

## **Contribution to the Bryophyte Flora of New Caledonia III. New and Interesting Records, New Combinations and New Synonyms**

Author(s): Louis Thouvenot, Frank Müller & S. Robbert Gradstein

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## Contribution to the bryophyte flora of New Caledonia III. New and interesting records, new combinations and new synonyms

Louis THOUVENOT<sup>a\*</sup>, Frank MÜLLER<sup>b</sup> & S. Robbert GRADSTEIN<sup>c</sup>

<sup>a</sup>11, rue Saint Léon, 66000 Perpignan, France

<sup>b</sup>Technische Universität Dresden, Institut für Botanik, D-01062 Dresden, Germany

<sup>c</sup>Muséum National d'Histoire Naturelle, ISYEB, Cryptogamie,  
CP 39, 57 rue Cuvier, 75231 Paris cedex 05, France

**Abstract** – Although numerous papers have already been published on the New Caledonia bryophytes, our knowledge of the bryophyte flora of the territory still remains incomplete. Here we report 13 species new to New Caledonia: six liverworts (*Bazzania caudistipula*, *B. loricata*, *B. wooroonoran*, *Ceratolejeunea belangeriana*, *Riccardia albomarginata*, *R. colensoi*) and seven mosses (*Austinia tenuinervis*, *Chionoloma crassicosatum*, *Diphyscium longifolium*, *Ectropothecium dealbatum*, *Fabronia australis*, *Schwetschkea pygmaea*, *Trichosteleum subfalcatulum*). The occurrence in New Caledonia of one hornwort (*Dendroceros granulatus*), four liverworts (*Acrolejeunea securifolia* subsp. *caledonica*, *Bazzania subtilis*, *Kurzia caduciloba*, *Spruceanthus thozetianus*) and one moss (*Chionoloma dubium*) is confirmed and additional data on the species are provided. New combinations and synonymies are proposed for four liverworts (*Mastigobryum bernieri* f. *falcifolium* = *Bazzania bernieri*, *Cryptolophocolea subcostata* = *Lophocolea subcostata*, *Heteroscyphus confertus* = *Chiloscyphus confertus*, *Heteroscyphus rotundiphyllus* = *Chiloscyphus rotundifolius*) and three mosses (*Radulina borbonica* = *Trichosteleum insigne*, *Trichosteleum stigmosum* = *Trichosteleum piliferum*, *Trichostomum noumeanum* = *Hymenostomum noumeanum*). Finally, one name is suppressed (*Mastigobryum pancheri*) and three species are rejected from the bryoflora of New Caledonia (*Bazzania falcifolia*, *Pseudosymbblepharis angustata*, *Spruceanthus sulcatus*).

**Anthocerotophyta / Bryophyta / hornworts / liverworts / Marchantiophyta / mosses / new records / Pacific region**

**Résumé** – Malgré les nombreuses contributions à la bryoflore de Nouvelle-Calédonie déjà publiées, 13 nouvelles espèces sont découvertes dans le territoire: six hépatiques (*Bazzania caudistipula*, *B. loricata*, *B. wooroonoran*, *Ceratolejeunea belangeriana*, *Riccardia albomarginata*, *R. colensoi*) et sept mousses (*Austinia tenuinervis*, *Chionoloma crassicosatum*, *Diphyscium longifolium*, *Ectropothecium dealbatum*, *Fabronia australis*, *Schwetschkea pygmaea*, *Trichosteleum subfalcatulum*). Un anthocéroto (*Dendroceros granulatus*), quatre hépatiques (*Acrolejeunea securifolia* subsp. *caledonica*, *Bazzania subtilis*, *Kurzia caduciloba*, *Spruceanthus thozetianus*) et une mousse (*Chionoloma dubium*) sont confirmées et les données les concernant complétées. De nouvelles combinaisons ou synonymies sont produites pour quatre hépatiques (*Mastigobryum bernieri* f. *falcifolium* = *Bazzania bernieri*,

\* Corresponding author: thouloup@orange.fr

*Cryptolophocolea subcostata*  $\equiv$  *Lophocolea subcostata*, *Heteroscyphus confertus*  $\equiv$  *Chiloscyphus confertus*, *Heteroscyphus rotundiphyllus*  $\equiv$  *Chiloscyphus rotundifolius*) et trois mousses (*Radulina borbonica* = *Trichosteleum insigne*, *Trichosteleum stigmosum* = *Trichosteleum piliferum*, *Trichostomum noumeanum*  $\equiv$  *Hymenostomum noumeanum*). Enfin, un nom est éliminé (*Mastigobryum pancheri*) et trois espèces sont rejetées de la bryoflore de Nouvelle-Calédonie (*Bazzania falcifolia*, *Pseudosymblypharis angustata*, *Spruceanthus sulcatus*).

**Anthocérotes / Anthocerotophyta / Bryophyta / hépatiques / Marchantiophyta / mousses / Nouvelle-Calédonie / nouvelles espèces / région Pacifique**

## INTRODUCTION

The New Caledonian bryophyte flora has been documented by many authors since 1853 (Thouvenot & Bardat, 2010; Thouvenot *et al.*, 2011). Pursell & Reese (1982) recorded 631 specific and infraspecific taxa of mosses; this number was updated and reduced to 520 by Thouvenot & Bardat (2010). Thouvenot *et al.* (2011) listed 482 hornworts and liverworts. Since then, studies of new collections and herbarium material made by two of us (LT, FM) and others led to discovery of new species, new records and new synonymies, resulting 546 mosses and 495 liverworts and hornworts being known from New Caledonia (Thouvenot & Müller, 2016). In the present paper we present further 13 species new to New Caledonia (six liverworts, seven mosses), confirm the presence in the territory of six poorly documented species (one hornwort, four liverworts, one moss), make seven nomenclatural changes (four in liverworts, three in mosses) and exclude four names. As a result, we now recognize 552 mosses and 499 liverworts in New Caledonia, including three moss families hitherto unknown in New Caledonia: Fabroniaceae, Leskeaceae and Myriniaceae. The collections made by L. Thouvenot are in the author's personal herbarium unless otherwise stated; those made by F. Müller are deposited in DR. Species new to New Caledonia are marked by an asterisk.

## RESULTS AND DISCUSSION

### ANTHOCEROTOPHYTA

#### *Dendroceros granulatus* Mitt.

Province Sud: Païta, on stem of isolated shrub on a terrace at the bottom of Mt Ouin, 900 m, 19 September 2016, *Thouvenot NC2122*; N.D. de la Conception, on trunks in forest, 550 m, February 1869, *Balansa 2587*, det. Bescherelle as *D. crispatus* (PC 0146827-9!).

The two specimens fit the specific character combination of *Dendroceros granulatus*, including the strongly crispate thalli with large, irregular perforations, capsule epidermal cells with thick, strongly nodulose walls and polygonal to stellate cavities, large multicellular spores (75-100  $\times$  50-75  $\mu$ m) and elaters with a single spiral. The Balansa's material was identified as *D. crispatus* (Hook.) by Bescherelle but the record remained unpublished. *Dendroceros crispatus* is known from South

America, Africa (Sao Tomé) and Australia (Garcia *et al.*, 2012) but it is morphologically hardly distinguishable from other species with nodulose capsule epidermal cells, especially *D. granulatus*. The latter is widely distributed in Pacific Islands and already reported from New Caledonia as *D. caledonicus* Steph. (Hasegawa, 1986). Without molecular data to separate or not these taxa, we retain *D. granulatus* as the most appropriate name. Other *Dendroceros* species reported from New Caledonia (Thouvenot *et al.*, 2011) do not match this set of characters. Two of them, *D. crispus* (Sw.) Nees (doubtfully recorded from New Caledonia as *D. brasiliensis* (Raddi) Nees, see Thouvenot *et al.*, 2011) and *D. tahitensis* Ångstr., also have crispate thalli but differ by the absence of thallus perforations.

## MARCHANTIOPHYTA

*Acrolejeunea securifolia* (Endl.) Watts *ex* Steph. **subsp. caledonica** (Steph.) Gradst.

Province Sud: Thio, St Gabriel, Tamaniou bay, on trunk in coastal dry forest, 10 m, 166°19'22"E, 21°38'56"S, 23 October 2016, *Thouvenot NC2070*.

The plants approach *A. securifolia* subsp. *securifolia*, as described by Gradstein (1975), by the relatively small underleaves with almost straight insertion line.

*Bazzania bernieri* (Steph.) Inoue & H.A.Mill.

= *Mastigobryum bernieri* f. *falcifolium* Steph., *Sp. Hepat.* 3: 476, 1908, **syn. nov.** ≡ *Mastigobryum falcifolium* Steph. *ex* Paris nom. inval., *Rev. bryol.* 33: 29, 1906 Type: New Caledonia, Province Sud: "M. Malaoui, pr. Nouméa", 20 November 1905, *Etesse s.n.* (isosytype, REN000098!); without locality, *Lerat s.n.* (n.v.).

Stephani (1908) distinguished *Mastigobryum bernieri* f. *falcifolium* by the rather small and somewhat falcate leaves. Study of the material in the herbarium of E.G. Paris at Rennes confirmed that the material matches the description of *B. bernieri* Steph. and do not justify an infraspecific separation.

\**Bazzania caudistipula* (Steph.) Inoue & H.A.Mill. (conf. D. Meagher)

Province Nord: Hienghène, Cascade de Tao, epiphytic in rainforest, ca. 50 m, 12 September 2001, *F. Müller NC216*.

The species was hitherto known from the Philippines, New Guinea, Fiji, Samoa and Australia (Queensland) (Meagher, 2010).

\**Bazzania loricata* (Reinw., Blume & Nees) Trevis. (conf. D. Meagher)

Province Nord: Mont Panié, along the hiking trail from the street RPN3 to the summit, epiphytic in very wet rainforest, ca. 900 m, 13 September 2001, *F. Müller NC153*.

A good description and illustration of the species based on Australian material is given by Meagher (2015). The species is widespread in tropical SE Asia and also occurs in northern Australia (Meagher, 2015).

*Bazzania subtilis* (Sande Lac.) Trevis. (p.p. conf. D. Meagher)

Province Sud: Païta, Mt Humboldt, cloud forest, on humus, 1255 m, 1 October 2008, *Thouvenot NC1771*; La Foa, Mt Dogny, mountain wet forest, on rotten log, 990 m, 23 September 2008, *Thouvenot NC635*; Parc Provincial de la Rivière Bleue, on the path from Refuge de la Rivière Bleue to Haute Pourina, epiphytic, ca. 300-800 m, 6 September 2001, *F. Müller NC53*; Farino, Parc des Grandes Fougères, on rotten wood, 400 m, 8 December 2010, *K. Reichel NC774* (DR).

*Bazzania subtilis* was recorded only once from New Caledonia (Paris, 1910). The species is known from Java, Ambon, New Guinea, Samoa and Australia (Queensland) (Meagher, 2010). The material with the collection numbers *NC53* and *NC774* was seen by David Meagher and he considered these to be poorly developed phenotypes (D. Meagher, in litt.). A good description and illustration of *B. subtilis* based on an Australian specimen is provided by Meagher (2010).

\**Bazzania wooroonooran* D.Meagher (conf. D. Meagher)

Province Sud: Païta, Mt Humboldt massif, between the mountain hut and the top of the mountain, epiphytic, ca 1600 m, 31 August 2003, *F. Müller NC773*.

The species was hitherto known only from the type locality in Bellenden Ker Range, northern Queensland (Meagher, 2015). The finding of the species in New Caledonia is a further example of bryogeographic similarities between New Caledonia and Queensland. In the type collection only immature perianths were seen and they were characterized as to have lacerate-ciliate apices (Meagher, 2015). Several well developed perianths are present in the New Caledonian material. As only immature perianths were known in this species, a brief description of the mature perianth is given: Perianths 3.7-4.1 mm long, 0.8-0.9 mm wide, tubular, three-sided, cells 38-88 µm long, 22-36 µm wide, with conspicuous nodular thickenings, thickenings of the cells in the mouth area less prominent, apices constricted, ciliate, cilia 250-400 µm long, biseriate at base and with a long uniseriate tip.

\**Ceratolejeunea belangeriana* (Gottsche) Steph.

Province Sud: Yaté, Plaine des Lacs, lowland wet forest with *Campecarpus fulcitus* (Brongn.) H.Wendl. ex Becc., epiphyte on *Euptychium piliferum* Frank Müll., 260 m, 166°56'37"E, 22°16'32"S, 6 October 2016, *Thouvenot NC2082*.

*Ceratolejeunea* was newly reported from New Caledonia with the discovery of *C. bardatii* Thouvenot *et al.* (Thouvenot *et al.*, 2015). *Ceratolejeunea belangeriana* is the second species of this genus in New Caledonia. The known distribution of *C. belangeriana* covers a wide area around the Indian and South Pacific Oceans (Zhu *et al.*, 2005), with localities nearest to New Caledonia in Fiji, New Guinea and Solomon Islands.

*Cryptolophocolea subcostata* (Steph.) Thouvenot, **comb. nov.**

≡ *Lophocolea subcostata* Steph., *Sp. Hepat.* 6: 295, 1922 ≡ *Chiloscyphus subcostatus* (Steph.) J.J.Engel & R.M.Schust. *Nova Hedwigia* 39: 423. 1985 ("1984"). Type: New Caledonia, *Le Rat s.n.* (n.v.).

Province Sud: ridge between Mt Dzumac and Mt Ouin, 1100 m, in meso-hygrophilous mountain forest, on trunks, 17 May 1951, *Hürlimann 2599a* (PC0167677!); Païta, Mt Humboldt massif, 1205 m, 166°23'53"E, 21°53'03"S, 30 September 2008, *Thouvenot NC1799, 1813, 1838*. Province Nord: Hienghène, Mt Panié massif, between Bwa Téan and Payolé, 1000 m, on logs, 9 October 2012, *Thouvenot NC1879*.

*Cryptolophocolea* Söderström *et al.* (2013a, b) was established based on the elevation of *Chiloscyphus* subg. *Connati* (Lindenb.) Gottsche to generic rank. The new genus differs from *Chiloscyphus* by gynoecea terminal on leading shoots and from *Lophocolea* by underleaves connate on both sides to subopposite leaves. *Chiloscyphus subcostatus*, described from New Caledonia by Stephani (1922) as *Lophocolea subcostata*, seems to be very close to *Cryptolophocolea costata* (Nees) L.Söderstr., a widespread Asiatic species not recorded from New Caledonia. Based on Stephani's diagnoses (1906, 1922), the two species differ mainly in quantitative

features such as the size of the plants, the degree of dentation of leaves and underleaves, and the shape of the perianth mouth (Stephani, 1906, 1922).

We have examined a specimen of *L. subcostata* collected in New Caledonia by H. Hürlimann and two new collections from this French overseas territory, and can confirm the presence of terminal gynoecia, subopposite leaves and connate underleaves, characteristic of *Cryptolophocolea*. We therefore transfer *Lophocolea subcostata* to *Cryptolophocolea*. Further characteristic features of this species are the obliquely spreading leaves, being canaliculate-concave when dry, the bifid and ciliate-dentate leaves and underleaves, and the long-spicate androecia on short ventro-lateral branches. The specimens differ from the two other *Cryptolophocolea* species recorded from New Caledonia, *C. explanata* (Mitt.) Söderström *et al.* and *C. levieri* (Schiffn.) Söderström *et al.*, by canaliculate leaves (plane in *C. explanata*) and a wide, truncate perianth mouth with inconspicuous lobes (narrow and deeply lobed with lanceolate lobes in *C. levieri*). From *C. costata* the New Caledonian plants differ mainly by the small leaves less than 2 mm long and the antical leaf margins being entire except for the occasional occurrence of a few small teeth in the subapical part. Further study is necessary to confirm the status of *C. subcostata* as a good species.

***Heteroscyphus confertus* (Steph.) Thouvenot, comb. nov.**

≡ *Chiloscyphus confertus* Steph., *Sp. Hepat.* 6: 305, 1922. Type: New Caledonia, Franc s.n. (isotype, PC0101951!).

Further specimens examined: Province Sud: Païta, Dzumac massif, on trunk in mountain forest with Cyperaceae undergrowth, 166°25'55"E, 22°02'45"S, September 2008, *Thouvenot NC1630*; Yaté, Pic du Grand Kaori, 280 m, wet forest, 16 October 2013, *Coulerie COU196* (hb. Thouvenot); Yaté, near Goro mine, 200-310 m, 31 March 2016, *Metoyer MET122* (hb. Thouvenot).

The genus *Heteroscyphus* is distinguished from *Chiloscyphus* by the tiny androecial spikes on short ventro-lateral branches (vs. intercalary on leading stems in *Chiloscyphus*), the usually distinct trigones and the underleaves connate on both sides with lateral leaves (free in *Chiloscyphus*). We examined the isotype of *Chiloscyphus confertus* in PC and can confirm the presence of the androecia on short ventro-lateral branches, justifying its transfer to *Heteroscyphus*. The recent samples from New Caledonia possess tiny ventro-lateral androecia, large trigones and widely connate underleaves. The underleaves are bifid with dentate margins and triangular lobes separated by a V-shaped sinus, the leaves are widely rounded with entire margins, and the leaf apex is shallowly and asymmetrically bifid with rounded antical tips and acute postical ones.

***Heteroscyphus rotundiphyllus* (H.A.Mill.) Thouvenot, comb. nov.**

≡ *Chiloscyphus rotundifolius* Steph., *Sp. Hepat.* 6: 313, 1922, nom. illeg. ≡ *Chiloscyphus rotundiphyllus* H.A.Mill., *Phytologia* 47: 321. 1981. Type: New Caledonia, "env. Nouméa", *L. Le Rat* s.n. (isotype, PC 0167665!).

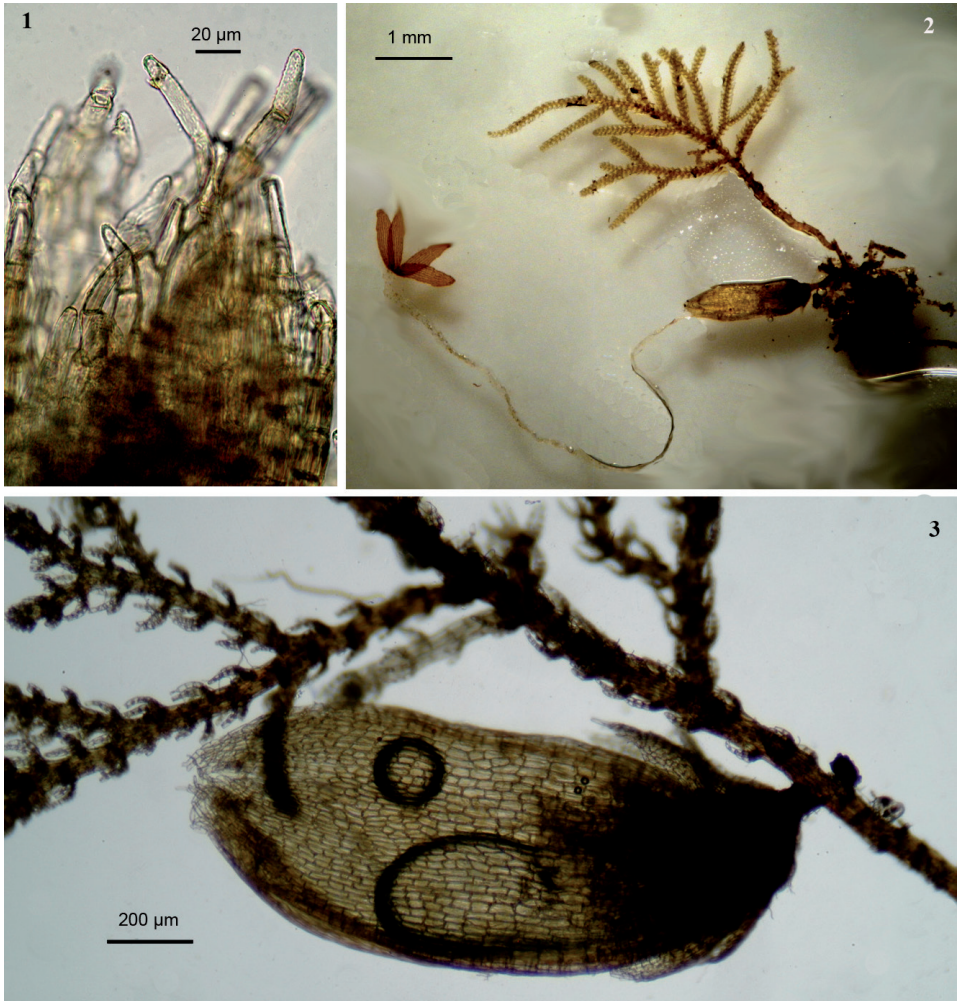
Further specimens examined: Province Sud: Païta, Mt Humboldt massif, 1205 m, 166°23'53"E; 21°53'03"S, 30 September 2008, *Thouvenot NC1832*; Mt Mou summit, 1219 m, 17 September 2016, *Thouvenot NC1971*.

Studies on two recent specimens of *Chiloscyphus rotundiphyllus* showed the presence of tiny androecial spikes on short ventro-lateral branches, large trigones and widely connate underleaves, as characteristic of *Heteroscyphus* (see above). We therefore transfer the species to *Heteroscyphus*. The leaves in this species are rounded, bifid and with entire or slightly toothed margins, and the underleaves are widely reniform and shortly toothed.

***Kurzia caduciloba* R.M.Schust.****Figs 1-3**

Province Sud: Païta, Dzumac massif, mountain shrubland with *Dracophyllum* sp., 1075 m, 166°27'04"E, 22°02'48"S, 18 September 2008, *Thouvenot NC159*; Mt Humboldt massif, path on the ridge to the hut, 1255 m, on the ground in cloud forest, 166°24'16"E, 21°52'57"S, 1 October 2008, *Thouvenot NC1782*; Yaté, Rivière Bleue Provincial Park, Pourina path, 480 m, 166°37'30"E, 22°04'21"S, 20 September 2016, *Thouvenot 2004*; Dumbéa, Montagne des Sources, creek bank in swampy sedge meadow, 810 m, 166°35'58"E, 22°07'07"S, 16 September 2016, *Thouvenot NC2096*.

The genus *Kurzia* has been little studied in New Caledonia (e.g., Grolle, 1964; Schuster, 2000; Cooper *et al.*, 2011). Four species, *K. abbreviata* Mizut., *K. brevicalycina* (Steph.) Grolle, *K. caduciloba* R.M.Schust. and *K. gonyotricha* (Sande Lac.) Grolle, have been reported from the territory (Cooper *et al.*, 2011; Thouvenot *et al.*, 2011). Among these, *K. caduciloba* is the rarest species that has



Figs 1-3. *Kurzia caduciloba* R.M.Schust. 1. Perianth mouth cilia. 2. Habit. 3. Portion of plant with perianth. From *Thouvenot NC1782*.

only been known from the type from New Caledonia. Characteristic features of the species are the (2-)4-lobed leaves with a patent lamina and erect and very fragile lobes that are often broken, and the rigid stems with a 1-layered cortex of 12 cells with strongly thickened walls (see figures in Schuster, 2000). In other respects the species is similar to *K. fragilifolia* R.M.Schust.

Among the *Kurzia* samples collected in New Caledonia by the first author, four specimens matched *K. caduciloba* well even though the leaf-lobes were not always caducous and the thickening of the cortical cells was rather variable. A fertile specimen allows us to describe gynoeceum for the first time (Figs 1-3). A full description based on the specimen *Thouvenot NC1782* (mixed with five species of Lepidoziaceae: *Neolepidozia aubertii* (Ast) E.D.Cooper, *Psiloclada clandestina* subsp. *melanesica* R.M.Schust., *Bazzania* cf. *subserrifolia* (Beauverd) H.A.Mill., *Bazzania bernieri* (Steph.) Inoue & H.A.Mill. and *Zoopsidella caledonica* (Steph.) R.M.Schust.) is given here:

Plants brownish, small, to 6 mm long, forming a dense tiny mat, dendroid with more or less creeping primary stems giving rise to erect secondary stems, being naked at base and becoming progressively leaved and branched upward; rhizoids scarce, limited to the margins and lobes of underleaves on primary stems. Stem (80-)90(-100)  $\mu\text{m}$  thick, with 12 thick-walled, brownish cortical cells in one layer surrounding 7-14 thin-walled, colourless to pale brownish medullary cells. Leaves (3-)4-lobed, lobes unbroken (*Thouvenot NC1782*) to commonly broken (*i.e.*, *Thouvenot NC159*), leaf cells evenly thick-walled, without trigones, smooth to papillose, strongly so in upper part of the lobes, stem leaves quadrate, 125  $\mu\text{m}$ , leaf lamina patent, 1-1.2 cells high, (6-)8 cells wide, cells 12-18  $\times$  10-12  $\mu\text{m}$ , lobes lanceolate-subulate, 5-6 cells long when well-developed, mostly uniseriate, at the base 1-2(-3) cells wide, apex rounded; branch leaves imbricate, 3-lobed, otherwise similar to stem leaves. Stem underleaves erect, quadrate to transversally rectangular, 100-150  $\mu\text{m}$  long, 90-100  $\mu\text{m}$  wide, otherwise similar to the leaves when fully developed.

Dioicous (?). Gynoeceia terminal on short branches with 0-3 reduced vegetative leaves; bracts 0.45-0.5 mm long, bilobed, lobes unevenly dentate, a few teeth shortly filiform, 2-celled; perianth *ca* 1.4 mm long and 0.55 mm wide, oblong, basally and apically rounded, hardly plicate at mouth, mouth unevenly ciliate-dentate, cilia 1-3 cells long, smooth to slightly rough, without apical protuberances. Androeceia and sporophytes not seen.

*Kurzia caduciloba* is rather similar to *K. abietinella* (Herzog) Grolle and *K. borneensis* Mizut. from Borneo (Mizutani, 1974). It differs from *K. abietinella* by the squarrose and narrower leaf lobes and the smaller perianth with a toothed-ciliate mouth, and from *K. borneensis* Mizut. by the shorter cilia of the perianth mouth, without protuberances. Furthermore, *K. abbreviata* differs from *K. caduciloba* by rounded leaf cells, *K. gonyotricha* by acute leaf lobes and smaller, trifid underleaves, and *K. brevicalycina* by trifid leaves and a narrower, fusiform perianth.

**\**Riccardia albomarginata* (Steph.) Schiffn.**

Province Sud: Mont Humboldt, along the hiking trail from the mountain hut to the summit, epiphytic, *ca.* 1600 m, 166°25'E, 21°53'S, 31 August 2003, *F. Müller NC776*.

The species belongs to subgenus *Hyaloneura* Schust. The taxonomy of this subgenus was treated by Furuki (1995). *Riccardia albomarginata* is related to *R. canaliculata* (Nees) Kuntze, a species reported from New Caledonia by Hürlimann (1976), but is distinguished from the latter mainly by autoicy. In the newly collected New Caledonian specimen only female plants were observed; it is therefore here assigned to *R. albomarginata*, but it differs in thallus cross section from the



description and illustration in Furuki (1995) by the inner cells being distinctly larger than the epidermal cells. As pointed out by T. Furuki (in litt.) two phases exist in *R. albomarginata*, the typical more robust phase agreeing with the holotype and another phase with smaller and narrower thalli being similar to *R. canaliculata* except in sexual condition. The New Caledonian material belongs to the phase with smaller and narrower thalli. A molecular study may solve the taxonomic status of *R. albomarginata*.

*Riccardia albomarginata* was hitherto only known from Malesia (Java, Borneo, the Philippines, Ambon, New Guinea) (Furuki, 1995).

**\**Riccardia colensoi* (Steph.) W.Martin**

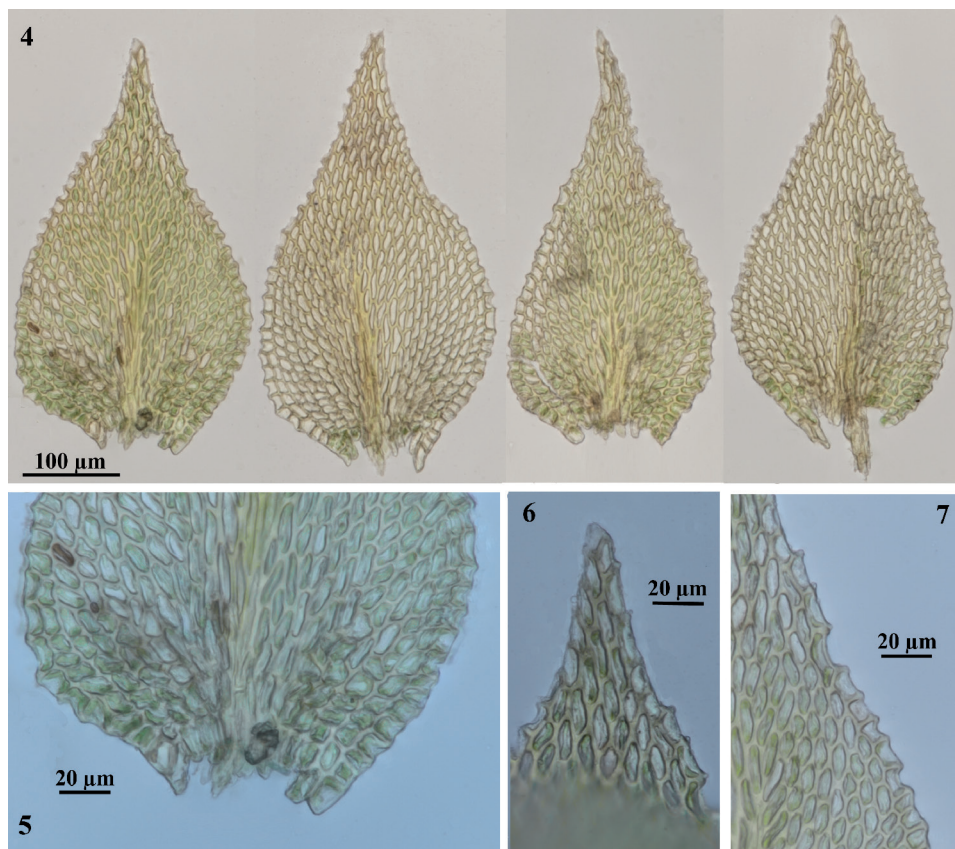
Province Sud: Sarraméa, along the trail towards Dogny plateau, on rocks in dripping water in a steep creek, mountain wet forest, 889 m, 26 September 2016, *Thouvenot NC2125*.

This species is easily identified by the thallus surface with numerous acute papillae due to the highly thickened outer walls of the epidermal cells. This discovery in New Caledonia complements its Australasian distribution (Brown & Braggins, 1989).

***Spruceanthus thozetianus* (Gottsche & F.Muell.) B.Thiers & Gradst.**

Province Sud, Yaté: «Sur l'écorce d'un arbre en forêt méso-hygrophile, plaine de la Rivière Bleue, après sa sortie des montagnes, 170 m, 13 June 1951», *H. Hürlimann 2670*, c. andr., c. gyn. mat., as *Spruceanthus sulcatus* (GOET!, PC!); *ibid.*, «Pendant d'un arbre ou étalé horizontalement», *H. Hürlimann 2679*, c. gyn. immat., as *Spruceanthus sulcatus* (GOET!, PC!). Province Nord, Pouembout, Pindaï peninsula, «sentier des sapins, sur une pierre dans le lit d'un creek, forêt sèche», 50 m, 16 December 2015, *B. Metoyer MET098*, c. andr. (PC!).

*Spruceanthus thozetianus* was recently recorded as new to New Caledonia by Müller *et al.* (2016) based on a single collection from Province Nord. We report here two new localities of the species in New Caledonia, one from humid forest of Rivière Bleue Park (Prov. Sud) and the other from relict dry forest of the Pindaï peninsula (Prov. Nord). The material from Yaté was previously published as *Spruceanthus sulcatus* (Nees) Gradst. (Hürlimann, 1991), a rare species from western Malesia (Java, Sumatra, Borneo). The latter species clearly differs from *S. thozetianus* by autoicy (*S. thozetianus* is dioicous), narrower, 6-8 cells broad ventral merophytes (at least 12 cells wide in *S. thozetianus*), undivided female bracteoles and very short female bract lobules (female bracteole bifid and female bract lobules strongly elongate in *S. thozetianus*) and 10-keeled perianths with a sulcate apex (7-8-keeled with a truncate apex in *S. thozetianus*). Unusual features in the material from Yaté were the mostly epistatic male bracts (one hypostatic bract was observed) and its pendent growth, with leafy shoots freely hanging down the tree from a shortly creeping base. By its growth form, the plants somewhat resembled *Ptychanthus striatus* (Lehm. & Lindenb.) Nees but the latter species is readily separated from *Spruceanthus* by *Frullania*-type branches and cordate trigones. Pendent growth is rare in *Spruceanthus* and male bracts in this genus are normally hypostatic. Possibly, the mostly epistatic nature of the male bracts was due to the fact that leaves and bracts in the pendent plants were very laxly imbricate.



Figs 4-7. *Austinia tenuinervis* Müll.Hal. 4. Leaves. 5. Basal part of leaf. 6. Leaf apex. 7. Median laminal cells. From F. Müller NC781.

## BRYOPHYTA

### \**Austinia tenuinervis* Müll.Hal.

**Figs 4-7**

Province Nord: Poya 14 km NE, Grottes d'Adio, limestone massif, on limestone rocks, ca. 200 m, 165°15'E, 21°15'S, 6 September 2003, F. Müller NC781.

The first record of a member of the family Myriniaceae for New Caledonia. The species is mainly distributed in the Neotropics, but it is also reported from the Old World. As pointed out by Buck & Crum (1978) the Palaeotropical material differs only in small quantitative differences in the sporophyte and is separated therefore at varietal rank as var. *micholitzii* (Broth. ex Dix.) W.R.Buck & H.Crum from the Neotropical var. *tenuinervis*. Unfortunately, the New Caledonian material is only in sterile condition and therefore sporophytic characters cannot be used for separation, but from a phytogeographical point of view it will more likely represent var. *micholitzii*. This variety is known from Borneo (Buck & Crum, 1978), Mindanao (Tan & Iwatsuki, 1991) and Thailand (Printarakul *et al.*, 2013).

\**Chionoloma crassicoatum* (D.H.Norris & T.J.Kop.) M.Alonso, M.J.Cano & J.A.Jiménez (det. M. Alonso Garcia)

Province Sud: Parc Provincial de la Rivière Bleue, along Rivière Bleue at the hiking trail Grand Kaori, rainforest, on earthy slopes along the trail, *ca.* 160 m, 4 September 2001, *F. Müller NC367*; Mont Humboldt, ascent from the south up to the mountain shelter below the summit, rainforest, on the forest floor, *ca.* 900 m, 166°24'E, 21°54'S, 30 August 2003, *F. Müller NC753*.

Sollman (2000, 2005) considered *Oxystegus crassicoatus* D.H.Norris & T.J.Kop. and *Trichostomum dubium* Thér. as synonyms of *Chionoloma bombayense* (Müll.Hal.) P.Sollman. Alonso *et al.* (2016) included many *Chionoloma* species in their morphological and molecular studies, with the result that these two species can easily be differentiated from *C. bombayense* and should be considered as separate species. Alonso *et al.* (2016) included the abovementioned specimens collected by F. Müller in New Caledonia. Because in Alonso *et al.* (2016) the record data are not given in detail they are mentioned here.

*Chionoloma dubium* (Thér.) M.Alonso, M.J.Cano & J.A.Jiménez (det. M. Alonso Garcia)

Province Sud: Païta, Mount Mou, along the hiking trail from the sanatorium via Poudio to the summit, epiphytic in montane rainforest, *ca.* 1150 m, 10 September 2001, *F. Müller NC383*; Mt Ouin, on rotten wood in mossy forest, *ca.* 900-1100 m, 166°28'E, 22°01'S, 1 September 2003, *F. Müller NC754*.

The specimens were previously determined as *Pseudosymblepharis angustata* (Mitt.) Hilp., but in the course of a morphological and molecular revision the material was revised as the abovementioned species (Alonso *et al.*, 2016). The record data of the specimens are given here in detail. The type of *Trichostomum dubium*, basionym of *Chionoloma dubium*, is from New Caledonia (Alonso *et al.*, 2016). Then it was reduced in synonymy to *Pseudosymblepharis angustata*, so that the species was mentioned by Thouvenot & Bardat (2010) under the latter name (see below).

\**Diphyscium longifolium* Griff.

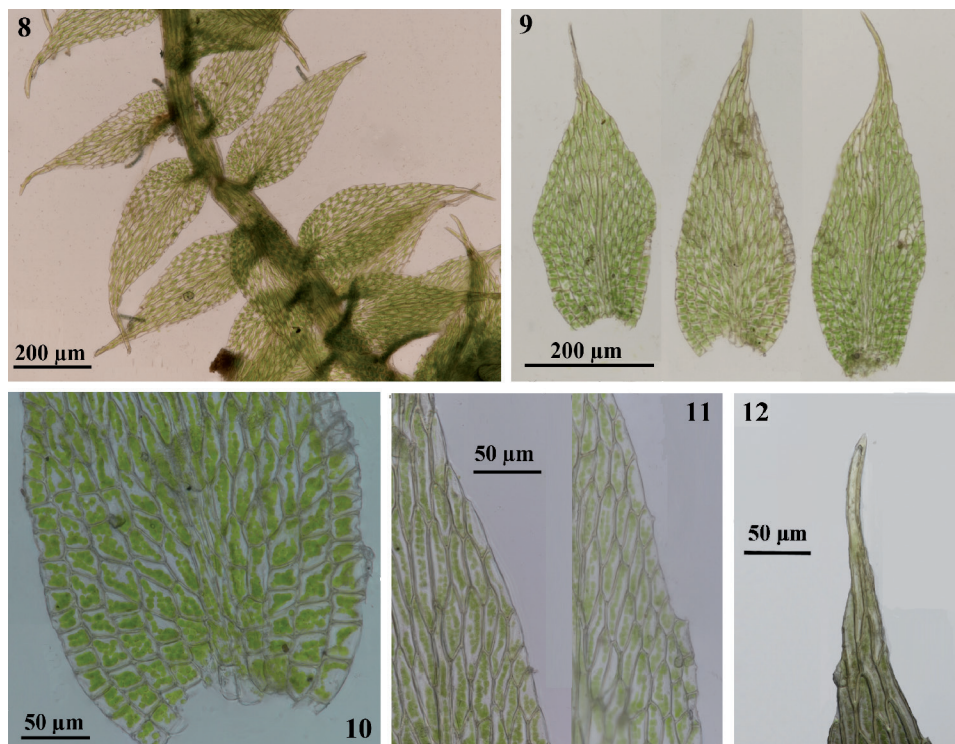
Province Nord: Touho, Massif des Lèvres, Tipiléi upper valley, on shadowed rocks near waterfall, 315 m, 12 October 2012, *L. Thouvenot NC2131*.

In New Caledonia, the only valid *Diphyscium* species hitherto reported is *D. mucronifolium* Mitt. (as *D. auriculatum* Besch.) (Thouvenot & Bardat, 2010). *D. longifolium* differs from the former in having dentate upper leaf margins and inner perichaetial leaves with entire apex at the awn base. Furthermore, the leaves of the specimen have conspicuous borders of thicker marginal cells, a character of *D. submarginatum* Mitt., synonym of *D. longifolium*. The median vegetative and outer perichaetial leaves are long ligulate, mucronate to long aristate. The inner perichaetial leaf apex is decurrent along the arista, not lacerate. Interestingly, *D. mucronifolium* was also present in the same locality (Thouvenot *NC1220*). *D. longifolium* has a wide tropical distribution and is known in Melanesia from Fiji and Papua New Guinea (Magombo, 2003).

\**Ectropothecium dealbatum* (Reinw. & Hornsch.) A. Jaeger (det. B.C. Tan)

Province Sud: Nouméa, Tina, on roots in dry forest, 25 m, 0653566E, 7540376N, 24 September 2012, *Thouvenot NC1464*.

This species can be separated from other species of *Ectropothecium* recorded from New Caledonia by the straight leaves with a short and double costa and the smooth laminal cells. The taxonomy of New Caledonian *Ectropothecium*



Figs 8-12. *Fabronia australis* Hook. **8.** Portion of branch. **9.** Leaves. **10.** Basal part of leaf. **11.** Leaf margin at mid-leaf. **12.** Leaf apex. From *F. Müller NC779*.

remains unclear, as several names recorded from the territory have not been included in any revision (Higuchi & Iwatzuki, 1994).

**\**Fabronia australis* Hook.**

**Figs 8-12**

Province Nord: Poya 14 km NE, Grottes d'Adio, limestone massif, on limestone rocks, ca. 200 m, 165°15'E, 21°15'S, 6 September 2003, *F. Müller NC779*.

The first record of a *Fabronia* and the family Fabroniaceae for New Caledonia. Unfortunately, the material is only in sterile condition. Therefore, the specimen can be herewith only tentatively attributed to *F. australis*. The Australian species of *Fabronia* were dealt by Gilmore (2012), the New Zealand species by Fife (2014), and the species of New Guinea by Norris & Koponen (1991). Meagher (2006) provided a detailed description and good illustrations of *F. australis*. The SE Asian species of the genus are in need of a critical taxonomic revision. In the New Caledonian material the leaves are nearly entire or have only rarely single 1-celled teeth at the margin (Fig. 11). Populations of *F. australis* with entire or nearly entire leaf margins are also reported from Australia (Gilmore, 2012; Meagher, 2006) and from New Zealand (Fife, 2014) where they are predominant on the North Island. The leaf length of the New Caledonian material is 0.6-0.8 mm and is therefore in the lower limit characterized by Gilmore (2012) for the Australian material ([0.56-] 0.65-1.35 mm) and more or less in the limit of the New Zealand specimens (0.45-0.7 mm) (Fife 2014). From the other Australian *Fabronia* species with nearly entire leaf

margins (*Fabronia scottiae* Müll.Hal. and *F. brachyphylla* Müll.Hal.) the New Caledonian material differs by ovate-lanceolate to lanceolate leaves, longer mid-leaf cells ([42-]48-78  $\mu\text{m}$ ), the presence of a long hairpoint (Fig. 12), and more elongated instead of subquadrate cells along the leaf margin in mid-leaf. *Fabronia curvirostris* Dozy & Molk., an Asian species reported from Papua New Guinea by Norris & Koponen (1991), differs from *F. australis* in having inconspicuously prorate leaf cells, papillae on apical cells and at least some teeth cells. At the New Caledonian site *F. australis* was growing together with *Erpodium biseriatum* (Austin) Austin.

***Radulina borbonica* (Bél.) W.R.Buck**

= *Trichosteleum insigne* Broth. & Paris, *Öfv. Finska Vetensk.-Soc. Förh* 51A(17): 30. 1909, **syn. nov.** Type: New Caledonia, Col d'Amieu, February 1907, *Le Rat s.n.* (isosyntype, PC0128234!).

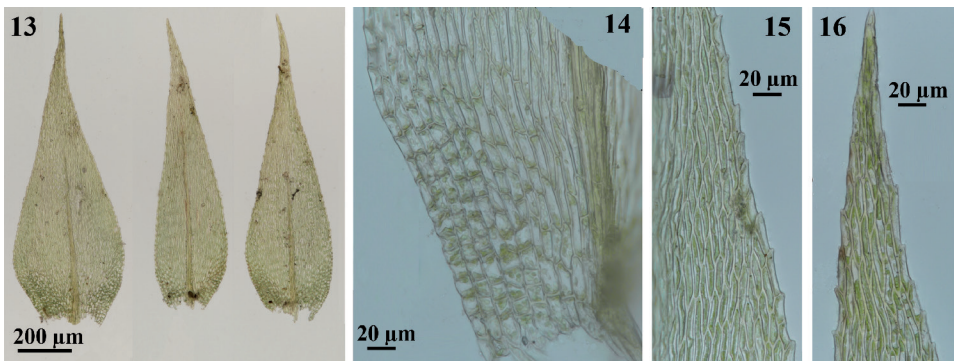
In his revision of the genus *Radulina*, O'Shea (2006) placed three *Trichosteleum* species from New Caledonia, *T. neo-caledonicum* Thér., *T. subinistratum* (Besch.) A.Jaeger and *T. subrhizophyllum* (Müll.Hal.) A.Jaeger, in the synonymy of *R. borbonica*. Study of the types of New Caledonian *Trichosteleum* species in PC showed that one further species, *T. insigne*, is conspecific with *R. borbonica*. Characteristic features of the species are the narrow and strongly falcate-secund branch leaves and the linear leaf cells with several seriate papillae being usually conspicuous and prominent on both faces of the leaves. In *Trichosteleum*, on the other hand, the leaves are straight and the leaf cells are unipapillose.

**\**Schwetschkea pygmaea* (Dozy & Molk.) Müll.Hal.**

**Figs 13-16**

Province Nord: Poya 15 km NE, Roche d'Adio, limestone massif, on limestone rock face, ca 200-250 m, 165°15'E, 21°14'S, 6 September 2003, *F. Müller NC778*.

The first record of a member of the family Leskeaceae for New Caledonia. The species was originally described from Borneo and is known furthermore from Java and Norfolk Island (Fleischer, 1915; Streimann, 2002). Good descriptions and illustrations are provided by Fleischer (1915) and Streimann (2002). Like the material from Norfolk Island, the material from New Caledonia is only in sterile condition, but it matches well the descriptions and illustrations given in the above cited references.



Figs 13-16. *Schwetschkea pygmaea* (Dozy *et* Molk.) Müll.Hal. **13.** Leaves. **14.** Basal part of leaf. **15.** Leaf margin at mid-leaf. **16.** Leaf apex. From *F. Müller NC778*.

***Trichosteleum stigmatum* Mitt.**

= *Trichosteleum piliferum* Broth. & Paris, *Öfv. Finska vetensk.-soc. förh.* 53A(11): 41. 1911, **syn. nov.** Type: New Caledonia, «entre Tao et Hienghène», October 1910, *Le Rat s.n.* (isotype, PC018251!).

Further specimens examined: *Trichosteleum stigmatum*, Province Sud, Port Boisé, path along the coast from Gite Kaa Nua to Rivière du Trou Bleu, lowland rain forest, on rotten wood, 10 m, 166°58'E, 22°21'S, 8 September 2001, *F. Müller NC81* (DR).

Tan *et al.* (2007) documented the synonymy of *Trichosteleum piliferum* Bartr. *nom. illeg.* from New Guinea with *T. stigmatum*, but they did not refer to *T. piliferum* Broth. & Paris from New Caledonia. Study of an isotype of the latter species kept at PC showed that the plant fits the characters of *T. stigmatum* as described by Tan *et al.* (2007) and represents a strongly papillose phenotype of the latter, confirmed by the voucher of the first reported *T. stigmatum* from the territory in Müller & Tan (2013). The leaves in the New Caledonian plants are strongly falcate-secund, with dentate apical margins and perichaetial leaves only denticulate.

**\**Trichosteleum subfalcatulum* (Broth. & Watts) B.C. Tan *et al.* (det. B.C. Tan)**

Province Sud: Dzumac massif, 1070 m, mountain shrubland, 166°27'10"E, 22°02'48"S, 18 September 2008, *Thouvenot NC1459, 1596-1598* (PC0735801).

The specimen is identical to the isosyntype of *Rhaphidostegium subfalcatulum* (basionym of *Trichosteleum subfalcatulum*) from Lord Howe Island kept at PC (Intermediate Hill, 10 July 1911, *W.W. Watts 135*, PC0128263!) in all respects, except for its thickened and porose angular cells, a feature unusual in the genus *Trichosteleum*. The specimen could be a phenotype from ultramafic soil, which is common in New Caledonia and is inhabited by a very particular flora (Isnard *et al.*, 2016).

***Trichostomum noumeanum* (Thér.) Thouvenot, **comb. nov.****

≡ *Hymenostomum noumeanum* Thér., *Bull. Acad. Intern. Géogr. Bot.* 20: 98. 1910. Type: New Caledonia, "env. Nouméa, 80 m, terre humide", October 1909, *Franc s.n.* (holotype, PC0697590!).

Following Zander (1993), species with plane leaf margins attributed to *Weissia* and *Hymenostomum* belong to the genus *Trichostomum*. We studied the holotype of *H. noumeanum* and found that the leaf margins in this species are plane. We therefore transfer *H. noumeanum* to *Trichostomum*. Further features of the species justifying the transfer are the ± plane outer walls of the leaf cells and the perichaetial leaves similar to the vegetative ones. In *Weissia* and *Hymenostomum* the leaf cells are bulging and the perichaetial leaves are enlarged.

As *Trichostomum noumeanum* is a very little-known species that is only known from the type from New Caledonia, a brief description (based on the type) is given here:

Stems short, 2 mm long, with leaves erecto-patent, 3 mm long, 150-170 µm wide, central strand present, cortex hardly distinct with 1(-2) rank of thin walled cells coloured and smaller than the medullar ones. Leaves oblong-lanceolate, obtuse and mucronate to shortly aristate, 1-1.45 mm long, 0.18-0.35 mm wide; costa strong, 50 µm wide at base (1/5 × leaf width), excurrent part to 75 µm long, costa in cross section semi-circular, dorsally strongly prominent and more or less papillose, without dorsal epidermis, with 2-4 guide cells and with a large dorsal stereid band and a smaller ventral band; leaf base hyaline, abruptly becoming very obscure in the median and upper part, margins plane, papillose-crenulate. Median and upper leaf cells isodiametric, 8(-10) µm wide, densely and finely papillose, papillae simple,

external walls equally plane or slightly convex on both faces, basal leaf cells rectangular, hyaline, smooth, firm-walled except the lax inner ones. Seta 1.7 mm long. Operculum rostrate, 0.5 mm long.

## EXCLUDED NAMES

*Bazzania falcifolia* (Steph.) H.A.Mill.

The New Caledonian record of *B. falcifolia*, a species from Samoa, was erroneously based on the specimen recorded by Paris (1906) as “*Mastigobryum falcifolium* Steph.”, which is a synonym of *Bazzania bernieri*. See above under *B. bernieri*.

*Mastigobryum pancheri* Gottsche *ex* Paris, nom. inval.

This name, reported from New Caledonia without diagnosis (Paris, 1910), was listed as a doubtful name by Thouvenot *et al.* (2011). We checked the specimen kept in the E.G. Paris herbarium at REN and found that it contains *Mastigolejeunea pancheri* Gottsche *ex* Steph. Apparently, the name “*Mastigobryum pancheri*” was an error for *Mastigolejeunea pancheri*.

*Pseudosymblepharis angustata* (Mitt.) Hilp.

The presence of this species in New Caledonia is based on its synonymy with *Trichostomum dubium* which is now *Chionoloma dubium* (see above). This name must be removed from the New Caledonian checklist.

*Spruceanthus sulcatus* (Nees) Gradst.

The New Caledonian records of this species (Hürlimann, 1991) belong to *S. thozetianus* (see above). Therefore, this name must be removed from the New Caledonia flora.

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