bikkia* has been studied extensively in the past (De Candolle 1830; Montrouzier 1860; Brongniart 1865; Hooker 1873; Schumann 1891; Drake del Castillo 1893; Guillaumin 1909,

1948; Verdcourt 1958; Bremekamp 1966; Jérémié & Hallé 1976; Darwin 1979; Smith & Darwin 1988; Bremer & Eriksson 1992; Delprete 1996; Rova *et al.* 2002; Motley *et al.* 2005). The striking overall resemblance among members of *Bikkia* s.l. (i.e., as circumscribed by Jérémié & Hallé [1976]) in large part explains why members of the two groups revealed by the recent phylogenetic studies have so often been considered to represent a single genus (De Candolle 1830; Hooker 1873; Schumann 1891; Verdcourt 1958; Bremekamp 1966). All taxa belonging to *Bikkia* s.l. have rather weakly diversified vegetative parts. Their leaves are glabrous, coriaceous, and lack domatia, and their stipules are interpetiolar. The inflorescence is supra-axillary and contains a relatively low number of flowers (fewer than 16). The calyx lobes are involute and the aestivation of the floral buds is imbricate. All species of *Bikkia* s.l. have *Portlandia*-type flowers, as described by Motley *et al.* (2005: 326), and the corolla tube ranges in shape from infundibuliform to campanulate, with triangular lobes. The stamens are inserted at the base of the corolla, the ovary is bilocular, and the placenta comprises a bifid axial blade bearing few to numerous ovules. The fruits of *Bikkia* s.l. are bilocular, dry capsules that dehisce by 4 sutures, the 2 loculicidal ones opening only partially. The seeds are few to numerous, small (less than 4 mm long), laterally compressed, and lack a wing.

Optimization of these historically used characters on the trees obtained by Motley *et al.* (2005) and Barrabé (2006) shows that each of them is homoplastic (Fig. 1), a situation that has been observed for certain of these features in other studies at various taxonomic levels within Rubiaceae (Bremer 1992; Bremer & Eriksson 1992; Huysmans *et al.* 1999; Motley *et al.* 2005). The two *Bikkia* clades identified by both Motley *et al.* (2005) and Barrabé (2006) can, however, be distinguished from one another by several other characters (Table 1; Figs 2, 3) that have not previously been emphasized or utilized to recognize genera in the family. Members of the coastal *Bikkia* clade have leaves with a granular texture when dry, whereas those of the New Caledonian endemic *Bikkia* are smooth. The stipules are free and acuminate in the coastal taxa, but are united and more or less truncate in the New Caledonian endemics. In the members of the coastal clade, the inflorescence is erect and the calyx margins are free, whereas in the New Caledonian endemic group, the inflorescence is drooping and the calyx margins are connate. The New Caledonian endemics are also characterized by anthers that twist at anthesis, unlike in members of the coastal clade. The combination of several placental features is also of good diagnostic value. Coastal *Bikkia* have ovules that are globose (vs. flattened in the New Caledonian endemic taxa), horizontally (vs. acro- or basipetally) oriented, and with an alternate quincuncial regular (vs. an imbricate or irregular) insertion. Moreover, a clear distinction can be seen in the number of ovules: coastal *Bikkia* have more than 500 ovules per locule, whereas members of the New Caledonian endemic clade have less than 75. Finally, the seeds of the New Caledonian endemics are flat and round, unlike those of the coastal species, which are angular and diamond-shaped (Table 1; Figs 2, 3).

GENERIC CIRCUMSCRIPTIONS

Bikkia s.s.

The results of the phylogenetic analysis of Motley *et al.* (2005) and Barrabé (2006) suggest that the circumscription of *Bikkia* should be restricted to comprise only those species belonging to the coastal *Bikkia* clade. As such, the genus includes between 3 and 10 species (depending on species

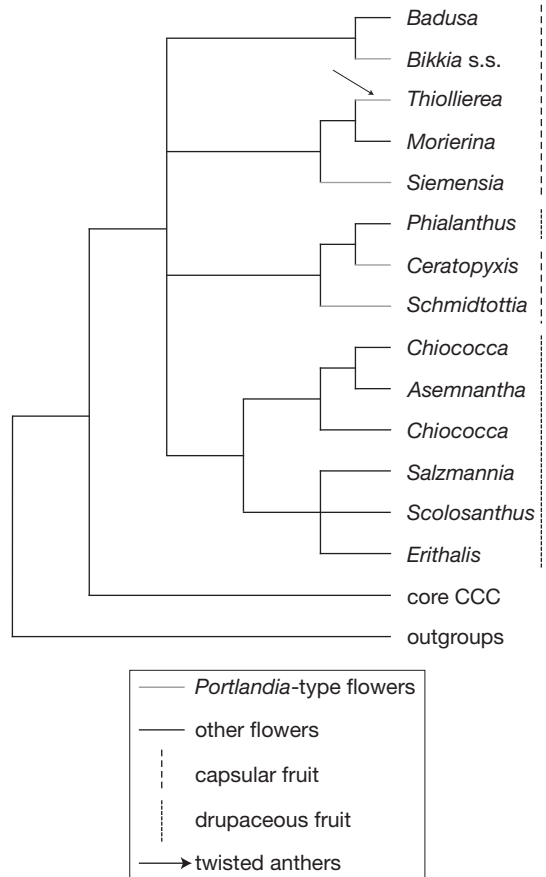


FIG. 1. — Simplified phylogeny of the clade "C" of the Catesbaeae-Chiococceae Complex (CCC, Motley *et al.* 2005), on which two homoplastic morphological characters (flowers type and fruits type) between *Bikkia* Reinw. s.s. and *Thiollierea* Montrouz. and the autapomorphy (twisted anthers) of *Thiollierea* were mapped.

delimitations), all of which are shrubs, often growing on exposed rocks, and occurring in littoral areas where they are exclusively found on calcareous substrates derived from coral (Fig. 4). *Bikkia* s.s. can be further defined on the basis of the following combination of characters: free and acuminate stipules, dried leaves with a granular texture, erect inflorescences, 4-merous flowers, calyx lobes with involute and free margins, a corolla with indument to the base on the inner surface, straight anthers, filaments that are pilose from the base, ovules with quincuncial arrangement, 7 or 8 series of globose

ovules per placental arm, more than 500 ovules per locule, and rhomboid, laterally compressed, angled seeds (Table 1; Figs 2, 3). Results of the molecular study by Motley *et al.* (2005) suggest that *Bikkia* s.s. is close to *Badusa*, a genus that is likewise associated with calcareous substrates, often in coastal areas.

Thiollierea

The clade comprising the endemic New Caledonian taxa historically placed in *Bikkia* includes 10 currently recognized species. Based on both phylogeny and morphology, these taxa should be excluded from *Bikkia* and placed in a separate genus, for which the oldest available name is *Thiollierea*, necessitating the seven new combinations made below. The taxa comprising *Thiollierea*, which are all restricted to ultramafic substrates, form a lineage that appears to be the result of a single colonization of this specialized environment (Fig. 4). Members of this clade can be defined by a character not observed in any *Bikkia* s.s. or in the other groups within the CCC, viz. a twisting of the anthers at anthesis. They are further characterized by a combination of the following features: sheathing and truncate stipules, dried leaves with a smooth texture, drooping inflorescences, united calyx lobes forming a sheath, presence of pilose indument on the internal surface of the staminal disc, 1 to 3 series of flat ovules per placental arm, less than 75 ovules per locule, and circular and flat seeds (Table 1; Figs 2, 3).

The phylogenetic position of *Morierina* is much debated. In the study of Motley *et al.* (2005), this genus forms a clade with *Thiollierea* within which relationships are unresolved. By contrast, the morphological phylogeny of Barrabé (2006) placed the clade formed by representatives of the tribe Chiococceae in a position between *Thiollierea* and *Morierina*, which are morphologically quite distinct from one another. This apparent discrepancy needs to be investigated further, especially using molecular data, to determine whether *Thiollierea* and *Morierina* represent separate genera (as morphology strongly suggests) or should be merged. In any case, the name *Thiollierea* (Montrouzier 1860) has priority over *Morierina* (Vieillard 1865).

TAXONOMIC TREATMENT

In accordance with the findings of Motley *et al.* (2005) and Barrabé (2006), we present an emended description of *Thiollierea* and propose seven new combinations for species that until now have been placed in *Bikkia* by most authors. *Thiollierea*, as circumscribed here, now comprises 10 of the New Caledonian species recognized by Jérémie & Hallé (1976; i.e., all excluding *Bikkia tetrandra*), to which a pair of additional species is being added in a companion paper (Barrabé *et al.* 2011).

Genus *Thiollierea* Montrouz.

Mémoires de l'Académie impériale des Sciences, Belles-Lettres et Arts de Lyon, Section des Sciences 10: 217 (1860). — Type: *T. artensis* Montrouz.

Grisia Brongn., *Bulletin de la Société botanique de France* 12: 405 (1865). — *Bikkia* sect. *Grisia* (Brongn.) K. Schum. in Engler & Prantl, *Die Natürlichen Pflanzenfamilien* 4 (4): 20 (1891). — Type: *G. campanulata* Brongn. (= *Thiollierea campanulata* (Brongn.) Baum.-Bod.), *Nouvelles Archives du Muséum national d'Histoire naturelle, Paris* 4: 10-38 (1868).

Tatea Seem., *Flora Vitiensis*: 125 (1866). — Type: *T. portlandioides* Seem. (= *Thiollierea campanulata* (Brongn.) Baum.-Bod.).

DESCRIPTION

Shrubs to 3(-6) m high, or small trees, hermaphrodite, branched, leaves clustered at the end of branches. Vegetative buds strongly waxy. Leaves opposite, subsessile to petiolate. Stipules interpetiolar, annular, sheathing, entirely joined together, persistent, truncate and not acuminate, inner surface generally covered by an indument and collectors. Blade smooth, glabrous, coriaceous to very coriaceous, margins revolute, venation brochidodromous, secondary veins generally not obvious abaxially. Domatia lacking. Inflorescences supra-axillary, subsessile to pedunculate, drooping, in reduced dichasial cymes, simple, compound or fasciculate, lacking a subtending specialized leaf, 1- to 16-flowered; flowers pedicellate; bracts and bracteoles present, reduced or foliaceous, axillary to inflorescence branches and flowers. Flowers 4- to

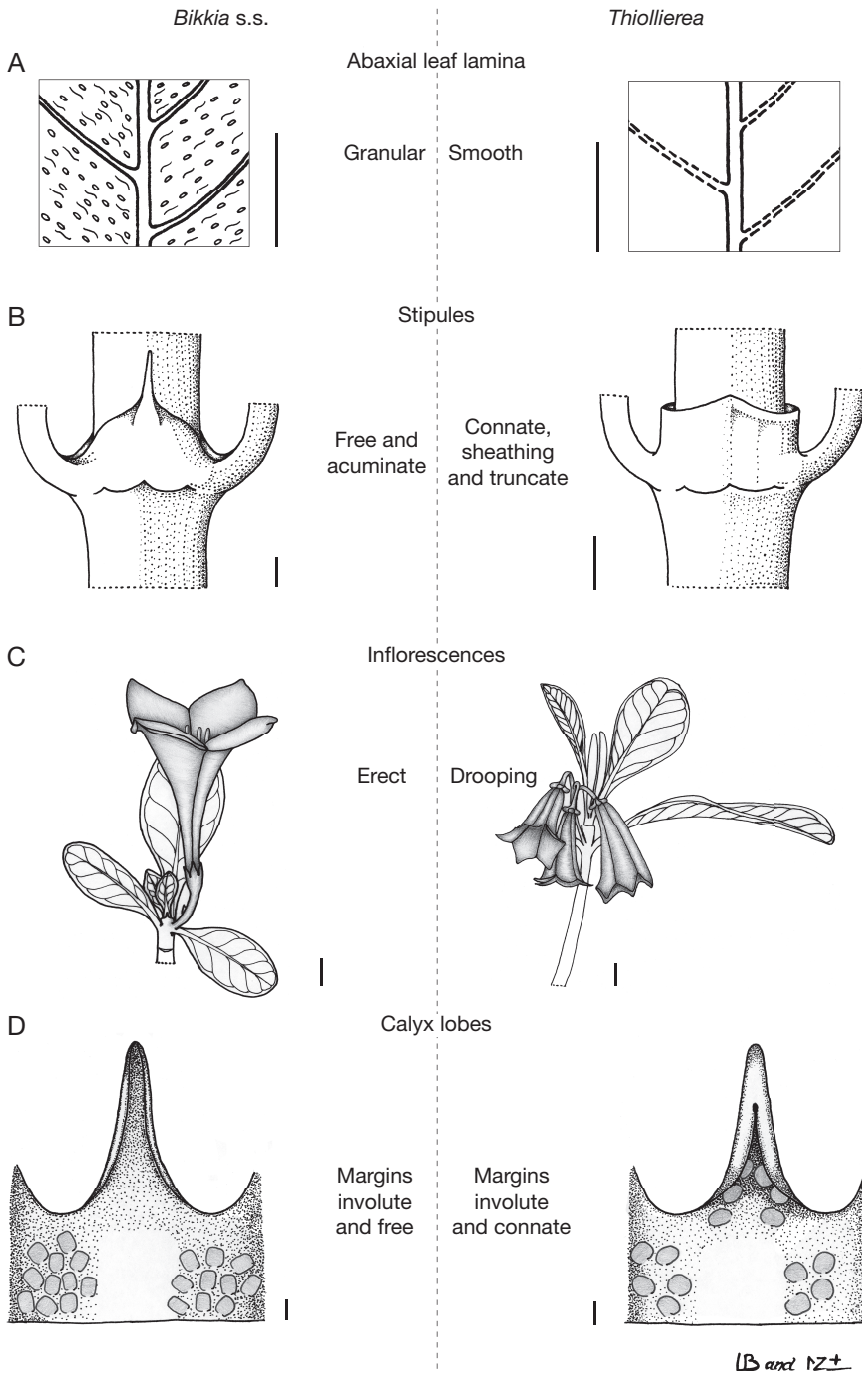


FIG. 2. — Key morphological features distinguishing *Bikkia* Reinw. s.s. and *Thiollierea* Montrouz., part 1: **A**, texture of abaxial leaf lamina; **B**, type and apex of stipules; **C**, inflorescence habit; **D**, margins of calyx lobes (L. Barrabé & M. Toussiro). Scale bars: A, C, 1 cm; B, D, 1 mm.

5- (to 6-)merous, hermaphroditic, actinomorphic to slightly zygomorphic; hypanthium globose, conical or cylindrical, glabrous, puberulent or tomentose, smooth, fluted or with wings. Calyx tube present or strongly reduced or absent, sometimes with a secondary tear, calyx lobes with margins involute and united to form a sheath, glabrous to pubescent within, inter- and/or intra-sepalous colleteries few to many. Corolla campanulate to conical, papyraceous to coriaceous, aestivation imbricate, tube angled, longer than corolla lobes, generally glabrous outside, sometimes hirsute at the base, glabrous or pubescent inside in its proximal half, but always glabrous at base, lobes triangular, straight, curved or reflexed. Stamens alternipetalous, included to exerted, inserted at corolla base, connate, forming a disc adnate to the corolla base, anthers basifixed, twisted at anthesis, filaments glabrous or pubescent, but always glabrous at base. Style filiform, stigma filiform to clavate, divided into two stigmatic lobes, receptive surface restricted to the apex or extended along style in two thin lateral lines. Ovary bilocular, placenta axial, bifid and flat. Ovules flat, imbricate or not imbricate, orientation acro- and/or basipetalous, in 1 to 3 series per placental arm, fewer than 75 per locule. Fruit a capsule with 2 locules, dehiscent by 4 sutures, 2 septical and complete, and 2 loculicidal and partial. Seeds 1-3 mm long, circular to elliptic, flat, unwinged, with alveolate ornamentation.

DISTRIBUTION AND ECOLOGY

Species of *Thiollierea* are all endemic to New Caledonia and are confined to “maquis miniers” (Jaffré 1980) and forest edges, on ultramafic substrates (peridotites and serpentinites), ferrallitic ferritic soils and/or hypermagnesian soils. They occur from about 50 to 1500 m elevation.

LIST OF NEW COMBINATIONS

Reinstatement of the genus *Thiollierea* requires the seven new combinations made below, to be added to the three names already available in the genus for accepted species, *T. artensis* Montrouz., *T. campanulata* (Brongn.) Baum.-Bod., and *T. macrophylla* (Brongn.) Baum.-Bod. We provide a nomenclatural synopsis of all the ten species in the following list.

The key to species provided by Jérémie & Hallé (1976) is only partially adequate, and several couplets are in need of revision. A new key is therefore presented in Barrabé *et al.* (2011).

Kuntze (1891: 279) used the name *Cormigonus* for a number of species assigned here to both *Thiollierea* and *Bikkia* s.s. However, because *Cormigonus* has been rejected against *Bikkia*, all the binomials established by Kuntze are illegitimate and consequently must be rejected (McNeill *et al.* 2006: article 56.1).

Baumann-Bodenheim (1988) published two names under *Thiollierea* that are invalid because they each lacked a direct and complete reference to the basionym (McNeill *et al.* 2006: article 33.2), although they were validated the following year (Baumann-Bodenheim 1989). These two names are: *Thiollierea fritillarioides* (Brongn.) Baum.-Bod. (1988: 98, validated 1989: 98), and *Thiollierea macrophylla* (Brongn.) Baum.-Bod. (1988: 98, validated 1989: 98). Moreover, Baumann-Bodenheim (1988: 73; 1989: 98) had simultaneously created a new name *Grisia artensis* (Montrouz.) Baum.-Bod., but this name was invalid, because it was merely cited as a synonym of the taxon *Thiollierea artensis* Montrouz. (McNeill *et al.* 2006: article 34.1).

1. *Thiollierea artensis* Montrouz.

Mémoires de l'Académie impériale des Sciences, Belles-Lettres et Arts de Lyon, Section des Sciences 10: 217 (1860). — *Bikkia artensis* (Montrouz.) Guillaumin, *Notulae Systematicae* 1: 112 (1909). — *Grisia artensis* (Montrouz.) Baum.-Bod., *Systematik der Flora von Neu-Caledonien (Melanesien-Südpazifik)* 4: 73 (1988), *Systematik der Flora von Neu-Caledonien (Melanesien-Südpazifik)* 5: 98 (1989), *pro syn.* — Type: New Caledonia, Art, s.d. (janvier), fl., Montrouzier “110” (lecto-, designated by Jérémie & Hallé [1976: 348], P!; isolecto-, G-BOISS, not seen).

Grisia deplanchei Brongn. & Gris, *Annales des Sciences Naturelles, Botanique* V, 13: 400-401 (1871). — *Cormigonus deplanchei* (Brongn. & Gris) Kuntze, *nom. rej.*, *Revisio Generum Plantarum* 1: 279 (1891). — *Bikkia deplanchei* (Brongn. & Gris) Guillaumin, *nom. inval.*, *Annales du Musée colonial de Marseille, série 2*, 9: 167 (1911). — Type: New Caledonia, Néné au cap Tommessé, 1864, fl., fr., *Deplanche 385* (holo-, P!; iso-, P! [3 sheets]).

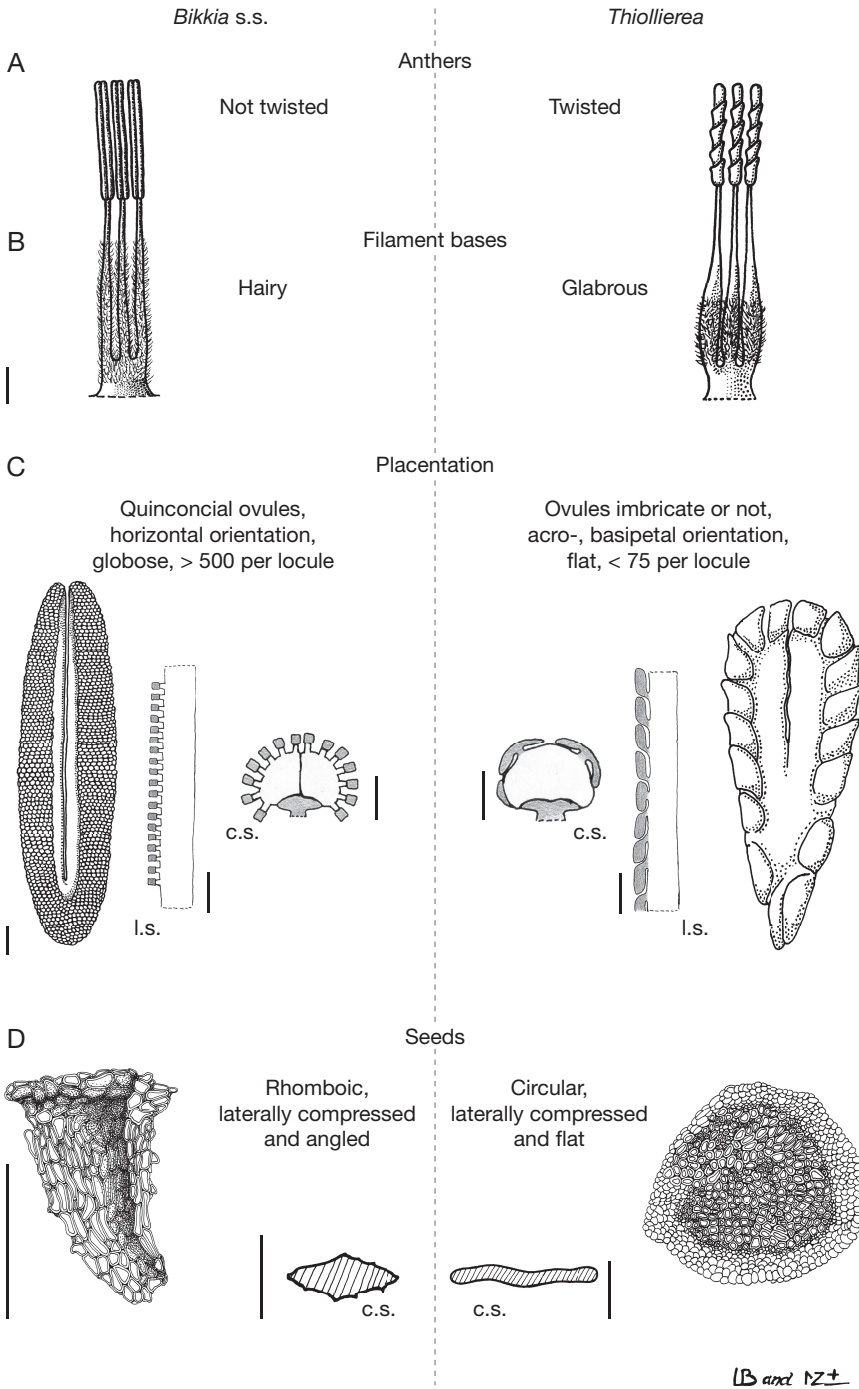


FIG. 3. — Key morphological features distinguishing *Bikkia* Reinw. s.s. and *Thiollierea* Montrouz., part 2: **A**, twisting of anthers; **B**, indument of filament; **C**, organization of placentation; **D**, shape of seeds (L. Barrabé & M. Toussiot). Scale bars: A, B, 1 cm; C, D, 1 mm.

2. *Thiollierea campanulata* (Brongn.) Baum.-Bod.

Systematik der Flora von Neu-Caledonien (Melanesien-Südpazifik) 5: 77 (1989). — *Grisia campanulata* Brongn., *Bulletin de la Société botanique de France* 12: 406 (1865). — *Cormigonus campanulata* (Brongn.) Kuntze, *nom. rej., Revisio Generum Plantarum* 1: 279 (1891). — *Bikkia campanulata* (Brongn.) Schltr., *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 39: 255 (1906). — Type: New Caledonia, *sine loco*, 1861, fl., *Deplanche 259* (lecto-, designated here, P!; isolecto-, P! [1 sheet], see notes below).

Tatea portlandioides Seem., *Flora Vitiensis*: 125 (1866). — *Cormigonus portlandioides* (Seem.) Kuntze, *nom. rej., Revisio Generum Plantarum* 1: 279 (1891). — *Bikkia portlandioides* (Seem.) Guillaumin, *nom. inval., Annales du Musée colonial de Marseille, série 2*, 9: 167 (1911). — Type: New Caledonia, Kanala, *Vieillard 850* (holo-, BM not seen, see notes below).

Grisia campanulata var. *laureola* Brongn. & Gris, *Annales des Sciences naturelles, Botanique* V, 13: 401 (1871). — *Bikkia campanulata* var. *laureola* (Brongn. & Gris) Guillaumin, *Annales du Musée colonial de Marseille, série 2*, 9: 167 (1911). — Type: New Caledonia, Mont Humboldt, 1100 m, 12.X.1869, fl., fr., *Balansa 1994* (holo-, P!; iso-, P!).

Bikkia alyxioides S.Moore, *Journal of the Linnean Society, Botany* 45: 326-327 (1921). — Type: New Caledonia, Monts Comboui, 2500 feet, 28.X.1914, fl., *Compton 2188* (holo-, BM [photo]).

NOMENCLATURE NOTES

The numbers assigned by Vieillard to his collections refer to material he regarded as belonging to a single species, and therefore specimens with the same number often constitute collections made at different times and/or in different places. This has often led to considerable confusion, especially with regard to names that have been typified on the basis of his collections. Jérémie & Hallé (1976) lectotypified the name *Grisia campanulata* based on *Vieillard 850*. After careful examination of all the material bearing this number, we were able to recognize two distinct gatherings. One of them, which we have designated as *Vieillard 850 "A"*, comprises three sheets with flowers and leafy branches that have dried dark brown, collected at "Kanala" in 1866 (two with printed labels indicating "1861-1867", and one erroneously

annotated some time later, next to Vieillard's original label, as coming from "Unio 1855-1861"). All three sheets of *Vieillard 850 "A"* bear Brongniart's determination and have a "Type" label affixed by Jérémie & Hallé. The second gathering, which we have marked *Vieillard 850 "B"*, corresponds to three sheets of flowering and leafy branches that have dried pale green, collected at "Montagnes d'Unia" between 1855 and 1860, also bearing Brongniart's determination. Given this situation, the lectotypification of *Thiollierea campanulata* by Jérémie & Hallé (1976) must be rejected, according to article 9.13 of the *International Code of Botanical Nomenclature* (McNeill et al. 2006) because the material they designated (which comprises *Vieillard 850 "A"*) was collected one year after the basionym was published by Brongniart (1865) and could therefore not have been used to prepare his description. It is therefore necessary to designate a new lectotype from among the material known to have been available to Brongniart at the time he prepared his description, which comprises, in addition to *Vieillard 850 "B"*, two other collections, viz., *Pancher s.n.*, 1862 and *Deplanche 259*, all of which were clearly identified and annotated by Brongniart himself. In order to avoid further confusion, we hereby designate *Deplanche 259* (with leafy, flowering branches) as the new lectotype of *Grisia campanulata*.

The genus *Tatea* and its sole species *T. portlandioides* were described in Part 4 of the first volume of Seemann's *Flora Vitiensis*, which was published on April 2, 1866 (Seemann 1865-1873). Several years later, in the additions and corrections provided at the end of the same volume (Part 10, published in February 1873), Seemann subsequently rejected his own names because he realized that Brongniart's *Grisia* and *G. campanulata* were published the year before (Brongniart 1865) and were likewise based on *Vieillard 850*. Seemann designated as the type of his genus and species a collection from Kanala that corresponds to the material we have designated as *Vieillard 850 "A"*. However, another gathering of *Vieillard 850* is also deposited in the Paris herbarium, which we have marked as *Vieillard 850 "C"*, also from Kanala but belonging to a different species, *Thiollierea macrophylla*. We have not seen the specimen of *Vieillard 850* deposited at the Museum of Natural History in London (BM),



FIG. 4. — Comparison of principal habitat types occupied by members of **A**, *Bikkia* Reinw. s.s.: coastal formations on limestone, and **B**, *Thiollierea* Montrouz.: “maquis miniers” on ultramafic rocks.

but considering the observations of Seemann (1865-1873: 429-430) and the placement of this entity by Jérémie & Hallé (1976), we retain *Tatea portlandioides* as a synonym of *Thiollierea campanulata*.

3. *Thiollierea kaalaensis* (N.Hallé & Jérémie)

Barrabé & Mouly, comb. nov.

Basionym: *Bikkia kaalaensis* N.Hallé & Jérémie, *Adansonia*, série 2, 15: 346 (1976). — Type: New Caledonia, sommet nord du Mont Kaala, 1000-1050 m, 25.XII.1966, fl., fr., *MacKee 16129* (holo-, P!; iso-, P! [1 sheet]).

4. *Thiollierea lenormandii* (N.Hallé & Jérémie)

Barrabé & Mouly, comb. nov.

Basionym: *Bikkia lenormandii* N.Hallé & Jérémie, *Adansonia*, série 2, 15: 349 (1976). — Type: New Caledonia, base sud du Koniambo, Rivière Rouge, 50 m, 1.XI.1971, fl., fr., *MacKee 24529* (holo-, P!; iso-, P [2 sheets]!, NOU!, Z [photo]!).

Grisia vieillardii Lenormand ex Guillaumin, *nom. superfl.*, *Archives de Botanique, Mémoires, Caen* 3 (5): 3 (1930).

5. *Thiollierea macrophylla*

(Brongn.) Baum.-Bod.

Systematik der Flora von Neu-Caledonien (Melanesien-Südpazifik) 5: 98 (1989), *Systematik der Flora von Neu-Caledonien (Melanesien-Südpazifik)* 4: 108 (1988), *nom. inval.* — *Grisia macrophylla* Brongn., *Bulletin de la Société botanique de France* 12: 406 (1865). — *Cormigonus macrophylla* (Brongn.) Kuntze, *nom. rej.*, *Revisio Generum Plantarum* 1: 279 (1891). — *Bikkia macrophylla* (Brongn.) K.Schum. in Engler & Prantl, *Die Natürlichen Pflanzenfamilien* 4 (4): 20 (1891). — Type: New Caledonia, Port de France, sur les bords de la Dombea (= Dumbéa), 1865, fl., *Baudouin s.n.* (holo-, P!).

Grisia fritillarioides Brongn., *Bulletin de la Société botanique de France* 12: 406 (1865). — *Cormigonus fritillarioides* (Brongn.) Kuntze, *nom. rej.*, *Revisio Generum Plantarum* 1: 279 (1891). — *Bikkia fritillarioides* (Brongn.) Schltr., *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 36: 19 (1905). — *Bikkia macrophylla* var. *fritillarioides* (Brongn.) N.Hallé & Jérémie, *Adansonia*, série 2, 15: 352 (1976). — *Thiollierea fritillarioides* (Brongn.) Baum.-Bod., *Systematik der Flora von Neu-Caledonien (Melanesien-Südpazifik)* 5: 98 (1989), *Systematik der Flora von Neu-Caledonien*

(*Melanesien-Südpazifik*) 4: 101 (1988), *nom. inval.* — Type: New Caledonia, Dombea (= Dumbéa), s.d., fl., *Baudouin s.n.* (holo-, P!).

Bikkia fulgida S.Moore, *Journal of the Linnean Society, Botany* 45: 326 (1921). — Type: New Caledonia, Baie Kuakoué (= Kouakoué), 300-1000 feet, 7.V.1914, br., fl., *Compton 886* (holo-, BM [photo]!).

Grisia corymbosa Brongn. & Gris ex Guillaumin, *nom. nud.*, *Annales du Musée colonial de Marseille*, série 2, 9: 167 (1911). — *Bikkia corymbosa* (Brongn. & Gris ex Guillaumin) Guillaumin, *nom. inval.*, *Annales du Musée colonial de Marseille*, série 2, 9: 167 (1911).

Bikkia fritillarioides var. *obovata* Brongn. ex Guillaumin, *nom. nud.*, *Annales du Musée colonial de Marseille*, série 2, 9: 167 (1911).

Bikkia macrophylla var. *obovata* Brongn. & Gris ex Guillaumin, *nom. nud.*, *Archives de Botanique, Mémoires, Caen* 3 (5): 3 (1930).

TAXONOMIC NOTES

Thiollierea macrophylla is a polymorphic species that occurs in the southern part of Grande Terre, the largest island, along the central-east coast. It is the only member of the genus that has compound cymes with numerous flowers.

The entity originally described as *Grisia fritillarioides* is not recognized here as distinct because plants corresponding to its type co-occur with individuals referable to typical *Thiollierea macrophylla*, which has been collected at several sites with similar environmental conditions. Moreover, the two diagnostic characters used by Jérémie & Hallé (1976) to distinguish these taxa, pubescent twigs and the number of ovules per placenta, are not correlated with one another, and individuals with intermediate combinations of character states have been observed.

6. *Thiollierea neriifolia*

(Brongn.) Barrabé & Mouly, comb. nov.

Basionym: *Grisia neriifolia* Brongn., *Bulletin de la Société botanique de France* 12: 406-407 (1865). — *Bikkia neriifolia* (Brongn.) Schltr., *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 39: 255 (1906). — *Cormigonus neriifolia* (Brongn.) Kuntze, *nom. rej.*, *Revisio Generum Plantarum* 1: 279 (1891). — Type: New Caledonia, *sine loco*, s.d., fl., *Müeller s.n.* (holo-, P!).

7. *Thiollierea pachyphylla* (Guillaumin)

Barrabé & Mouly, comb. nov.

Basionym: *Bikkia pachyphylla* Guillaumin, *Bulletin du Muséum national d'Histoire naturelle*, série 2, 20: 284 (1948). — Type: New Caledonia, Montagne des Sources, ± 1000 m, IX.1947, fl., fr., *Bernier 120* (holo-, P!; iso-, P! [1 sheet]).

8. *Thiollierea parviflora* (Schltr. & K.Krause)

Barrabé & Mouly, comb. nov.

Basionym: *Bikkia parviflora* Schltr. & K.Krause, *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 40 (92): 45 (1908). — Type: New Caledonia, Caricouïé, Rivière du Pont Cassé, I.1903, fl., fr., *Le Rat 15* (holo-, P!).

9. *Thiollierea retusiflora* (Brongn.)

Barrabé & Mouly, comb. nov.

Basionym: *Grisia retusiflora* Brongn., *Bulletin de la Société botanique de France* 12: 407 (1865). — *Bikkia retusiflora* (Brongn.) Schltr., *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 39: 255 (1906). — Type: New Caledonia, Montagnes ferrugineuses à Kanala, 1861-1867, fl., fr., *Vieillard 851* (holo-, P!; iso-, P! [3 sheets], NOU!, Z [photo]!).

Grisia carnea Brongn. & Gris, *Annales des Sciences naturelles, Botanique* V, 13: 400 (1871). — *Cormigonus carneus* (Brongn. & Gris) Kuntze, *nom. rej.*, *Revisio Generum Plantarum* 1: 279 (1891). — Type: New Caledonia, au fond de la baie Dupressé, rade de Canala, VII.1869, fl., *Balansa 1991* (holo-, P!).

Bikkia truncata S.Moore, *Journal of the Linnean Society, Botany* 45: 327 (1921). — Type: New Caledonia, Cap Bocage, 800 feet, 10.VII.1914, bt., fl., *Compton 1391* (holo-, BM [photo]!).

10. *Thiollierea tubiflora* (Brongn.)

Barrabé & Mouly, comb. nov.

Basionym: *Grisia tubiflora* Brongn., *Bulletin de la Société botanique de France* 12: 407 (1865). — *Bikkia tubiflora* (Brongn.) Schltr., *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 39: 255 (1906). — Type: New Caledonia, *sine loco*, 1862, fl., *Pancher s.n.* (lecto-, designated by Jérémie & Hallé (1976: 347), P!; isolecto-, P! [1 sheet]).

Acknowledgements

We thank the Direction de l'Environnement of the Province Sud and the Direction du Développement économique et de l'Environnement of the Province Nord in New Caledonia for permission to conduct field work and collect specimens. We are grateful to Frédéric Rigault, Yohan Pillon, Gilles Dago-tini, Williams Nigote, Tanguy Jaffré, Jacqueline Fambart-Tinel, David Kurpisz, Romain Barrière and Marine Toussiroit for their assistance in the laboratory and in the field. Thanks to Daniel and Irène Létocart and Rémy Amice for their unconditional assistance in the field. We are also grateful to the staff of the herbarium of Muséum national d'Histoire naturelle, especially Jean-Noël Labat, Frédéric Achille, Jacques Florence and Marc Pignal for help to access P collections and nomenclatural interpretations. We are indebted to John Hunnax for assistance in accessing collections of the Natural History Museum of London (BM). We thank two anonymous reviewers for helpful comments on the manuscript.

REFERENCES

- BARRABÉ L. 2006. — *Systématique des « Catesbaeeae-Chiococceae » océaniques (Rubiaceae)*. Mémoire de master 2^e année, Muséum national d'Histoire naturelle, Paris, 54 p.
- BARRABÉ L., MOULY A. & MUNZINGER J. 2011. — Deux espèces nouvelles de *Thiollierea* (Rubiaceae) restreintes aux sols hypermagnésiens du Massif du Boulinda (Nouvelle-Calédonie). *Adansonia*, sér. 3, 33 (1): 135-148. DOI: 10.5252/a2011n1a9.
- BAUMANN-BODENHEIM M. G. 1988. — *Systematik der Flora von Neu-Caledonien (Melanesien-Südpazifik)*, Band 4. Schenk-Baumann A. L. (ed.), Merenschwand, 139 p.
- BAUMANN-BODENHEIM M. G. 1989. — *Systematik der Flora von Neu-Caledonien (Melanesien-Südpazifik)*, Band 5. Schenk-Baumann A. L. (ed.), Merenschwand, 100 p.
- BREMEKAMP C. E. B. 1966. — Remarks on the position, the delimitation, and the subdivision of the Rubiaceae. *Acta Botanica Neerlandica* 15: 1-33.
- BREMER B. 1992. — Phylogeny of the Rubiaceae (Chiococceae) based on molecular and morphological data – useful approaches for the classification and comparative ecology. *Annals of the Missouri Botanical Garden* 79 (2): 380-387.

- BREMER B. & ERIKSSON O. 1992. — Evolution of fruit characters and dispersal modes in the tropical family Rubiaceae. *Biological Journal of the Linnean Society* 47: 79-95.
- BRONGNIART A. T. 1865. — Description de deux genres nouveaux de la famille des Rubiaceae, appartenant à la flore de la Nouvelle-Calédonie. *Bulletin de la Société botanique de France* 12: 402-407.
- BRONGNIART A. T. & GRIS J. A. A. 1868. — Description de quelques plantes remarquables de la Nouvelle-Calédonie. *Nouvelles Archives du Muséum national d'Histoire naturelle*, Paris 4: 10-38.
- BRONGNIART A. T. & GRIS J. A. A. 1871. — Supplément aux Rubiacées. *Annales des Sciences naturelles, Botanique* 5: 400-404 (dated 1870, published 1871).
- BROWNE P. 1756. — *The Civil and Natural History of Jamaica in Three Parts*. Osborne T. & Shipton J. (eds). Gray's-Inn, London, 153 p.
- DARWIN S. P. 1979. — A synopsis of the indigenous genera of Pacific Rubiaceae. *Allertonia* 2 (1): 1-21.
- DE CANDOLLE A. P. 1830. — *Prodromus systematis naturalis regni vegetabilis*. Treuttel & Würtz, Paris, 683 p.
- DELPRETE P. G. 1996. — Evaluation of the tribes Chiococceae, Condamineae and Catesbaeeae (Rubiaceae) based on morphological characters. *Opera Botanica Belgica* 7: 165-192.
- DRAKE DEL CASTILLO E. 1893. — *Flore de la Polynésie française*. Librairie de l'Académie de Médecine, Paris, 352 p.
- GRAY A. M. D. 1859. — Notes upon some Rubiaceae, collected in the South Sea Exploring Expedition under Captain Wilkes. *Proceedings of the American Academy of Arts and Sciences* 4: 308.
- GUILLAUMIN A. 1909. — Remarques sur la synonymie de quelques plantes néo-calédoniennes. *Notulae Systematicae* 1: 111-112.
- GUILLAUMIN A. 1930. — Matériaux pour la flore de la Nouvelle-Calédonie. *Archives de Botanique, Mémoires, Caen* 3 (5): 2-4.
- GUILLAUMIN A. 1948. — *Flore analytique et synoptique de la Nouvelle-Calédonie, phanérogames*. Office de la Recherche scientifique coloniale, Paris, 369 p.
- GUILLAUMIN A. & BEAUVISAGE G. 1913. — *Species montrouzierianae seu enumeratio plantarum in Nova Caledonia terrisque adjacentibus* A. R. P. Montrouzier lectarum. *Annales de la Société botanique de Lyon* 38: 95-98.
- HOOKE J. D. 1873. — Rubiaceae, in BENTHAM G. & HOOKE J. D. (eds), *Genera plantarum*, vol. 2. Lovell Reeve & Co, London: 7-151.
- HUYSMANS S., ROBBRECHT E., DELPRETE P. G. & SMETS E. 1999. — Pollen morphological support for the Catesbaeeae-Chiococceae-*Exostema*-complex (Rubiaceae). *Grana* 38: 325-338.
- JAFFRÉ T. 1980. — *Étude écologique du peuplement végétal des sols dérivés de roches ultrabasiques en Nouvelle-Calédonie*. ORSTOM, Paris, 273 p.
- JAFFRÉ T., MORAT P. & VEILLON J.-M. 1994. — La flore, caractéristiques et composition floristique des principales formations végétales. Dossier Nouvelle-Calédonie. *Bois et Forêts des Tropiques* 242: 7-30.
- JÉRÉMIE J. & HALLÉ N. 1976. — Le genre *Bikkia* (Rubiaceae-Condamineae) en Nouvelle-Calédonie. *Adansonia*, série 2, 15 (3): 341-355 (dated 1975, published 1976).
- KUNTZE O. 1891. — *Revisio Generum Plantarum*, pars 1. Arthur Felix, Leipzig, 374 p.
- LINNAEUS C. VON FILIUS. 1782. — *Supplementum Plantarum*. Impensis Orphanotrophei, Braunschweig, 468 p.
- MCNEILL J., BARRIE F. R., BURDET H. M., DEMOULIN V., HAWKSWORTH D. L., MARHOLD K., NICOLSON D. H., PRADO J., SILVA P. C., SKOG J. E., WIERSEMA J. H. & TURLAND N. J. 2006. — International code of botanical nomenclature (Vienna Code), adopted by the Seventeenth International Botanical Congress, Vienna, July 2005. *Regnum Vegetabile* 146: 1-568.
- MONTROUZIER X. 1860. — Flore de l'île Art (près de la Nouvelle-Calédonie). *Mémoires de l'Académie impériale des Sciences, Belles-Lettres et Arts de Lyon, Section des Sciences* 10: 1-254.
- MOORE S. 1921. — A systematic account of the plants collected in New Caledonia and the Isle of Pines by Prof. R. H. Compton, M. A., in 1914 – Part I. Flowering plants, Gamopetalae. *Journal of the Linnean Society, Botany* 14: 325-379.
- MOTLEY T. J., WURDACK K. J. & DELPRETE P. G. 2005. — Molecular systematics of the Catesbaeeae-Chiococceae complex (Rubiaceae): flower and fruit evolution and biogeographic implications. *American Journal of Botany* 92 (2): 316-329.
- RAFINESQUE-SCHMALTZ C. S. 1820. — Tableau analytique des ordres naturels, familles naturelles et genres, de la classe endogynie sous classe corisantherie. *Annales générales des Sciences physiques* 6: 76-89.
- REINWARDT C. G. C. 1925. IX. Rubiaceae. *Syllogue Plantarum Novarum* 2: 8.
- RICHARD A. 1830. — *Mémoire sur la famille des Rubiacées contenant la description générale de cette famille et les caractères des genres qui la composent*. Imprimerie de J. Tatsu, Paris, 223 p (dated 1829, published 1830).
- RIDSDALE C. E. 1982. — A revision of *Badusa* (Rubiaceae, Condamineae, Portlandiinae). *Blumea* 28 (1): 145-150.
- ROVA J. H. E., DELPRETE P. G., ANDERSSON L. & ALBERT V. A. 2002. — A *trnL-F* cpDNA sequence study of the Condamineae-Rondeletiae-Sipaneae complex with implications of the phylogeny of the Rubiaceae. *American Journal of Botany* 89 (1): 145-159.
- SCHLECHTER R. 1905. — Pflanzengeographische Gliederung der Insel Neu-Caledonien. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 36: 18-19.

- SCHLECHTER R. 1906. — Beiträge zur Kenntnis der Flora von Neu-Kaledonien. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 39: 255-268.
- SCHLECHTER R. & KRAUSE K. 1908. — Beiträge zur Kenntnis der Flora von Neu-Kaledonien. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 40 (Beibl. 92): 20-45.
- SCHUMANN K. 1891. — Rubiaceae, in ENGLER A. & PRANTL K. (eds), *Die natürlichen Pflanzenfamilien*, vol. IV(4). W. Engelmann, Leipzig: 1-156.
- SEEMANN B. C. 1865-1873. — *Flora vitiensis*. Volume 1. L. Reeve, London, 453 p.
- SMITH A. C. & DARWIN S. P. 1988. — Rubiaceae, in SMITH A. C. (ed.), *Flora vitiensis nova*, vol. 4, Pacific Tropical Botanical Garden, Lawai, Kauai: 172-174.
- VERDCOURT B. 1958. — Remarks on the classification of the Rubiaceae. *Bulletin du Jardin botanique de l'État à Bruxelles* 28: 209-281.
- VIEILLARD M. E. 1865. — Plantes de la Nouvelle-Calédonie. *Bulletin de la Société linnéenne de Normandie* 9: 344-345.

Submitted on 19 February 2010;
accepted on 18 June 2010.

APPENDIX

List of the material studied with the identification of herbarium specimens from Paris (P) and Nouméa (NOU).

Bikkia moluccana Suess. ex Troll & Dragend.

Pacific, Moluccas. Aroe Island, P. Kobroör, Dositamalaoe, 17.V.1938, bt., fl., fr., *Buwalda* 4989 (P).

Bikkia palauensis Valetton.

Pacific, Palau. Babeldaob, Rock island near "Ulong" Island, XI.1966, fl., fr., *Cheatham* 112 (P). — Ngeanges (Gaiangas) Island, in Yoo (Sar) Passage just west of south point of Urukthapel Island, 2-25 m, 23-24.VII.1946, fl., fr., *Fosberg* 25833 (P). — Middle of northeast coast of Magaiald (north arm of Urukthapel Island) southwest shore of Malakal Harbor, 1 m, 23.VII.1946, fl., fr., *Fosberg* 25860 (P). — Urukthapel, one of small islands north of southwest peninsula of Urukthapel Island, 1-2 m, 17-19.III.1950, fl., *Fosberg* 32196 (P). — Eil Malk, Oroukuizu or "Seventy Islands" Nature Reserve, eastern-most large island, 2 m, 1.IX.1965, fl., fr., *Fosberg* 47650 (P). — Koror Island, northeast corner of island, along road to Airai Ferry dock, 24.XI.1968, fl., fr., *Fosberg* 50623 (P). — Pelew Island, VIII.1933, bt., fl., *Kanehira* 2450 (P).

Bikkia tetrandra (L.f.) A.Rich.

Pacific, New Caledonia. Maré, Baie de Yenidridri, côte au sud de Eni, 20 m, 20.IV.2000, fl., fr., *Achille* 967 (P). — Lifou, VII.1869, fl., fr., *Balansa* 1996 (P). — Île des Pins, Oro, 23.IV.2006, bt., fl., *Barrabé (Leg. Dumontet)* 358 (NOU). — Ouvéa, Wadrilla, 10.VI.2006, bt., fl., *Barrabé* 360 (NOU). — Île des Pins, Île de Konibandion, 25.V.1951, fl., *Baumann-Bodenheim* 13442 (P). — Maré, La Roche, 16.VII.1951, fr., *Baumann-Bodenheim* 14664 (P). — Maré, Tô, 16.VII.1951, fr., *Baumann-Bodenheim* 14681 (P). — Maré, Batho, 18.VII.1951, fr., *Baumann-Bodenheim* 14807 (P). — Lifou, 1926, fl., fr., *Bergeret* 22 (P). — Île des Pins, Kunié, littoral de la péninsule d'Oro, 17.VII, fr., *Bernardi* 1965a (P). — Ouvéa, Fayaoué, 24.III.1965, fl., *Blanchon* 1503 (NOU). — Ouvéa, 16.V.1976, fl., *Bourret* 846 (NOU). — Île des Pins, Ouro, 8.II.1948, fl., fr., *Buchholz* 1659 (P). — Maré, 30.VII.1925, fl., fr., *Däniker* 1877 (P). — Île des Pins, 19.VIII.1961, fl., fr., *Denizot s.n.* (P). — Lifou, s.d., fl., fr., *Deplanche s.n.* (P). — Lifou, 1869, fl., fr., *Deplanche* 20 (P). — S.I., s.d., fl., *Franc* 3043 (P). — Île des Pins, presque île de Kato, 1874-1876, fl., fr., *Germain s.n.* (P). — Lifou, Hapétra, 24.XI.1979, bt., fl., *Hoff* 1426 (NOU). — Île des Pins, VII.1909, fr., *Le Rat* 141 (P). — Lifou, Chepenehe, 8.IX.1956, fr., *MacKee* 5209 (P). — Lifou, Yaco près de Chepenehe, 40 m, 9.IX.1956, fl., *MacKee* 5231 (P). — Baie Obouai, presque île Oro, 17.VII.1965, bt., fl., *MacKee* 13059 (NOU, P). — Ouvéa,

30.IX.1965, fl., fr., *MacKee* 14122 (P). — Kuébini, 2 m, 7.II.1967, fl., fr., *MacKee* 16400 (NOU, P). — Ouvéa, côte est, à la hauteur d'Ouloup (St Gabriel), 10.VI.1968, fl., fr., *MacKee* 18911 (P). — Kuébini, cap Coronation, 0-3 m, 15.IX.1970, fl., fr., *MacKee* 22469 (NOU, P). — Maré, Pédé, 2 m, 4.V.1972, fl., fr., *MacKee* 25448 (P). — Île Walpole, 10.XI.1972, fl., fr., *MacKee* 25884 (P). — Lifou, Eacho, 18.I.1975, fl., fr., *MacKee* 29669 (P). — Île Walpole (plateau), 70 m, 6.XII.1977, fl., fr., *MacKee* 34408 (P). — Île des Pins, Kuto, 24.I.1986, bt., fl., *MacKee (Leg. Cherrier)* 42998 (NOU). — Maré, Wabao, 21.III.1984, fl., fr., *Morat* 7710 (NOU). — Île des Pins, baie d'Oro, piscine naturelle, 0-5 m, 4.I.2004, bt., fl., fr., *Mouly et Innocente* 266 (NOU, P). — Île des Pins, Gadjji, 0-2 m, 5.I.2004, fl., fr., *Mouly* 274 (K, NOU, P). — Île des Pins, 1860, fl., fr., *Pancher s.n.* (P). — Île des Pins, s.d., fl., fr., *Pancher* 520 (P). — Ouvéa, Wadrilla, côté océan, 17.VII.2005, fl., *Pillon* 125 (NOU, P). — Maré, La Roche, 1.XII.1911, fl., fr., *Sarasin* 521 (P). — Maré, Shabadane, 11.VII.1967, fl., fr., *Schmid* 2243 (NOU). — Ouvéa, Mouli, 29.VIII.1967, fl., *Schmid* 2351 (NOU). — Lifou, 15.I.1975, fl., fr., *Sévenet* 817 (NOU). — Lifou, 1865, fl., *Thiébaud s.n.* (P). — Île Walpole, 5 m, 6.XII.1977, fl., fr., *Veillon* 3382 (NOU, P). — Lifou, s.d., fl., fr., *Vieillard* 2195 (P). — Lifou, 1861-1967, fl., fr., *Vieillard* 2196 (P). — Maré, La Roche, 30 m, 1.II.1946, fl., *Vivot* 1587 (NOU, P).

Thiollierea artensis Montrouz. (= *Bikkia artensis* (Montrouz.) Guillaumin).

Pacific, New Caledonia. Massif du Boulinda, 320 m, 23.I.2008, fr., *Barrabé et al.* 638 (K, NOU, P, S). — Baie MacKan, Canala, 50 ft., 5.VI.1914, fl., fr., *Compton* 1108 pro parte (BM [photo], P). — Paagoumène, base nord-ouest du dôme, 0 m, 20.I.2004, fr., *Dagostini et al.* 738 (NOU). — Boulinda, 200m, 3.II.2006, fr., *Dagostini et Barrière* 1178 (NOU). — Nené au cap Tommessé, 1864, fl., fr., *Deplanche* 385 (P). — Koniambo, vallée de la Pandanus, 2.VII.2004, fr., *Dumontet et al.* 458 (NOU). — Tiébaghi, 5.V.1978, fl., *Jaffré* 2442 (NOU, P). — Vavouto, Voh, 45 m, 18.XII.2002, fr., *Jaffré* 3577 (NOU). — Pente sud-ouest du Dôme de Tiébaghi, 100-200 m, 10.V.1966, bt., fr., *MacKee* 14962 (NOU, P). — Taom, Mt. Homédéboa, 800-900 m, 16.X.1969, fl., *MacKee* 20965 (NOU). — Plateau de Tiéa, pente nord, 200-300 m, 2.XI.1971, fr., *MacKee* 24540 (P). — Base nord-est du Dôme de Tiébaghi, 100 m, 11.V.1978, fl., *MacKee* 35118 (NOU, P). — Tinip, 150 m, 12.IV.1971, bt., fr., *MacKee* 36771 (NOU). — Art, s.d. (janvier), fl., *Montrouzier* "110" (P). — Vavouto, 9.IX.2004, fr., *Munzinger et al.* 2358, (NOU, P). — Paagoumène, creek à Paul, 11.VI.2005, fl., fr., *Munzinger & Pillon* 2857 (NOU, P, UPS). — Tiébaghi flanc ouest, basse altitude, 20.IX.1994, fr., *Suprin* 2451 (NOU). — Île Yandé, 23.VIII.1978, fr., *Veillon* 3648 (NOU, P). — Cap Tonnerre, 1867, fl., fr., *Vieillard* 385 (NOU). — S.I.,

montagnes, 20.VIII.1868, fl., fr., *Vieillard 2707* (P). — Monts de Ouatendé, Gatope, I.1868, fl., fr., *Vieillard 2707* (P). — Monts de Ouatendé, Gatope, Nené, 1864, fl., fr., *Vieillard 2707* (P).

Thiollierea campanulata (Brongn.) Baum.-Bod. (= *Bikkia campanulata* (Brongn.) Schltr.).

Pacific, New Caledonia. Mont Kopéto, versant ouest, 25.III.2000, 900 m, fl., *Achille 905* (P). — Mont Humboldt, 1100 m, 12.X.1869, fl., fr., *Balansa 1994* (P). — Montagne des Sources, 650 m, 17.XI.1977, fl., *Bamps 5772* (NOU, P). — Mine Galliéni, Mont Vulcain, 860 m, 13.XII.1977, fl., *Bamps 5964* (P). — Kopéto, 920 m, 8.VIII.2006, bt., fl., fr., *Barrabé (Leg. Rigault & Barrière) 366* (NOU). — Réserve de Fausse Yaté, 4.IV.2007, fl., *Barrabé et al. 476* (MO, NOU, P, S). — Montagne des Sources, 580 m, 5.VI.2008, bt., fl., *Barrabé & Rigault 654* (NOU, P, S). — S.l., s.d., fl., *Baudouin 796* (P). — Moné, 1070 m, 28.VII.1951, st., *Baumann-Bodenheim 14888* (P). — Forêt Plate, Montagne Paéoua, 950-1000 m, 13.VIII.1965, fl., *Bernardi 10137bis* (P). — Montagne des Sources, VII.1947, fl., *Bernier 38* (P). — Montagne des Sources, 600 m, 18.VI.1963, bt., *Blanchon 180* (NOU, P). — Plaines des Lacs, route du Grand Lac, 25.VI.1963, bt., fl., *Blanchon 214* (NOU, P). — Pont de la Rivière des Lacs, 22.VII.1977, fl., *Carlquist 15278* (NOU). — Nekando, 3500-4000 ft., 16-23.X.1914, fl., *Compton 2019* (BM[photo], P). — Monts Comboui, 2500 ft., 28.X.1914, fl., *Compton 2188* (BM[photo]). — Monts Koghis, 21.X.1990, fl., *Cosson 561* (NOU). — Goro-Nickel, 18.V.2002, fl., fr., *Dagostini & Rigault 626* (NOU). — S.l., 1861, fl., *Deplanche 259* (P). — Route de la Montagne des Sources, 20 km de Nouméa, 200 m, 23.VI.1977, fl., *Fallen 120* (P). — Flanc sud de Forêt Nord, 500 m, 23.V.2006, bt., fl., *Fambart-Tinel (Leg. Rigault) 86* (NOU, P). — Plaine des Lacs, sur la route entre Nouméa et Yaté, Creek Pernod, 14.V.1956, fl., *Forster 69* (P). — Prony, IX.1913, fl., *Franc 1536 A* (P). — Prony, VII.1914, fl., *Franc 1826 A* (P). — Vallée du Lac / Pont, 6.X.1950, st., *Guillaumin 6720* (P). — Montagne des Sources, 700 m, 18.XI.1979, fr., *Hartley 14946* (NOU). — Massif du Boulinda, 820 m, 19.VII.1972, bt., fl., *Jaffré 936* (NOU, P). — Pic du Pin, VIII.1977, bt., fl., *Jaffré 1934* (NOU, P). — Massif du Boulinda, 1000 m, 22.I.1978, bt., fr., *Jaffré 2334* (NOU). — Paéoua, 1000 m, 16.X.1986, bt., fl., *Jaffré 2735* (NOU). — Mine Kopéto, 910 m, 27.VIII.1996, bt., fl., *Litaudon 150* (NOU). — Montagne des Sources, 4.IX.2000, bt., fl., *Litaudon 1203* (NOU). — Kopéto, 800 m, 12.XII.2002, fl., fr., *Lowry & Tronchet 5990* (NOU). — Route de la Montagne des Sources, 600 m, 16.X.1955, fl., *MacKee 3245* (P). — Route de la Montagne des Sources, 600 m, 27.V.1956, fl., *MacKee 4664* (P). — Route de Yaté, près du Pont de la Rivière des Lacs, 150 m, 31.VII.1966, bt., fl., *MacKee 15400* (NOU, P). — Crête entre Haute Boulari et Haute Rivière Blanche, 500 m, 31.VII.1966,

fl., *MacKee 15423* (NOU, P). — Contrefort nord-est du Mt. Paéoua, 600-900 m, 4.VII.1967, bt., *MacKee 17001* (NOU, P). — Plateau de la Montagne des Sources, 800 m, 7.X.1969, bt., fl., *MacKee 20926* (NOU, P). — Sommet ouest du Mt. Paéoua, 1000-1140 m, 9.VII.1970, bt., *MacKee 22241* (NOU, P). — Sommet ouest du Mt. Paéoua, 900-1000 m, 24.V.1973, bt., fl., *MacKee 26874* (NOU, P). — Prony, Mont Oungoné, 400 m, 30.VIII.1974, fl., *MacKee 29218* (P). — Route de Yaté, Rivière des Lacs, 200 m, 25.V.1976, fl., *MacKee 31242* (P). — Prony, Mont Oungoné, 400 m, 12.XII.1976, fl., fr., *MacKee 32467* (P). — Route de Yaté, Marais Kiki, 150 m, 11.V.1980, bt., fl., *MacKee 38109* (NOU, P). — Montagne des Sources, 500 m, 21.VII.1979, bt., fl., *McPherson 1794* (NOU). — Montagne des Sources, 10.VII.1980, fl., *Morat 6593* (NOU). — Aiguilles de Muéo, est du Kopéto, 900 m, 28.XI.1980, fl., *Morat 6637* (NOU). — Kopéto, 800 m, 8.XI.1990, fl., fr., *Müller 173* (P). — Forêt Nord, 7.VI.2006, bt., fl., *Munzinger 3508* (NOU). — Paéoua, 1105 m, 10.IX.2008, bt., fl., *Munzinger et al. 5134* (NOU). — Paéoua, 1073 m, 10.IX.2008, fl., *Munzinger et al. 5152* (NOU). — Montagne des Sources, 900 m, 14.V.1977, bt., fl., *Musselman 5161* (NOU). — S.l., 1871, fl., fr., *Pancher s.n.* (P). — S.l., 1872, fl., *Pancher s.n.* (P). — S.l., s.d., fl., *Petit 186* (P). — Kopéto, 900 m, 19.VII.2005, bt., fl., *Pillon et al. 136* (NOU, P). — Mont Paéoua, 1060 m, 21.IX.2006, bt., fl., *Pillon 484* (NOU). — Chute de la Madeleine, 28.VII.1966, fl., *Schmid 1365* (NOU). — Montagne des Sources, 24.VIII.1971, bt., fl., *Schmid 4016* (NOU, P). — Montagne des Sources, 650 m, 17.XI.1977, fl., *Sévenet-Pusset 1402* (NOU). — Chutes de la Madeleine, 27.IV.1976, fl., *Suprin 34* (NOU). — Creek Pernod, 22.VI.1977, fl., *Suprin 196* (NOU). — Montagne des Sources, 600 m, 11.VI.1959, y.fr., *Thorne 28678* (P). — Montagne des Sources, 500 m, 14.XII.1970, bt., fl., *Veillon 2252* (NOU, P). — Piste du Nekando, 1100 m, X.1978, fl., *Veillon 3787* (NOU). — Kanala, 1866, fl., *Vieillard 850 "A"* (P). — Montagnes d'Unia, 1855-1860, fl., *Vieillard 850 "B"* (P). — Mont Humboldt, 900 m, 11.XII.1940, fl., *Viroit 429* (NOU, P). — Yaté, Plaine des Lacs, 6 km de Rivière des Lacs, 400 m, 2.VIII.1968, fl., *Webster 14508* (P).

Thiollierea kaalaensis (N.Hallé & Jérémie) Barrabé & Mouly (= *Bikkia kaalaensis* N.Hallé & Jérémie).

Pacific, New Caledonia. Massif Kaala, 740 m, 7.XI.2005, fl., *Dagostini et al. 973* (NOU, P). — Massif Kaala, 800 m, 7.XI.2005, bt., fl., *Dagostini et al. 974* (NOU, P). — Massif du Kaala, 800 m, 7.XI.2005, bt., fl., *Dagostini et al. 975* (NOU). — Kaala, 900 m, 15.II.2006, bt., fl., *Dagostini 1123* (NOU). — Sommet nord du Mont Kaala, 1000-1050 m, 25.XII.1966, fl., fr., *MacKee 16129* (P). — Mont Kaala, 650 m, 7.I.1981, fl., fr., *McPherson 3498* (NOU). — Mont Kaala, 530 m, 6.XII.2005, bt., fl., *Pillon et al. 200* (NOU).

Thiollierea lenormandii (N.Hallé & Jérémie) Barrabé & Mouly (= *Bikkia lenormandii* N.Hallé & Jérémie).

Pacific, New Caledonia. Tiébaghi, 450 m, 13.IV.2006, fl., fr., Barrabé et al. 354 (NOU, P, S). — Koniambo, le long de la Rivière Pandanus, 100 m, 17.II.2007, bt., fl., Barrière (Leg. Ducouso) 83 (NOU, P). — Koniambo, branche nord de la Thalea, 95 m, 30.VI.2004, fl., Dumontet et al. 451 (NOU). — Tiébaghi, relais de TV, 25.XI.1980, fl., Gérard 51 (NOU). — Vallée de la Confiance, 1.II.2003, bt., fl., Jaffré (Leg. Roumagnac) 3656 (NOU). — Base sud du Koniambo, Rivière Rouge, 51 m, 4.I.1969, fl., fr., MacKee 20089 (P). — Base sud du Koniambo, Rivière Rouge, 50 m, 1.XI.1971, fl., fr., MacKee 24529 (NOU, P, Z [photo]). — Koumac, Chagrín, 300 m, 8.I.1983, fl., MacKee 41145 (NOU). — Paagoumène, creek à Paul, 31.VIII.2005, fl., Munzinger 2991 (NOU). — Base du Koniambo, Rivière Pandanus, 3.X.2005, bt., fl., Munzinger & Swenson 3016 (NOU, S). — Tiébaghi, 26.XI.1980, fl., Pusset 163 (NOU). — Koné, route de la mine Confiance près de la Grande Cascade, 50 m, 12.XII.1968, bt., fl., fr., Veillon 1900 (NOU). — Montagnes de Gomouen, Gatope, I.1868, fl., Vieillard 2706 (P).

Thiollierea macrophylla (Brongn.) Baum.-Bod. (= *Bikkia macrophylla* (Brongn.) K.Schum.).

Pacific, New Caledonia. Douthio, vallée de Kieho, 22.III.2000, bt., Achille 867 (P). — Bourail, VII.1910, fl., Alleizette (Leg. Godefroy) 383 (P). — Mont Dzumac, 8.VII.1965, fl., Aubréville 227 (P). — Rives de la Dumbéa au-dessus de Koé, 21.XI.1968, fl., fr., Balansa 323 (P). — Mont Mi, 20.II.1869, fr., Balansa 1143 (P). — Mont Humboldt, 800 m, 26.IX.1869, fl., fr., Balansa 1993 (P). — Port Bouquet, IX.1869, fr., Balansa 1993a (NOU, P). — Montagnes ferrugineuses situées à l'ouest de Missioncoué, près de Port Bouquet, IX.1869, fr., Balansa 1993b (P). — Mine Gallieni, Mont Vulcain, 860 m, 13.XII.1977, fl., Bamps 5964 (NOU). — Vallée de la Tontouta, mine Gallieni, 486 m, 22.III.2006, bt., fl., fr., Barrabé et al. 343 (NOU, P, S). — Route de Poro-Kouaoua, 500 m, 29.III.2006, bt., fl., Barrabé & Pillon 347 (NOU, P, S). — Kouaoua, mine de Méa, décharge Montmartre, 759 m, 17.VIII.2009, bt., fl., Barrabé & Nigote 939 (NOU, P, S). — Païta, flanc est du Mont Mou, 700-800 m, 4.XI.2009, fl., Barrabé & Rigault 983 (NOU). — Côte Est, massif de Poro, près du sommet Mé Jawari, 450 m, 11.X.2007, fr., Barrière 144 (NOU). — Massif de Ménazi, relevé Mena 26, 822 m, 29.IV.2008, bt., fl., Barrière & Nigote 201 (NOU, P). — Nakéty, sud du massif, relevé Nak 01, 432 m, 31.VI.2008, bt., fl., Barrière & Nigote 226 (NOU, P). — Dombéa, s.d., fl., Baudouin s.n. (P). — Port de France sur les bords de la Dombéa, 1865, fl., Baudouin s.n. (P). — S.l., s.d., fl., Baudouin 352 (P). — S.l., s.d., fl., Baudouin 901 (P). — Haute Tontouta, 11.XI.1950, fl., Baumann-Bodenheim 8063 (P). — Mont Dzumac, 8.VII.1965, fl., Bernardi 9486

(P). — Vallée de la Ouinné, 27.IX.1963, fl., Blanchon 460 (P). — Thio, Port Bouquet, 14.V.1964, bt., fl., Blanchon 815 (NOU, P). — Mont Dzumac, 800-1000 m, VII.1906, fl., fr., Bonati 205bis (P). — Kouaoua, Boakaine, VII.1977, fl., Bourret 1291 (NOU). — Baie Kuakué, 300-1000 ft., 7.V.1914, bt., fl., Compton 886 (BM[photo]). — Port-Bouquet, 1.III.1992, bt., Cosson 821 (NOU). — N'goye, concession sln [société Le Nickel] Louise, XII.2002, fl., Dagostini et al. 640 (NOU). — Mamié, au-dessus de Unia, 350 m, 5.XI.2005, bt., fl., fr., Dagostini et al. 972 (NOU). — Yaté, massif du Mamié, au-dessus de Unia, 5.XI.2005, bt., fl., Dagostini et al. 1366 (NOU). — Mont Humboldt, 6.XI.1924, fl., Däniker 533 (P). — Baie de Tupéti, trouvée antérieurement sur le bord du Cours Hawe, 1867, fl., fr., Deplanche s.n. (P). — De Poum ou de Tupéti, 1861-1867, fl., Deplanche s.n. (P). — Baie de Tupéti, 1861-1867, fl., Deplanche s.n. "A" (P). — Entre Thio et Houailou, 1910, fl., Fetserin s.n. (P). — Yaté, III.1916, fl., fr., Franc 2088 (P). — Kouakoué, 950 m, 29.IX.2009, fl., Grignon et al. 454 (NOU). — Kouaoua, 25.IV.1979, bt., Hoff 780 (NOU). — Fausse Yaté, 220 m, 12.I.1951, fl., Hürlimann 678 (P). — Yaté, 22.II.1968, bt., fl., Jaffré 12 (NOU). — Port Bouquet, 2.IV.1969, bt., fl., Jaffré 185 (NOU, P). — Poro, 190 m, 6.V.1969, bt., fl., Jaffré 221 (NOU, P). — Poro, 800 m, 8.VII.1975, bt., fl., Jaffré 1353 (NOU, P). — Mont Humboldt, 980 m, 22.I.1987, fl., fr., Jérémie 1724 (P). — Col de Yaté, crête et pente de la montagne, 300 m, 1.III.1992, fl., fr., Koyama 8205 (P). — Mont Dzumac, I.1909, fl., fr., Le Rat 163 (P). — Mont Dzumac, s.d., fl., fr., Le Rat 1081 (P). — Mont Dzumac, 600-1000 m, I.1906, fl., fr., Le Rat 2565 (P). — Barrage de Yaté, 29.VII.1999, fl., Litaudon et al. 898 (NOU). — Embouchure de la Rivière de Houailou, s.d., fl., MacKee s.n. (NOU). — Vallée de Dumbéa, sous le barrage, 100 m, 9.III.1956, fl., MacKee 4081 (P). — Vallée de Dumbéa, pente au-dessus du barrage, 100-200 m, 5.V.1956, fl., MacKee 4485 (P). — Vallée de Dumbéa, pente au-dessus du barrage, 100-200 m, 12.V.1956, fl., MacKee 4529 (P). — Sentier du Dzumac, environs du deuxième col, 900 m, 23.XI.1963, fl., MacKee 9811 (P). — Route du Mont Dzumac au-dessus de la vallée de la Kalouehola, 900 m, 8.VII.1965, fl., MacKee 12931 (P). — Rivière Houailou, 30.IV.1966, bt., fl., MacKee 14808 (NOU, P). — 5 km au sud du Plateau Poro, 600 m, 1.V.1966, bt., fl., MacKee 14861 (NOU, P). — Crête au-dessus de la vallée de la Tontouta, 1000 m, 14.VIII.1966, fl., MacKee 15306 (P). — Ouroué, 50-250 m, 30.IV.1967, bt., fl., MacKee 16700 (NOU, P). — Haute Ouano, crête au nord du Mt. Tonta, 950 m, 6.XI.1970, fl., MacKee 22973 (NOU, P). — Hauteurs à l'est du Barrage Yaté, 350 m, 23.III.1971, bt., fl., MacKee 23456 (NOU, P). — 10 km de Thio sur la route de Port Bouquet, 200 m, 29.VI.1971, y.fr., MacKee 23903 (P). — Vallée de la Tontouta, près de la mine Liliane, 100 m, 22.V.1972, fl., fr., MacKee 25520 (P). — Basse vallée de la Ouinné, 0-20 m, 3.VIII.1973,

y.fr., *MacKee* 27103 (P). — Contrefort du Humboldt, 1150 m, 30.IX.1973, fl., *MacKee* 27542 (P). — Basse vallée de la Ouinné, 0-2 m, 24.V.1974, fl., fr., *MacKee* 28682 (P). — Rive gauche de la Haute Koua, 500 m, 4.VI.1976, fl., *MacKee* 31386 (NOU, P). — Yaté, Gouemba, 300 m, 4.VI.1977, fl., y.fr., *MacKee* 33237 (P). — Kouaoua, contrefort nord du Ménazi, 500 m, 26.VI.1977, fl., *MacKee* 33416 (NOU, P). — Vallée Koélagoguamba, 100 m, 9.X.1977, bt., fl., fr., *MacKee* 34062 (NOU, P). — Plateau au sud du Village de Yaté, 300 m, 10.III.1978, fl., *MacKee* 34840 (NOU, P). — Kouaoua, Dahi, 500 m, 2.VIII.1978, fl., *MacKee* 35510 (P). — Yaté, Gouemba, 400 m, 22.III.1981, bt., fl., *MacKee* 38859 (NOU, P). — Bourail, Mé Jéjehari, 750 m, 18.IV.1985, bt., *MacKee* 42560 (NOU). — Poro, Kaséoua, 500 m, 17.XII.1992, fr., *MacKee* 46076 (NOU, P). — Thio-Canala, 14.V.1980, bt., fl., *McPherson* 2651 (NOU). — Thio, 26.IV.1984, bt., fl., *McPherson* 6515 (NOU). — S.l., s.d., fl., *Müeller* 55 (P). — Port Bouquet, Rivière Koum, au bout de la piste longeant la rivière, berge ouest, 80 m, 24.XI.2001, fr., *Munzinger* 1013 (MO, NOU, P). — Port Bouquet, Rivière Koum, au bout de la piste longeant la rivière, berge ouest, 105 m, 24.XI.2001, fl., *Munzinger* 1026 (MO, NOU, P). — Tontouta, 50 m, 3.VII.2004, fl., fr., *Munzinger et al.* 2178 (NOU). — Route de Kouaoua-Poro, 16.VII.2004, bt., fl., *Munzinger* 2266 (NOU, P, UPS). — S.l., 1871, fl., *Pancher s.n.* (P). — S.l., 1871, bt., fl., *Pancher s.n.* (P). — S.l., 1879, fl., *Pancher s.n.* (P). — S.l., s.d., fl., fr., *Pancher* 325 (P). — S.l., s.d., fl., *Pancher* 333 (P). — Ngoyé, 100-200 m, 15.IX.1911, fl., *Sarasin* 170 (P). — Montagne de Ngoye, 200 m, 7.XI.1902, fl., fr., *Schlechter* 15242 (P). — Montagne de Ngoye, 500 m, 12.XI.1902, fl., *Schlechter* 15273 (P). — Mont Dzumac, 8.VII.1965, bt., fl., *Schmid* 426 (NOU). — Port-Bouquet, îlot Toupi, face nord-est, 3.VI.1982, fl., *Suprin* 1902 (NOU). — N'goye Ouen Dakoesse, 500m, 3.V.1995, fl., *Suprin* 2551 (NOU). — Mont Tonta, 950 m, 10.VIII.1967, fl., *Veillon* 1313 (NOU). — Port Bouquet, 9.VI.1972, fl., fr., *Veillon* 2603 (NOU, P). — Vulcain, 850 m, 26.IV.1973, bt., fl., *Veillon* 2866 (NOU). — Mont Ménazi, 980 m, 6.V.1987, bt., *Veillon* 6370 (NOU). — Kanala, 1861-1867, fl., *Vieillard* 850 "C" (P). — Mine Werquin, base du Pic du Rocher, exposition ouest, ± 200 m, 30.IX.1939, fl., *Viot* 209bis (P). — Dumbéa, branche nord, 100 m, 23.IV.1944, fl., *Viot* 1235 (NOU, P). — Païta / Dumbéa, le long d'un col entre les Mont Kouvelé et Mont Dzumac, 800-900 m, 7.VIII.1968, fl., *Webster* 14617 (P). — Massif du Humboldt, 950 m, 14.XI.1982, bt., fl., *Ziarnik* 73 (NOU).

Thiollierea neriifolia (Brongn.) Barrabé & Mouly (= *Bikkia neriifolia* (Brongn.) Schltr.).

Pacific, New Caledonia. Taom, 700 m, 13.IX.2006, bt., fl., fr., *Barrabé (Leg. Rigault & Barrière)* 373 (NOU, P). — Taom, 850 m, 12.IX.2006, bt., fl., *Barrabé (Leg. Rigault & Barrière)* 374 (NOU). — Taom, crête est, relevé

TAOM 27, 980 m, 6.XII.2006, fl., *Barrière & Nigote* 60 (NOU, P). — S.l., s.d., fl., Compton 2302 (P). — Taom, Mont Homédéboa, 800-900 m, 3.XI.1971, fl., *MacKee* 24558 (P). — S.l., s.d., fl., *Müeller s.n.* (P).

Thiollierea pachyphylla (Guillaumin) Barrabé & Mouly (= *Bikkia pachyphylla* Guillaumin).

Pacific, New Caledonia. Montagne des Sources, ± 1000 m, IX.1947, fl., fr., *Bernier* 120 (P). — Plateau de la Montagne des Sources, le long d'un sentier, c. 850 m, 15.X.1947, fl., *Buchholz* 1227 (P). — Massif du Kouakoué, VIII.1955, bt., fl., *Chevalier* 12 (NOU). — Montagne des Sources, 900 m, 7.III.1951, st., *Hürlimann* 967 (P). — Kouakoué, 1323 m, 25.I.2010, fl., *Grignon et al.* 758 (NOU). — Kouakoué, 1500 m, 25.IX.2003, bt., fl., *Jaffré* 3660 (NOU). — Est de Dumbéa, Montagne des Sources, c. 900 m, 27.XI.1991, fl., fr., *Jérémié* 1930 (P). — Crête sud-est du Pic du Rocher, 900-1000 m, 28.IV.1967, fl., *MacKee* 16686 (*Leg. Boulet*) (P). — Mt. Kouakoué, 1400 m, 9.XII.1976, fl., *MacKee* 32400 (NOU, P). — Mont Kouakoué, 1480 m, 20.XI.1981, fl., *MacKee* 39897 (P). — Mt. Kouakoué, 1450 m, 11.IX.1991, fl., *MacKee (Leg. Suprin)* 45645 (NOU). — Massif du Kouakoué, 1300 m, 22.IX.1977, fl., *Morat* 5695 (NOU, P). — Mont Kouakoué, 1480 m, 20.XI.1981, bt., fl., fr., *Morat* 6751 (NOU). — Mont Kouakoué, 28.XI.2002, fl., fr., *Munzinger et al.* 1708 (MO, NOU, P). — Mont Kouakoué, 1350 m, 28.IV.2006, fl., *Pillon et al.* 363 (K, MO, NOU, P). — Montagne des Sources, 2.III.1982, bt., fl., *Suprin* 1686 (NOU). — Montagne des Sources, 900 m, 27.IV.1967, bt., fl., *Veillon* 1196 (NOU, P). — Montagne des Sources, 950 m, 5.X.1967, fl., *Veillon* 1388 (NOU, P).

Thiollierea parviflora (Schltr. & K.Krause) Barrabé & Mouly (= *Bikkia parviflora* Schltr. & K.Krause).

Pacific, New Caledonia. Boulinda, vers Népouto, à proximité du campement de l'ancienne exploitation minière ouest, 15.II.2006, fl., fr., *Barrabé et al.* 328 (NOU, S). — Réserve spéciale botanique de Fausse Yaté, 4.IV.2007, bt., fl., fr., *Barrabé et al.* 475 (G, K, MO, NOU, P, S). — Massif du Boulinda, ancien campement de l'exploitation minière ouest, vers Népouto, 500 m, 23.I.2008, bt., fl., fr., *Barrabé et al.* 629 (NOU, P, S). — Forêt du Pic du Pin, 25.XI.2004, bt., fl., *Dagostini & Rigault* 902 (NOU, P). — Réserve du Pic du Grand Kaori, versant nord nord-est, 300-350 m, 27.IX.2007, bt., fr., *Dagostini et al.* 1381 (NOU, P). — Réserve de Nodéla, 400-500 m, 29.I.2008, bt., fl., fr., *Dagostini & Barrabé* 1542 (NOU, P). — Caricouié, Rivière du Pont Cassé, I.1903, fl., fr., *Le Rat* 15 (P). — Mont Dzumac, s.d., fl., fr., *Le Rat* 577 (P). — Forêt du Grand Kaori, 24.V.2005, fr., *Munzinger & Rigault* 2836 (NOU)

Thiollierea retusiflora (Brongn.) Barrabé & Mouly (= *Bikkia retusiflora* (Brongn.) Schltr.).

Pacific, New Caledonia. S.l., 1868-1870, fl., *Balansa s.n.* (P). — Au fond de la baie Dupressé, rade de Canala, VII.1869, fl., *Balansa 1991* (P). — Camp des Sapins, Haute Koua, 8.III.2006, fr., *Barrabé et al. 333* (MO, NOU, P, S). — Massif de Bogota, piste qui descend vers Ouassé, relevé Bogo 06, 248 m, 4.VI.2008, fr., *Barrière & Nigote 214* (NOU, P). — Baie MacKan, Canala, 50 ft., 5.VI.1914, fl., fr., *Compton 1108* pro parte (BM[photo], P). — Cap Bocage, 800 ft., 10.VII.1914, bt., fl., *Compton 1391* (BM[photo]). — Versant nord-est du Cap Bocage, 28.VIII.2001, fr., *Dagostini & Jaffré 359* (NOU). — Baie d'Urville, V.1869, fl., fr., *Delecour s.n.* (P). — Forêt de Sailles, 134 m, 8.I.2009, bt., *Grignon et al. 94* (NOU). — Col de Hô, 22.II.1968, bt., fr., *Jaffré 11* (NOU, P). — Montagne au sud de la basse Vallée de Thio, route de la mine Bornet, 600 m, 7.VIII.1966, bt., fl., *MacKee 15468* (NOU, P). — Kouaoua, Ndouvéra, 30.III.1970, bt., fl., *MacKee 21703* (NOU, P). — Canala, 250 m, 4.II.1983, bt., *McPherson 5485* (NOU). — Thio, Ton N'Deu, 18.VI.2006, fl., fr., *Munzinger (Leg. Amice) 3487* (NOU). — Thio, 16.XII.1981, fr., *Veillon 4734* (NOU). — Canala, 1855, fl., *Vieillard s.n.* (NOU). — Montagnes ferrugineuses à Kanala, 1861-1867, bt., fl., fr., *Vieillard 851* (NOU, P, Z [photo]).

Thiolliera tubiflora (Brongn.) Barrabé & Mouly (= *Bikkia tubiflora* (Brongn.) Schltr.).

Pacific, New Caledonia. Vallée de Dumbéa Nord, Bord du sentier, 20.I.2000, bt. *Achille 528* (P). — Col de Mouirange, route Nouméa-Yaté, piste en direction du nord-ouest à 300 m de la route, 17.II.2000, fl., *Achille 692* (P). — Mont Dzumac, VI.1910, fl., *Alleizette (Leg. Godefroy) 61* (P). — Entre Saint-Louis et Yaté, 17.V.1869, fl., fr., *Balansa 1473* (NOU, P). — Les Dalmates, route Mont-Dore / Yaté, 4.III.2006, bt., fl., fr., *Barrabé et al. 332* (MO, NOU, P, S). — Vallée de la Tontouta, mine Galliéni, 500 m, 22.III.2006, bt., fr., *Barrabé et al. 341* (NOU, P, S). — Vallée de la Tontouta, mine Galliéni, 500 m, 22.III.2006, fl., fr., *Barrabé et al. 342* (NOU, P, S). — Col de Plum, ascension du sommet du Wé Xi, 200-300 m, 29.VII.2007, fl., fr., *Barrabé & Rigault 536* (NOU, P, S). — Vallée de la Kouvelée, 1.V.1951, fl., *Baumann-Bodenheim 13038* (P). — Mont Dzumac, VIII.1906, fl., fr., *Bonati 221* (P). — Mont Dzumac, 700 m, IV.1906, fl., fr., *Bonati 306* (P). — Sources de la Rivière de Yahoué, 21.VIII.18?, fl., *Brousmitche s.n.* (P). — Rivière de Dumbéa, 1914, fl., *Compton 813* (P). — Plateau de Prony, 100 m, XI.1903, fr., *Cribs 1538* (P). — Plateau nord de Prony, 300 m, X.1903, fr., *Cribs 1750* (P). — S.l., 1861, fl., *Deplanche 256* (P). — Forêt Nord, 20.II.2007, bt., fl., fr., *Fambart-Tinel (Leg. Kurpysz) 124* (K, NOU, P, S). — Dumbéa, Mont Dzumac, 500 m, 13.VII.1914, fl., *Franc 1977* (P). — Val Suzon, vers Dumbéa, 250 m, 20.VII.1930, fl., *Franc 2475* (P). — Mont Mou, 660 m, 2.IV.2009, fr., *Grignon & Munzinger 258* (NOU). — Mont Dore, 500 m, 21.III.1951,

fl., *Guillaumin 11362* (P). — Mont Dzumac, 900 m, 28.IV.1951, st., *Guillaumin 12688* (P). — Konébutie Nord, 140 m, 10.I.1951, fr., *Hürlimann 594* (P). — Vers Boulari, 430 m, 30.I.1951, bt., *Hürlimann 800* (P). — Sunshine, Dumbéa, 350 m, 14.III.1951, fl., *Hürlimann 1045* (P). — Monts Kouvelées, 800 m, 29.III.1951, fl., *Hürlimann 1106* (P). — Les Dalmates, 140 m, 10.IV.1968, bt., fl., *Jaffré 15* (NOU). — Tontouta, 25.VII.1984, fr., *Jaffré 2534* (NOU). — Prony, s.d., fl., *Le Rat A-136* (P). — Prony, s.d., fr., *Le Rat 464* (P). — Mont Dzumac, s.d., fl., *Le Rat 602* (P). — Mont Dzumac, s.d., fl., fr., *Le Rat 1081* (P). — Bords de la Couvelée, IX.1904, fl., fr., *Le Rat 2276* (P). — Mont Dzumac, sentier, 800 m, VI.1906, fr., *Le Rat 2550* (P). — Sentier du Dzumac, pente au dessus de la vallée de la Couvelée, 15.V.1955, fl., *MacKee 2517* (P). — Sentier du Dzumac, pente au-dessus de la vallée de la Couvelée, 400-500 m, 15.IV.1956, fr., *MacKee 4340* (P). — Sentier du Dzumac, pente au-dessus de la vallée de la Couvelée, 400-500 m, 16.IV.1956, fl., *MacKee 4341* (P). — Route de Yaté, Dalmates, 150 m, 8.III.1969, bt., fl., *MacKee 20270* (NOU, P). — Basse Vallée de la Ouinné, 0-20 m, 3.VIII.1973, fr., *MacKee 27141* (NOU). — Vallée de la Ouinné, 150 m, 25.V.1974, fr., *MacKee 28722* (P). — Yaté, Kuébini, 20-100 m, 2.IV.1975, bt., fl., *MacKee 29967* (NOU, P). — Dumbéa Nord, 200 m, 11.III.1978, bt., fl., *MacKee 34844* (NOU, P). — Piste Dzumac, 800 m, 6.V.1978, fl., *MacKee 35090* (NOU, P). — Touaourou, 150 m, 4.V.1980, bt., *MacKee 38094* (NOU, P). — Haute Ouenghi, 700 m, 2.VI.1982, fl., fr., *MacKee 40459* (NOU, P). — Mont Dzumac, 600 m, 7.II.1982, bt., *McPherson 4566* (NOU). — Montagne des Sources, 300 m, 4.III.2005, bt., fl., *Munzinger & Amice 2720* (NOU, P). — Prony, bassin de la Kwe Ouest, 20.IV.2005, fl., *Munzinger & Dagostini 2775* (NOU, P). — Tontouta, 26.II.2006, fr., *Munzinger et al. 3367* (MO, NOU, P). — Plum en face du col, 16.VII.2006, fl., *Munzinger 3510* (NOU, P). — Dumbéa Nord, 25.III.1966, bt., fl., *Nothis 91* (NOU, P). — S.l., 1862, fl., *Pancher s.n.* (P). — S.l., 1871, fl., fr., *Pancher s.n.* (P). — S.l., 1879, fl., *Pancher s.n.* (P). — S.l., 1871, fl., *Pancher 326* (P). — Dumbéa, 21.V.1969, bt., fl., *Schmid 2821* (NOU). — Route du Dzumac, 700 m, 18.IV.1974, fl., *Schmid 5002* (NOU). — Col Mouirange, 10.II.1981, bt., fl., *Suprin 1026* (NOU). — Sud de Thio, Ouen Dakoesse, N'goye, 500 m, 3.V.1995, bt., fl., *Suprin 2553* (NOU). — Mont Dzumac, 800 m, 8.VI.1966, bt., fl., *Veillon 758* (NOU). — Rivière Bleue, 18.III.1970, fl., *Veillon 2101* (NOU, P). — Mont Dzumac, 500 m, 30.III.1978, bt., fl., *Veillon 3549* (NOU, P). — Rive droite de la Tontouta, 7.X.1986, st., *Veillon 6015* (NOU). — Col de Mouirange, Propriété S.Tomono, 100 m, 4.III.1993, bt., fl., *Veillon 7620* (NOU, P). — Sentier du Dzumac, après la première cascade, exposition sud, ± 600 m, 4.IX.1940, fl., *Viroi 169* (P).