Pichonia munzingeri (Sapotaceae), a new and rare micro-endemic species from New Caledonia

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Source: Candollea, 74(1) : 1-7

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

URL: https://doi.org/10.15553/c2019v741a1

Pichonia munzingeri (Sapotaceae), a new and rare micro-endemic species from New Caledonia

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Abstract

GÂTEBLÉ, G. & U. SWENSON (2019). Pichonia munzingeri (Sapotaceae), a new and rare micro-endemic species from New Caledonia. In English, English and French abstracts. *Candollea* 74: 1–7. DOI: http://dx.doi.org/10.15553/c2019v741a1

Pichonia munzingeri Gâteblé & Swenson (*Sapotaceae, Chrysophylloideae*) is here described from the southern ultramafic massif of Grande Terre, New Caledonia. It is a micro-endemic species confined to a small area along Oumbéa Creek in La Coulée Valley of Mont-Dore. Based on nuclear ribosomal sequence data, areolate higher leaf venation, staminodes, stamens in corolla tube orifice, and seeds having plano-convex cotyledons, no endosperm, and no radicle, this new species is placed in *Pichonia* Pierre. Preliminary phylogenetic analysis places *Pichonia munzingeri* as the sister species to all other congeners in New Caledonia, which justifies a high conservation status from the authorities for protecting the species. Less than 50 individuals have been counted in an area affected by the major "Montagne des Sources" anthropogenic fire in late 2005. Hence, repeated fires form the main threat to the existence of this new species, and it is assigned an IUCN Red List preliminary status as "Critically Endangered".

Résumé

GÂTEBLÉ, G. & U. SWENSON (2019). Pichonia munzingeri (Sapotaceae), une nouvelle espèce rare et micro-endémique de Nouvelle Calédonie. En anglais, résumés anglais et français. *Candollea* 74: 1–7. DOI: http://dx.doi.org/10.15553/c2019v741a1

Une nouvelle espèce, *Pichonia munzingeri* Gâteblé & Swenson (*Sapotaceae, Chrysophylloideae*), est décrite du grand massif ultramafique du sud de la Grande Terre, en Nouvelle-Calédonie. Il s'agit d'une espèce micro-endémique confinée à une petite zone le long de la Oumbéa, un affluent de la rivière La Coulée au Mont-Dore. Les données de séquences ribosomiques nucléaires, la nervation marginale aréolée de la feuille, les staminodes et étamines insérés à la base de la partie libre des lobes de la corolle, les graines à cotylédons plans-convexes sans albumen et sans radicule permettent un placement de la nouvelle espèce dans le genre *Pichonia* Pierre. Une étude phylogénétique préliminaire place *Pichonia munzingeri* en tant qu'espèce sœur de tous les *Pichonia* de Nouvelle-Calédonie ce qui tend à justifier de lui donner un statut de conservation particulier et des mesures spécifiques de protection. Moins d'une cinquantaine d'individus ont été recensés dans une zone qui a été largement impactée par l'incendie majeur d'origine humaine de la "Montagne des Sources" de la fin de l'année 2005. Les feux répétés sont donc la menace principale pesant sur la survie de cette nouvelle espèce; le statut «En danger Critique» de la liste rouge de l'UICN lui est provisoirement attribué.

Keywords

SAPOTACEAE – *CHRYSOPHYLLOIDEAE* – *Pichonia* – New Caledonia – Conservation – New species

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Submitted on September 21, 2018. Accepted on January 24, 2019. First published online on March 28, 2019.

ISSN: 0373-2967 – Online ISSN: 2235-3658 – *Candollea* 74(1): 1–7 (2019)

Introduction

New Caledonia with the main island Grande Terre is a rather large oceanic archipelago in the south-west Pacific covering a land surface of 18,575 km^2 with a plant endemism of 74.4% (Bonvallot, 2012; Jaffré et al., 2012) for 3389 vascular plant species. The richest plant families in the archipelago are *Myrtaceae* (257 species), *Orchidaceae* (237 species), *Rubiaceae* (232 species), *Phyllanthaceae* (120 species), *Apocynaceae* (112 species) and *Sapotaceae* (112 species) (Morat et al., 2012). Since then, a number of new species have been described in *Sapotaceae* which becomes the fourth largest plant family in New Caledonia with 123 species (Munzinger et al., 2016; Gâteblé et al., 2018). *Sapotaceae* is represented by six genera of which *Pycnandra* Benth. is the largest endemic genus in New Caledonia with 59 accepted species (Swenson & Munzinger, 2016). Other genera of *Sapotaceae* are *Planchonella* Pierre (38 species), *Pleioluma* (Baill.) Baehni (17 species), and *Pichonia* Pierre (7 species). Endemism of the family is as high as 98% and new discoveries are usually micro-endemic species restricted to small areas, which is often true for other vascular plants (Gâteblé et al., 2018).

Pichonia is a genus of only 12 species distributed in Maluku Islands, New Guinea, Solomon Islands and New Caledonia (Swenson et al., 2013). The genus was revised for New Caledonia with seven accepted species, all except one are restricted to ultramafic substrates (Swenson & Munzinger, 2012). The odd species is *P. balansana* Pierre that occurs on limestone, and together with *P. dubia* (Pierre ex Guillaumin) Swenson & Munzinger, they are more of forest constituents while the other five are shrubs or small trees usually growing in maquis, a type of rather low vegetation found on ultramafic substrates. Swenson & Munzinger (2012) provided IUCN Red List risk of extinction assessments to all *Pichonia* species which have been revised by the local IUCN Endemia-Red List Authority [10 May 2016]. Analysis of available data has found two species being "Endangered", two being "Vulnerable", and three being listed as "Least Concern" [see http://www.endemia.nc]. Threats against these and many other species in New Caledonia are the previous and ongoing mining activities and anthropogenic fires (Swenson & Munzinger, 2012, 2016; Gâteblé et al., 2018; Swenson et al., 2018).

In June 2016, while going to swim in a water hole of the Oumbéa creek, Mont-Dore in the south of Grande Terre, a small, slender shrub was spotted (Fig. 1). This plant had leaves similar to *Pycnandra francii* (Guillaumin & Dubard) Swenson & Munzinger. However, the higher leaf venation is areolate and flowers have staminodes, two features absent in *Pycnandra*. The flowers are more or less sessile and the stamens are inserted in the corolla tube orifice, characters better matching *Pichonia* rather than *Pleioluma*, another genus with areolate venation and staminodes. Close examination of leaf venation and flower morphology indicated that *Pichonia daenikeri* (Aubrév.) Swenson et al. could be a close relative, a species forming shrubs or small trees, known from the ultramafic mountains along the north-western coast (c. 200 km north of La Coulée for *P. daenikeri*'s southernmost population). Leaves of *P. daenikeri* are oblong to broadly elliptic and up to 11(–15) cm long, which differs from the oblong, usually no longer than 5 cm long leaves on the plant from Mont-Dore. In addition, a preliminary phylogenetic study (U. Swenson, unpubl. data) shows that the species is strongly supported as sister to all other species of *Pichonia* in New Caledonia. We therefore describe this as a new species of *Pichonia*.

Identification key to the species of Pichonia in New Caledonia

1. Flowers or fruit sessile or subsessile 2
1a. Flowers or fruit on a pedicel at least 5 mm long 3
2. Leaves c. 3–5 cm long; petiole 5–7 mm long, canaliculate ..... ***P. munzingeri***
2a. Leaves c. 5–15 cm long; petiole 10–30 mm long, terete ..... ***P. daenikeri***
3. Leaves pubescent, at least on the lower surface 4
3a. Leaves glabrous on both surfaces 5
4. Large tree (>6 m tall); leaves glabrous above; corolla lobes 5–8 ..... ***P. dubia***
4a. Treelet (<5 m tall); young leaves pubescent above; corolla lobes 5 ..... ***P. grandiflora***
5. Flowers borne in umbelliform clusters, often on leafless shoots; limestone substrate ..... ***P. balansana***
5a. Flowers axillary, usually 1–3 in each fascicle; ultramafic (often serpentinite) substrate 6
6. Leaves >8 cm long; petiole >10 mm long; pedicel with bracts; flowers cream ..... ***P. balansae***
6a. Leaves <8 cm long; petiole <8 mm long; pedicel without bracts; flowers usually red with cream corolla lobe margins 7
7. Leaves 2–4 cm long; pedicel 10–16 mm long, thin; staminodes bent inwards ..... ***P. deplanchei***
7a. Leaves 5–8 cm long; pedicel 4–5 mm long, stout; staminodes spreading ..... ***P. lecomtei***

Taxonomy

Pichonia munzingeri Gâteblé & Swenson, **spec. nova** (Fig. 1B, 2–3).

Pichonia munzingeri Gâteblé & Swenson is similar to but differs from P. daenikeri (Aubrév.) Swenson et al. in being a much smaller shrub having small, up to 5 cm long, oblong, almost glabrous leaves; petioles being canaliculate and less than 10 mm long.

Fig. 1. – *Pichonia munzingeri* Gâteblé & Swenson. **A.** Overview of the Montagne des Sources fire on 29 December 2005, the arrow points to the fire in the Oumbéa creek; **B.** Upper population in degraded maquis vegetation showing *Pteridium esculentum* (G. Forst.) Cockayne flammable dead whitish fronds along the pipe to the water catchment, arrows point to ten individuals of *Pichonia munzingeri*.
[Photos: G. Gâteblé]

Holotypus: New Caledonia. Prov. Sud: Mont-Dore, La Coulée, Captage de la Oumbéa, 21°11'19"S 166°34' 22"E, 150 m, 14.III.2018, fl., *Gâteblé & Rochard 1011* (P [P001156237]!; iso-: G [G00341841]!, MO!, MPU!, NOU [NOU089084]!, S [S18-39759]!).

Shrub up to 3–4 m tall, usually erect but sometimes decumbent and even with erect and decumbent branches on the same plant. *Branches* tomentulose when young, ferruginous, soon glabrous. *Leaves* simple, alternate (a few sometimes subopposite), usually oblong but sometimes broadly elliptic to obovate, blade 3.0–5.0 (–7.0) × 1.5–2.5 (–3.0) cm, coriaceous, somewhat conduplicate in its entire length, slightly revolute; young leaves tomentulose, quickly glabrescent on both surfaces, with some scattered, usually short, appressed trichomes remaining below, especially along the midvein, but all eventually vanish; leaf base round; leaf apex obtuse or sometimes retuse; leaf venation brochidodromous with weak submarginal loops, midvein impressed above, prominent below; secondary venation of 8–12 pairs, weak; tertiary venation laxly reticulate, faint; higher venation areolate (high magnification); petiole 5–7(–10) mm long, ferruginously tomentulose, usually glabrescent and canaliculate. *Flower* 5-merous, bisexual, usually axillary and solitary, rarely in fascicle of two, sessile or subsessile, subtended by a minute bract. *Sepals* ovate, 2–3 mm long, base c. 1.5 mm wide, the outers tomentulose on the entire outer surface, the inners with tomentum in the central part, flanked with glabrous surfaces and fimbriate margins, all being glabrous inside. *Corolla* campanulate, yellowish or greenish with paler lobe margins, 4–5 mm long, glabrous; corolla lobes suborbicular or quadrangular in shape, of about the same length as the corolla tube. *Stamens* inserted in the tube orifice, shorter than the corolla lobes; anthers c. 1 mm long. *Staminodes* inserted in the corolla sinus, oblong to lanceolate, entire. *Gynoecium* flask-shaped, c. 5 mm long in total; ovary c. 2 mm long, pubescent; style 2.5–3.0 mm long, glabrous, slightly exserted, simple, without visible stigmatic areas. *Fruit* 1-seeded, ellipsoid, 28 × 14 mm, crowned with 3-mm-long remnant style; seed ellipsoid with a scar 25% of circumference and 100% of the seed length (observed from a single immature seed); cotyledons plano-convex without endosperm and radicle.

Etymology. – This new species is named in honor of our colleague and friend Jérôme Munzinger who has revised, along with numerous authors, many taxa in New Caledonia. Jérôme used the Centre IRD in Nouméa for seven years as his base for numerous fieldworks in the archipelago. His eye for undescribed species has generated too many novelties for a single researcher to handle and that is why he built an extensive collaborator network across the world. In 2011 Jérôme returned to Montpellier (France) where he continues his excellent botanical studies. At the time of writing, he has described 69 endemic species for New Caledonia of which 46 are *Sapotaceae*.

Distribution and Ecology. – *Pichonia munzingeri* is so far only known from the Oumbéa Creek, one of the tributaries of La Coulée River within the Mont-Dore municipality (Fig. 4). It grows in degraded maquis and rainforest remnants, on the lower and wettest parts of the slopes, though it is not a riparian species. It occurs on ultramafic substrate with peridotites rocks. It seems to flower and fruit mainly between March and June. So far, during seven visits between 2016 and 2018, only one fruit has been observed. One possible explanation is habitat destruction and a decline of natural pollinators following the

fire in 2005 (see conservation status below). We suspect that the species is protandrous with pollen release before the style becomes exserted and receptive to pollen in order to prevent self-pollination.

Conservation status. – Even if only preliminary results are available, *Pichonia munzingeri* has a unique phylogenetic position, being the sister species to all congeners in New Caledonia and, hence, the oldest lineage of its kind in the territory. It has been found in only one location with two very small subpopulations on both sides of Oumbéa Creek separated by less than 600 m. The upper subpopulation has some 30 individuals whereas only three have been located in the lower one. In the upper subpopulation, *P. munzingeri* grows along a track to a water catchment area built in 1997 that was expanded in 2001. It is possible that some individuals were removed when the catchment area was established. Oumbéa Creek, Coulée River, and the Montagne des Sources protected area were severely damaged by a deliberately set fire at the end of the 2005 dry season that burned around 43 km² (Fig. 1A). Both subpopulations of *P. munzingeri* must have been badly impacted by this anthropogenic fire because most plants are regrowth from burnt stumps and not juveniles. The lower subpopulation is adjacent to a popular water hole where people enjoy swimming during the hot season and where the vegetation (including the new *Pichonia*) is regularly cut down for setting up camp fires. After the 2005 Montagne des Sources severe fire, the ground has become infested by *Pteridium esculentum* (G. Forst.) Cockayne, a species that is highly flammable in the dry season and well known to facilitate the spread of new fires (Jaffré et al., 1998). Hence, the main threat to *Pichonia munzingeri* is the frequent anthropogenic fires which are likely to further reduce the populations size. The calculated Area of occupancy (AOO) value is only 4 km² (grid of 2 × 2 km) a value also applicable for Extent of Occurrence (EOO). All in all, effective *in situ* conservation appears very important to maintain high genetic diversity and we therefore suggest that *P. munzingeri* is assigned a preliminary status of "Critically Endangered" [CR B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); C2a(i); D] based on the IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. – *Pichonia munzingeri* is particularly similar to *Pycnandra francii* in habit, from which it is distinguished by an areolate venation and the presence of staminodes (see above). The areolate venation is a feature present in all species of *Pichonia* and *Pleioluma* (Baill.) Baehni, but *Pichonia* have stamens inserted in the tube orifice (not in the lower half of the corolla tube) and seeds with plano-convex cotyledons without endosperm (not foliaceous cotyledons with endosperm). Among the congeners, *P. daenikeri* is the most similar but *P. balansae* (Baehni) Swenson & Munzinger is also to some extent similar. The foliage of *P. munzingeri* is much smaller (usually less than 5 cm long) and somewhat conduplicate with canaliculate, shorter petioles (usually no more than 7 mm long) than those of *P. daenikeri* and *P. balansae*. The foliage together with sessile (or subsessile) flowers make *P. munzingeri* a species easy to identify in the field.

Paratypi. – **New Caledonia. Prov. Sud:** Mont-Dore, La Coulée, Captage de la Oumbéa, 21°11'19"S 166°34'22"E, 150 m, 8.V.2017, fl., *Gâteblé 936* (MPU, NOU, P, S); *ibid. loco*, 8.V.2017, fl., *Gâteblé 937* (NOU, P, S); *ibid. loco*, 14.III.2018, fl., *Gâteblé & Rochard 1012* (P); *ibid. loco*, 14.III.2018, fl., *Gâteblé & Rochard 1013* (NOU); *ibid. loco*, 14.III.2018, fl., *Gâteblé & Rochard 1014* (S); *ibid. loc*., 21.V.2018, fr., *Gâteblé 1026* (NOU, P).

Acknowledgements

We are grateful to Jacqueline Tinel and the team at the NOU herbarium (IRD, Nouméa) for mounting, distributing and computerizing the specimens; to Grégoire Flament (P) for providing a barcode; to Laurence Ramon for the fine line illustration; to Guillaume Lannuzel for Fig. 3. The species was first spotted by the first author who went swimming in the water pool with his son Erwann in June 2016. Many thanks to Gabriel Rochard for some photos and field observations, to Emma Do Khak and Hubert Géraux (WWF) and to Christine Pöllabauer (Mocamana) for providing feedback on the 2005 Montagne des Sources fire and to Shankar Meyer (Endemia) for personal communications about the unpublished *Pichonia* IUCN Red List evaluations. We thank the authorities of New Caledonia's Southern Province (DENV) for providing collecting permits (nº 2319–2015/ARR/DENV, nº 2605–2017/ARR/DENV). Martin W. Callmander and Laurent Gautier have provided useful comments on a previous version of the manuscript.

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Fig. 2. – *Pichonia munzingeri* Gâteblé & Swenson. **A.** Overview of a single shrub; **B.** Decumbent shrub with leaves from above, resembling those of *Pycnandra francii* (Guillaumin & Dubard) Swenson & Munzinger; **C–E.** Sessile flower; **F.** Immature fruit. [Photos: **A–D, F:** G. Gâteblé; **E:** G. Rochard]

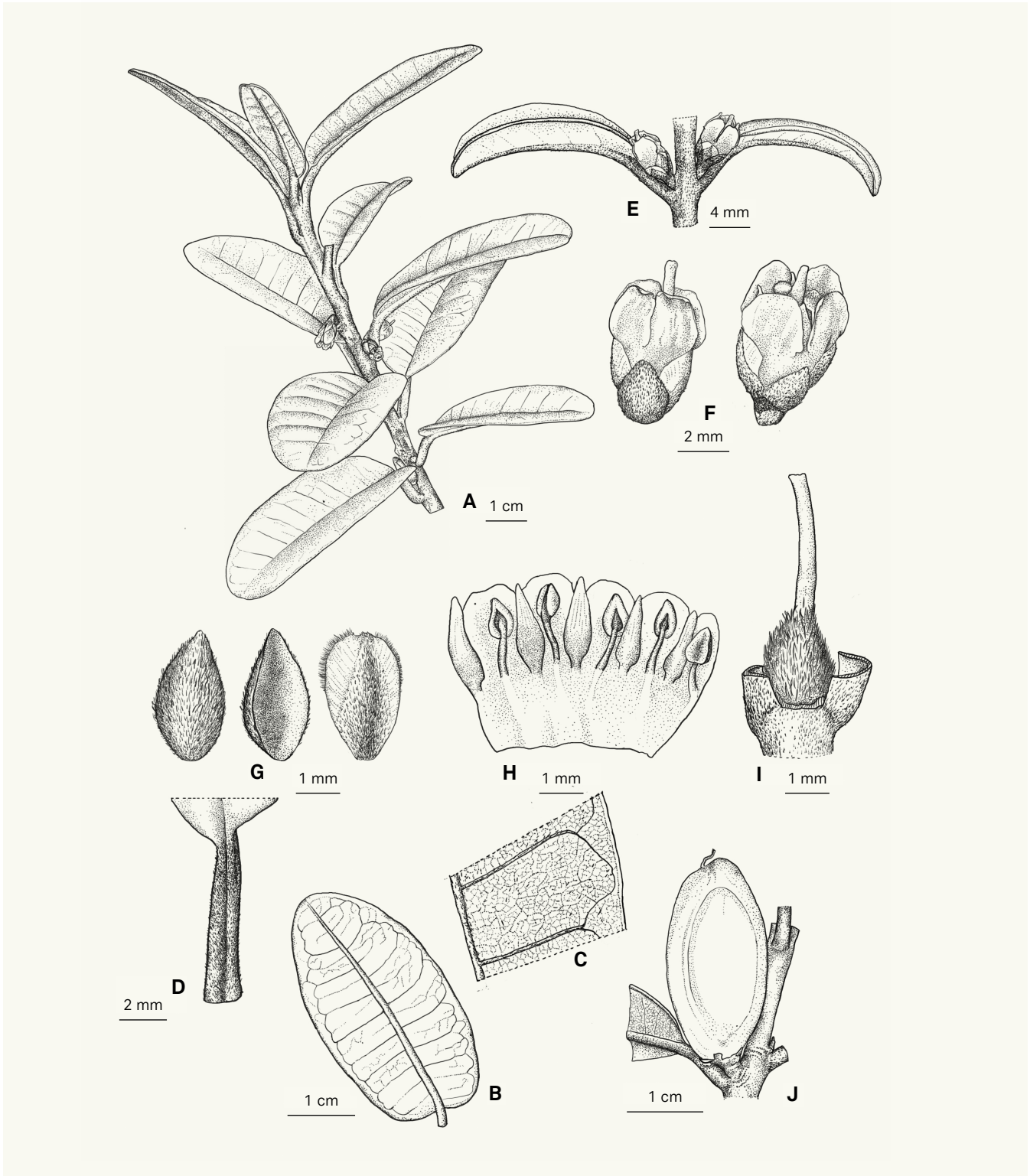

Fig. 3. – *Pichonia munzingeri* Gâteblé & Swenson. **A.** Flowering branch; **B.** Leaf with brochidodromous leaf venation; **C.** Lower surface of leaf showing an areolate higher leaf venation; **D.** Canaliculate petiole; **E.** Axillary solitary flowers; **F.** Flowers; **G.** Sepals, outer surface of an outer sepal (left), inner surface of an outer sepal (middle), and outer surface of an inner sepal (right); **H**. Open corolla with stamens and staminodes; **I.** Flower with sepals and corolla removed; **J.** Transection of fruit.
[**B, J:** *Gâteblé 1026;* **C–I:** *Gâteblé & Rochard 1011*] [Drawing: L. Ramon]

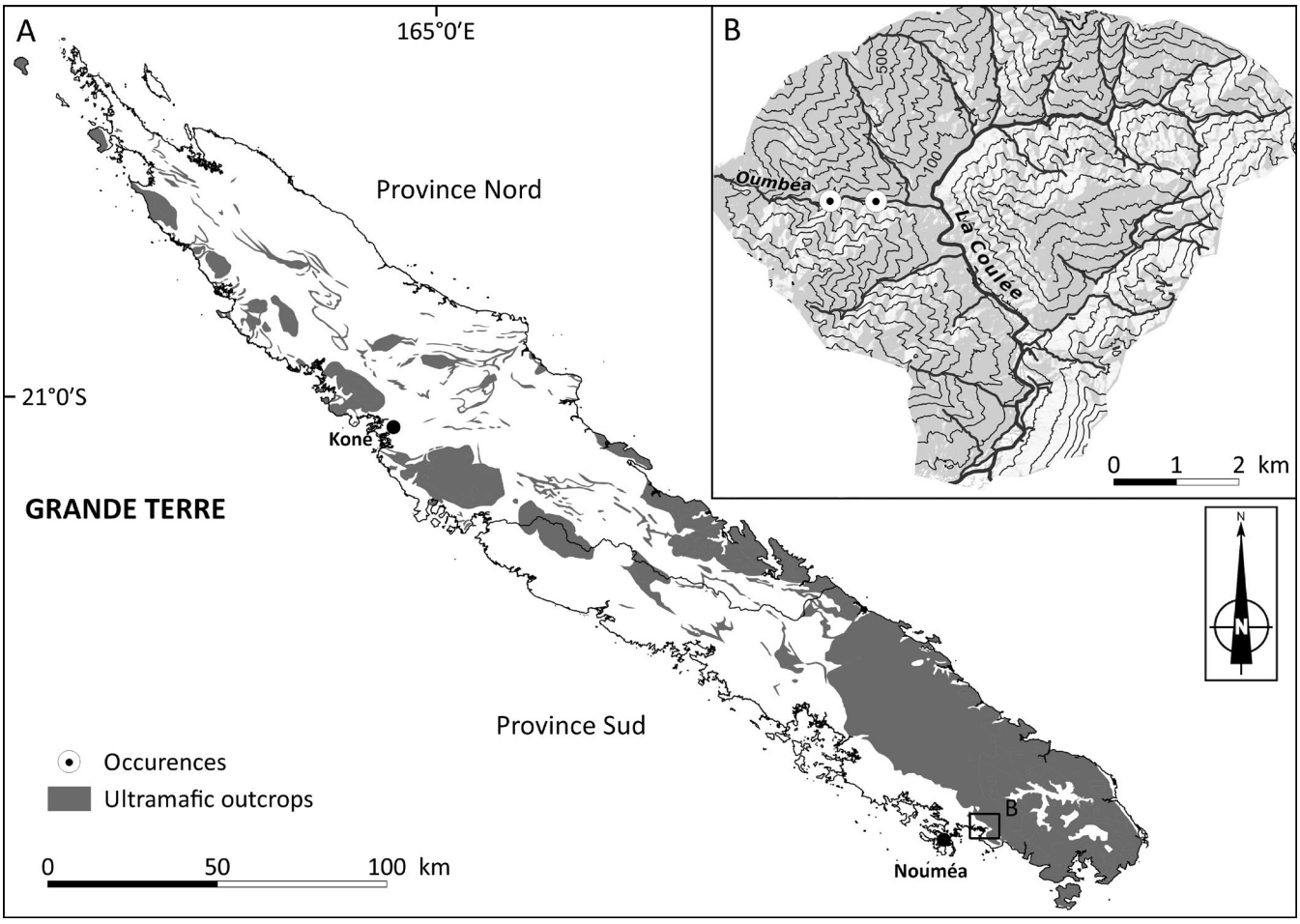

Fig. 4. – Geographic distribution of *Pichonia munzingeri* Gâteblé & Swenson.

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