

## Further new endemic taxa of Cunoniaceae from New Caledonia

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**Summary.** A description, illustration, distribution map and conservation assessment are given for each of three new species of Cunoniaceae from New Caledonia and plants endemic to the same localities from other genera are mentioned. *Cunonia bopopensis* Pillon & H. C. Hopkins is known from forest on ultramafic soils at high elevation on Mt Tchingou. This massif offers ecological conditions markedly different from those of its surroundings, which may explain the occurrence of several micro-endemics on this mountain. Some specimens of *C. bopopensis* were previously identified as *C. bernieri* Guillaumin but the type of the latter is probably a hybrid and this name is now considered doubtful. *Geissois belema* Pillon & H. C. Hopkins is endemic to Ile Art in the Belep archipelago, where it occurs in forest on ultramafic soils; it is the only species of *Geissois* known from Ile Art. *Pancheria xaragwensis* H. C. Hopkins & Pillon is found largely on the little-explored Forgotten Coast (“Côte Oubliée”) of south-eastern Grande Terre, generally in maquis along streams and in river beds at low elevation on ultramafic substrate. Morphological and ecological variation in the widespread taxa *Geissois pruinosa* Brongn. & Gris and *Weinmannia dichotoma* Brongn. & Gris are discussed and the combinations *G. pruinosa* var. *intermedia* (Vieill. ex Pamp.) H. C. Hopkins & Pillon and *W. dichotoma* var. *monticola* (Däniker) H. C. Hopkins & Pillon are published to accommodate some of this variability.

**Key Words.** *Cunonia*, *Geissois*, infraspecific variation, micro-endemic, *Pancheria*, serpentine, ultramafic, *Weinmannia*.

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## Introduction

In this paper we publish names for three new species of Cunoniaceae from New Caledonia and discuss two complex taxa, resulting in the publication of two new varietal names. As recent papers have provided an introduction to the genera concerned (*Cunonia*: Hoogland *et al.* 1997; Pillon *et al.* 2008; *Geissois*: Hopkins 2006, 2008; *Pancheria*: Bradford & Jaffré 2004; Hopkins & Bradford 2009; Hopkins *et al.* 2009; and *Weinmannia*: Bradford 1998; Hopkins & Bradford 1998; Hopkins *et al.* 1998), only a few general remarks are given here.

The protologues of two of the names that are discussed below, *Cunonia bernieri* Guillaumin (Guillaumin 1948a) and *Weinmannia monticola* Däniker (Däniker 1931), indicate that each was based on a single gathering but in neither case did the author specify in print that a particular sheet was the holotype. Following Recommendation 9A.4 of the Code (McNeill *et al.* 2006), we could assume that the holotype of *C. bernieri* is at P and that for *W. monticola* it is at Z, but in each case, two sheets are known at the institution where the author worked and so for each name a lectotype is designated here (see Art. 9.9). Images of types at P and Z are available from [http://coldb.](http://coldb.mnhn.fr/colweb/TreeView.do)

[mnhn.fr/colweb/TreeView.do](http://coldb.mnhn.fr/colweb/TreeView.do) and <http://www.zuerich-herbarien.uzh.ch/datenbanken> respectively.

## Cunonia

A draft revision of *Cunonia* for the *Flore de la Nouvelle-Calédonie* prepared by R. D. Hoogland in the 1980s included descriptions of five new species that were published posthumously (Hoogland *et al.* 1997), and two others have been described subsequently (Pillon *et al.* 2008). Although species circumscription within *Cunonia* is generally uncontroversial and Hoogland’s treatment is largely satisfactory, recent collections and field work have raised questions about the distinctiveness of a few of the species recognised by him.

One of these is *Cunonia bernieri*, and the type for this name is *Bernier* 121 (Guillaumin 1948a) (Montagne des Sources, 750 m, Sept. 1947; lectotype P – P00602328, selected here; isolectotype P – P00602329). Vegetatively *Bernier* 121 resembles *C. lenormandii* Vieill. ex Brongn. & Gris except that its leaves have three or five leaflets (versus exclusively 3-foliolate leaves on the fertile stems of *C. lenormandii*). Field notes on specimens of *C. lenormandii* describe the flowers as pink, pinkish red, bright red or purple and those of *Bernier* 121 are also

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Accepted for publication 9 November 2011.

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pink (Guillaumin 1948a). However, *Bernier* 121 has racemes c. 6 cm long with  $\pm$  sessile flowers whereas the inflorescences of *C. lenormandii* are 1–4 cm long, usually in the form of irregular glomerules with few flowers and pedicels 3–4.5 mm long. *Bernier* 121 was collected at Montagne des Sources where *C. lenormandii* is common and co-occurs with *C. atrorubens* Schltr., a rather similar and apparently closely related species. The latter also has reddish flowers but they are borne in longer racemes than in *C. lenormandii* and they have shorter pedicels; its leaves are 3-foliolate but distinctly cuneate and  $\pm$  sessile (versus shortly petiolate in *C. lenormandii*). The type of *C. bernieri* thus appears to be intermediate between *C. lenormandii* and *C. atrorubens* and may be a hybrid between them. Despite having conducted extensive field work at Montagne des Sources, no individuals similar to *Bernier* 121 have been found (Pillon pers. obs.) and it therefore seems doubtful that the name *C. bernieri* represents a taxon worthy of recognition.

Hoogland's unpublished manuscript listed several collections under the name *Cunonia bernieri* in addition to the type. All were from high elevation sites on ultramafic soils but as noted by Hoogland himself, they do not form an entirely homogeneous group. *Blanchon* 195 (P, NOU), also from the type locality, is better treated as *C. alticola* Guillaumin, although this name may eventually prove to refer to a series of hybrids rather than a biological species; *Veillon* 6100 (P) from Mt Paéoua appears to be a hybrid, probably *C. montana* Schltr.  $\times$  *C. varijuga* Hoogland; *Veillon* 3327 (NOU) from Mt Nakada cannot be assigned to any currently recognised species and *Le Rat* 2981 (P) from Mt Dzumac is also unidentified at present. However, the remaining three collections listed by Hoogland, all from Mt Tchingou, form a morphologically coherent assemblage that also includes recent collections by Munzinger and McPherson and is described below as a new species.

***Cunonia bopopensis* Pillon & H. C. Hopkins sp. nov.** frutex vel arbor parva in altitudinibus excelsis crescens *C. lenormandii* maxime similis sed foliis pinnatis plerumque 5–7 (non 3) foliola ferentibus, floribus albis (non rubellis) in racemis 3.5–6.5 cm longis (non in glomerulis irregularibus 1–4 cm longis) dispositis differt. *C. pterophyllae* (Brongn. & Gris) Schltr. etiam comparanda sed foliolis paucioribus 5–7 (non  $\geq$  9) numero majoribus usque 3 cm (non < 2 cm) longis differt. Typus: New Caledonia, Massif de Tchingou, east side, 20°53'29"S 165°00'48"E, 1250 m, 2 April 2001, fl. & fr., *Munzinger & McPherson* 666 (holotype P P00217197!; isotypi K!, MO, NOU!).

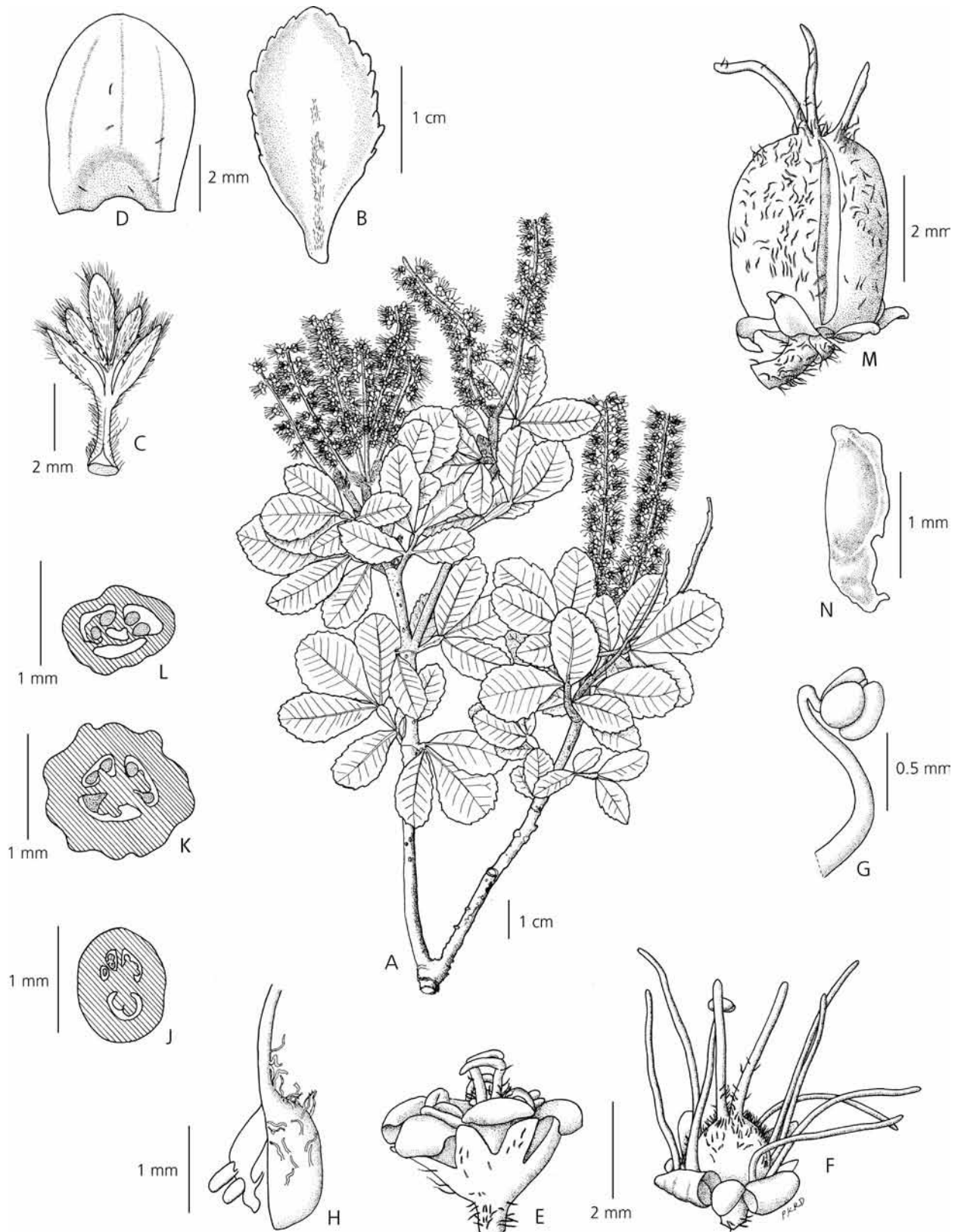
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*Shrubs* or *small trees*, to 4 m tall; bark  $\pm$  rugose with lenticels. Young stems densely hirsute (hairs wavy, 1–

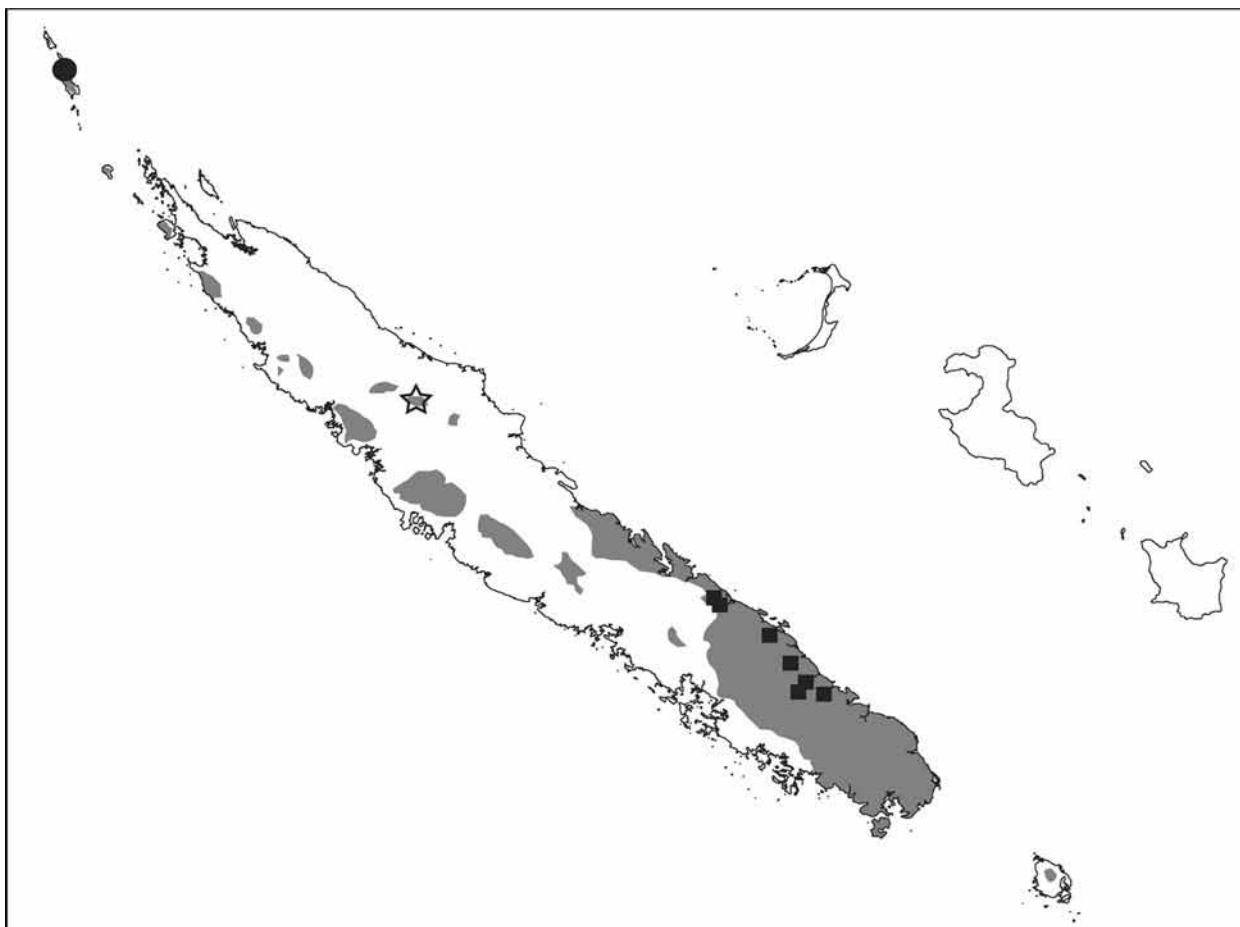
2 mm long), older twigs glabrescent. *Stipules* interpetiolar, ovate, to 8  $\times$  7 mm, generally longer than wide, apex acute to obtuse, abaxial surface densely hirsute-villous (hairs  $\pm$  caducous, to c. 1 mm long), adaxial surface glabrous. *Leaves* opposite and decussate, mostly imparipinnate (or rarely paripinnate) with (1–) 2–3 pairs of lateral leaflets, to 4 cm long. Petioles 3–6 mm long, not winged. Rachis segments 4–9 mm long, with a wing extending to 2 mm on either side of mid-line, broader distally than proximally on each segment. Lateral leaflets increasing in size distally along rachis, sessile, elliptic, 10–27  $\times$  7–13 mm, slightly asymmetric at base, broadly acute to obtuse at apex, mid-vein slightly curved, 2° veins 5–9 on either side of mid-vein. Terminal leaflet obovate, larger than largest laterals, 17–30  $\times$  10–18 mm, cuneate at base, obtuse to broadly obtuse at apex, 2° veins 8–9 on either side of mid-vein. Leaflet blades flat to slightly conduplicate, coriaceous, drying chocolate brown beneath; margins revolute with acroscopic teeth, 2° veins branching towards margin, each branch ending at sinus of a tooth. Petiole, rachis and mid-vein of blades densely hirsute, leaflet blades sparsely hirsute on both surfaces (hairs 0.5–2 mm long, tending to break or fall off), adaxial surface  $\pm$  glabrescent. *Inflorescence* racemose, of type 3 (Hoogland *et al.* 1997), i.e. consisting of opposite axillary dyads. Rachis 3.5–6.5 cm in total length, the lower 1 cm devoid of flowers, distal part with up to c. 50 flowers; hairs on inflorescence axis, pedicels, outer surface of calyx and ovary pale, curly, to 0.5 mm long. Floral bracts lanceolate, 4  $\times$  0.2–0.5 mm, hairy, caducous. Pedicels 1 mm long at anthesis, hairy, articulated at base. *Flowers*: Sepals 5, triangular, 2.5  $\times$  1 mm, sparsely hairy on outer surface. Petals 5, white, ovate, 2.5  $\times$  1.5 mm, glabrous. Stamens 10; filaments to 4.5 mm long; anthers 0.5  $\times$  0.5 mm, minutely apiculate. Disc adnate to base of ovary, rather indistinct, 1 mm high. Ovary ovoid-conical, 2  $\times$  1.5 mm,  $\pm$  glabrous at base, densely hairy distally; locules 2–3; ovules in 2 rows of c. 6 per locule; styles 2 (3), each 2–2.5 mm long, glabrous. *Mature capsules*  $\pm$  ovoid, with persistent sepals; valves 4  $\times$  3 mm, glabrescent, exocarp eventually detaching from endocarp. Seeds  $\pm$  flattened, c. 1.5  $\times$  0.5 mm. Fig. 1.

**DISTRIBUTION.** New Caledonia: Mt Tchingou. Map 1.

**SPECIMENS EXAMINED. NEW CALEDONIA.** Province Nord: Mt Tchingou, slope towards Pic 1374, 1320 m, 18 April 1951, fl., *Hürlimann* 1256 (P); *ibid.*, 20°53'36"S 165°00'42"E, 1160–1175 m, 1 April 2001, fl., *McPherson & Munzinger* 18092 (MO n.v., NOU, P); *ibid.*, 1150 m, 13 Dec. 1983, fr., *Morat* 7660 (K, NOU, P); *ibid.*, E side, 20°53'29"S 165°00'48"E, 1250 m, 2 April 2001, fl. & fr., *Munzinger & McPherson* 666 (holotype P; isotypes K, MO n.v., NOU); *ibid.*, 1150–1200 m, 10 Dec. 1986, fr., *Veillon* 6178 (NOU, P).



**Fig. 1.** *Cunonia bopopensis*. A leafy twig, in flower; B terminal leaflet, upper surface; C very young leaf; D stipule; E flower at anthesis, filaments not yet uncurled; F flower post-anthesis, with filaments uncurled and anthers fallen and 2-carpellate gynoecium; G stamen; H part of ovary dissected to show placenta bearing 2 ovules; J – L cross-sections of a 3-carpellate ovary, J near base, K in middle, L near top; M nearly mature 3-carpellate fruit; N seed. A – N Munzinger & McPherson 666. DRAWN BY PATRICIA K. R. DAVIES.



**Map 1.** Distribution of *Geissois belema* (●), *Cunonia bopopensis* (☆) and *Pancheria xaragurensis* (■) in New Caledonia, with the main areas of ultramafic soils shown in grey.

**HABITAT.** This species occurs between 1150 – 1320 m on Mt Tchingou, where it grows in high elevation forest on ultramafic soils, often on ridges.

**CONSERVATION STATUS.** *Cunonia bopopensis* is known from five collections, all from Mt Tchingou (1385 m), where it was reported as uncommon by Veillon in 1986 (see field notes of *Veillon* 6178). We consider that this species is unlikely to be found in other localities with the possible exceptions of two other mountains in the vicinity that may provide similar ecological conditions, Oua-Tilou (1122 m) and Mt Grandié (948 m), although their maximum elevations are lower than the minimum height recorded for *C. bopopensis*. The area of Mt Tchingou above 1000 m does not exceed 7 km<sup>2</sup>, so that, even when considering a slightly lower elevation than is known for *C. bopopensis*, the extent of occurrence of this species is small. The most significant current threat is probably climate change as this will reduce the area of suitable high elevation habitat for this species, although nickel mining on Mt Tchingou in the future cannot be ruled out. Thus we assign here a provisional threat status for *C. bopopensis* of Critically Endangered: CR B1ab(i,ii,iii) + 2ab(i,ii,iii), following IUCN (2001).

**PHENOLOGY.** Flowers have been collected in April and fruits in April and December.

**ETYMOLOGY.** This species is named after the land and people of Bopope (Pwöpwöp), in the vicinity of Mt Tchingou.

**NOTES.** *Cunonia bopopensis* has the distinctive combination of imparipinnate leaves with a winged rachis and normally five or seven leaflets, the terminal one broader than the laterals, and white flowers. It has a dense indumentum of wavy hairs on the young stems and stipules, sparser hairs on the leaves, and small hairs on the inflorescences.

The ovary of *Cunonia* is usually illustrated and described as bilocular with axile placentation, i.e. 2-carpellate with the placentas connate (e.g. *C. balansae* Brongn. & Gris, fig. 130 and *C. pterophylla*, fig. 132, both in Dickison 1984; Hutchinson 1967). However, some flowers and fruits of *C. bopopensis* have a 3-carpellate ovary (Fig. 1M), a condition noted by Hoogland (unpublished) as absent or rare in most species of *Cunonia*, although found by him in *C. rotundifolia* Däniker and *C. pulchella* Brongn. & Gris. In addition, Hoogland noted flowers with four carpels in a few collections of *C. pulchella* and in a study of 20

collections he found that the percentage of flowers with two, three or four locules varied from 100/0/0 (*McPherson* 3171) to 20/74/6 (*MacKee* 21544); flowers with four carpels were also found in one collection of *C. cerifera* Hoogland (*MacKee* 35515).

Baillon (1874) noted that the expanded edges of the placentas in *Cunonia* can remain separate, in which case the ovary is unilocular with parietal placentation, but typically near the base the placentas are connate, although they may start to separate distally (Fig. 1J – L) (see also Brongniart & Gris 1873; Dickison 1975: fig. 22a – d, *C. vieillardii* Brongn. & Gris).

The seeds of *Cunonia bopopensis* are flattened-ellipsoid with a somewhat irregular wing expanded at one end, small at the opposite end and narrow along one side (Fig. 1N), and similar seeds have been illustrated in other species (*C. purpurea* Brongn. & Gris, fig. 44, and *C. macrophylla* Brongn. & Gris, fig. 46, both in Dickison 1984; *C. koghicola* H. C. Hopkins, J. Bradford & Pillon, fig. 4 K, in Pillon *et al.* 2008). However, sometimes seeds in *Cunonia* are more angular, with the wing not or only slightly developed (Brongniart & Gris 1873); such seeds are not necessarily non-viable, although their ability to disperse is likely to be reduced (B. Fogliani pers. comm.).

The affinities of this new taxon are not clear but morphologically the closest species are probably *Cunonia lenormandii* and *C. pterophylla*. *C. bopopensis* has leaves quite similar to those of *C. lenormandii*, although the latter normally have only three leaflets, and the two differ in flower colour (red in *C. lenormandii*, white in *C. bopopensis*). Both occur on ultramafic substrates and *C. lenormandii* is widespread in New Caledonia, occurring in forest and maquis over a range of elevations (especially 400 – 1200 m). The indumentum and colour of the leaves in *C. bopopensis* are reminiscent of *C. pterophylla* but the leaflets of the latter are more numerous (nine or more per leaf) and smaller (< 2 cm long). *C. pterophylla* occurs in forest or occasionally maquis on ultramafic soils in southern Grande Terre, from 250 – 1350 m, and like *C. bopopensis*, it has white flowers.

*Cunonia bopopensis* is one of a handful of species in this genus in New Caledonia that is restricted to no more than a few mountain tops, and this type of distribution is also seen in the closely related genus *Pancheria* (Bradford & Jaffré 2004; Hopkins *et al.* 2009), as well as in *Beauprea* (Proteaceae, Virot 1968), *Dracophyllum* (Ericaceae, Virot 1975) and *Metrosideros* (Myrtaceae, Dawson 1992). All five genera have, for example, rare montane micro-endemics on northern, non-ultramafic mountains (Panié range, Roche Ouaième, Massif des Lèvres, see Bradford & Jaffré 2004) and on southern, ultramafic mountains (Mt Humboldt, Mt Kouakoué, Montagne des Sources, see Munzinger *et al.* 2008).

Endemics restricted to Mt Tchingou are expected for two reasons. First, it is the highest mountain in this

part of north-central New Caledonia and it is relatively distant from the Panié range (maximum elevation 1629 m) and higher than both the Ton-Non massif, which includes Roche Ouaième (986 m), and the closer Massif des Lèvres (1076 m). Second, like Ouaitlou to the north-west and Mt Grandié to the south-east, the upper part of Mt Tchingou has ultramafic soils, whereas most of the surrounding mountainous areas, including the Massif des Lèvres to the north-east, have non-ultramafic substrates, derived from metamorphic or sedimentary rocks. Mt Tchingou is thus somewhat comparable to an inselberg, because although this massif does not arise from a flat plain, at high elevation it offers ecological conditions that are markedly different from those of its surroundings.

To our knowledge, only two species have so far been reported as restricted to Mt Tchingou: *Soulamea moratii* Jaffré & Fambart (Simaroubaceae, Jaffré & Fambart 2002) and *Rapanea tchingouensis* M. Schmid (Primulaceae, previously Myrsinaceae, Schmid 2009). However, we are aware of species in several genera, including *Acropogon* (Malvaceae, formerly Sterculiaceae), *Coronanthera* (Gesneriaceae), *Nothofagus* (Nothofagaceae) and *Pittosporum* (Pittosporaceae), that have similar distributions and are awaiting description or are in the process of being described. Most collections from Mt Tchingou were made from the 1980s onwards so little material from this mountain was available for the earliest revisions published in the *Flore de la Nouvelle-Calédonie et Dépendances*, and this probably explains why few micro-endemics from this mountain have been described so far. The presence of micro-endemics on Mt Tchingou and the fact that the vegetation of its upper slopes has been little altered by humans suggest that this massif is an important area for the conservation of the New Caledonian flora.

### Geissois

Art (or Aar) is the largest of the Iles Belep to the north of Grande Terre. Its flora was studied by Montrouzier, a missionary and the first European naturalist to settle in New Caledonia in the mid 19th century (Guillaumin & Beauvisage 1914; Montrouzier 1860) but the island remains imperfectly collected because of its isolation. Recent collections by Barrabé, Swenson and Munzinger have provided fertile material of an endemic *Geissois* known previously only from a sterile collection by MacKee.

***Geissois belema* Pillon & H. C. Hopkins sp. nov.** *G. pruinosa* Brongn. & Gris characteribus vegetativis similis sed foliis in eadem grege 3- atque 5-foliolatis mixtis (nec in eadem grege omnibus 3-foliolatus tantum nec omnibus 5-foliolatis) differt; etiam inflorescentiis atque floribus fructibusque majoribus differt.

*G. magnifica* Baker f. *magnitudine partium reproductivarum similis* sed foliis plerumque minoribus atque stipulis plerumque minoribus minus rotundatis differt. Ala seminis longa usque 1.3 cm longa. Taxon adhuc geographice sejunctum ex Insula Art solum cognitum est. Typus: New Caledonia, Province Nord, Iles Belep, Ile Art, Plateau Nord, Te Waala, 19°41'43"S 163°39'50"E, 275 m, 26 Aug. 2009, fl. & fr., *Barrabé, Swenson & Munzinger* 961 (holotypus P!; isotypi CANB!, K 2 sheets!, MO!, MPU!, NOU 2 sheets!, P!, SUVA!).

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*Shrubs* or *small trees* to 4 m high, sometimes branched near the base. Twigs glabrous (velutinous to strigose in saplings), generally pruinose and laterally compressed toward the apex. *Stipules* intrapetiolar, type 2B (see Hopkins 2008); in bud c. 3 × 3 mm, strigose; after separating persistent at 1 to 3 nodes, elliptic-ovate, (1.5 –) 2 – 3.5 × 1.2 – 2.5 cm (to 4.5 × 3 cm in saplings), rounded at base and broadly acute at apex, glabrous on both surfaces (abaxial surface velutinous to strigose in saplings), green to red, sometimes pruinose. *Leaves* opposite and decussate, palmately compound with 3 (– 4 –) 5 leaflets. Petioles 3.5 – 15 cm long, glabrous, often pruinose especially towards either end. Median leaflet: petiolule 1.5 – 4 cm, glabrous; blade obovate, (5 –) 7.5 – 15 × (2.5 –) 4.5 – 9 cm, length/breadth ratio 1.7 – 2.1, attenuate at base into petiolule, broadly acute at apex, with margin red, entire and minutely recurved; blade subcoriaceous, glabrous on both surfaces; domatia absent; 2° veins (6 –) 7 – 8 (– 10) on either side of midrib, 3° veins not or scarcely thicker than 4° veins, higher order venation (3°, 4°, 5°) densely reticulate, forming distinct areoles, readily visible on abaxial surface when dry. Lateral leaflets on either side of median: petiolule ½ as long as in median leaflet, blade similar in length but often slightly narrower, elliptic; midrib often closer to adaxial margin, base ± symmetric to asymmetric especially in 3-foliolate leaves; outer laterals (when leaves 5-foliolate) markedly smaller than median leaflet, markedly asymmetric at base. Sapling leaves larger and entirely pubescent-strigose (scarcely so on upper surface of blade), margin toothed or entire. *Inflorescence* of simple, projecting, ramiflorous racemes (monads) arising singly (or in pairs). Rachis 10 – 18 cm in total length, red, glabrous, the lower part devoid of flowers, distal part with up to c. 65 flowers. Floral bracts thread-like, 2 mm long, with a few hairs, caducous. Pedicels 7 – 18 mm long at anthesis, glabrous, articulated above middle (between ½ and ⅔ of distance from base). Flower buds ovoid, to 9 × 4 mm. *Flowers*: Calyx lobes 4, narrowly triangular with acute apex, 8.5 – 10 × 4 mm, red with a green base, abaxial surface glabrous, adaxial surface densely silky-velutinous except at margins. Petals absent. Stamens c. 24

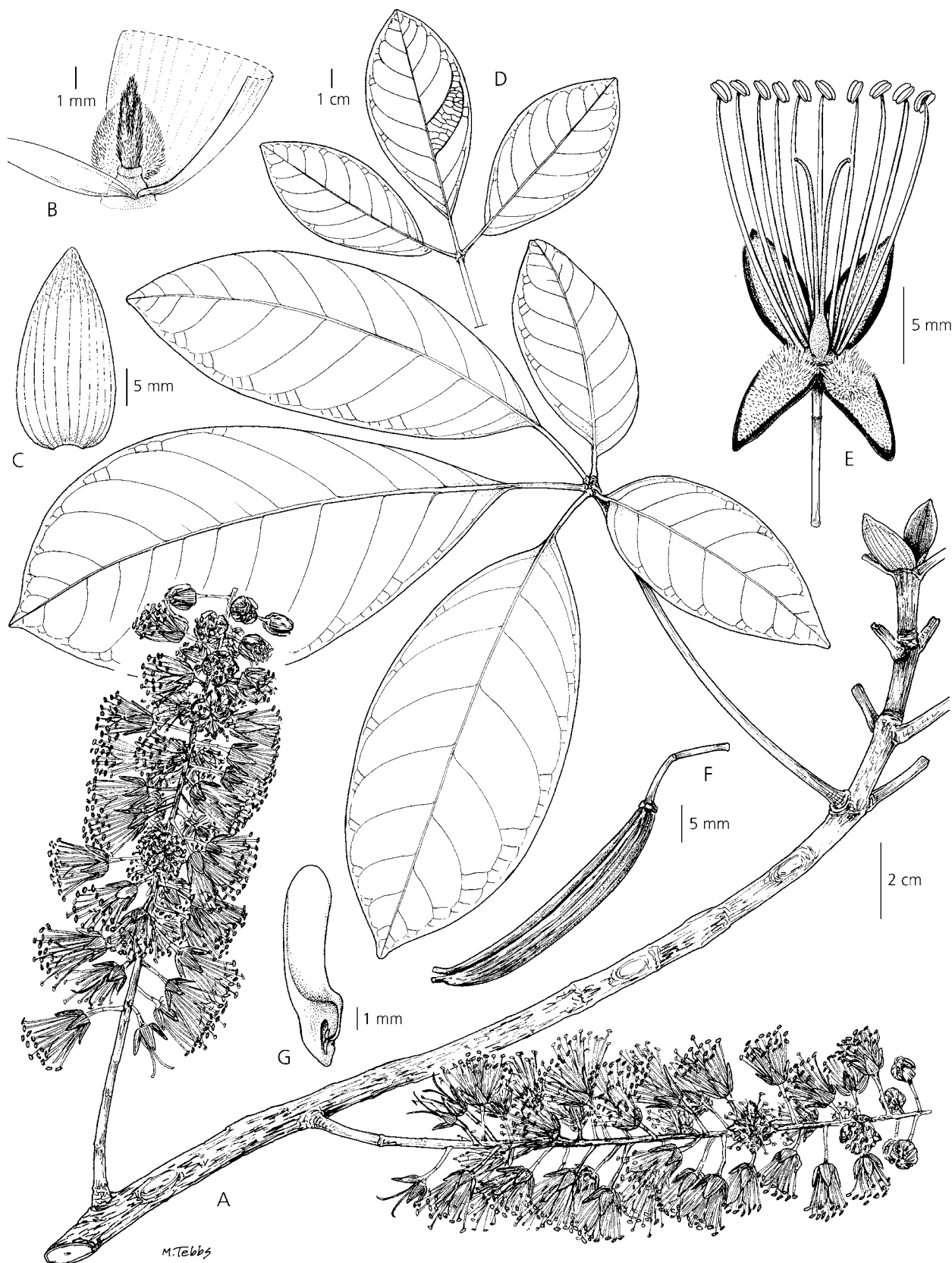
inserted in a single series; filaments to 18 mm long at anthesis, red; anthers 1.5 mm long, black with yellow pollen. Disc 1 mm wide. Ovary ovoid-conical above disc, 1.5 – 2.5 × 0.5 – 1.8 mm, glabrous, yellow; locules 2; ovules in 2 rows of up to 14 per locule; styles 2, to 14 mm long at anthesis, red. *Mature capsules* ± cylindrical, sometimes slightly curved, tapering toward the apex; valves (25 –) 35 – 42 × 4 – 6 mm, green to red, glabrous, coriaceous. Seeds elliptic in outline and flattened, 9 – 11 × 2.5 mm including a basal wing to 1 mm and an apical wing to 7+ mm long. Figs 2, 3.

**DISTRIBUTION.** New Caledonia: Belep Archipelago: Ile Art. Map 1.

**SPECIMENS EXAMINED. NEW CALEDONIA.** Province Nord: Iles Belep, Ile Art, Plateau Nord, Te Waala, 19°41'43"S 163°39'50"E, 275 m, 26 Aug. 2009, fl. & fr., *Barrabé, Swenson & Munzinger* 960 (G, K 3 sheets, L, MO, MPU, NOU 2 sheets, NSW, P 2 sheets, SUVA); *ibid.*, 26 Aug. 2009, st. (juvenile foliage from preceding plant), *Barrabé, Swenson & Munzinger* 960 bis (K, MO, NOU, P); *ibid.*, 26 Aug. 2009, fl. & fr., *Barrabé, Swenson & Munzinger* 961 (holotype P; isotypes CANB, K 2 sheets, MO, MPU, NOU 2 sheets, P, SUVA); Ile Art, Plateau Nord, rebord est, 220 m, 9 Dec. 1975, st. (juvenile/shade leaves), *MacKee* 30438 (NOU, P 4 sheets).

**HABITAT.** *Geissois belema* is known only from Ile Art in the Belep archipelago, where it occurs in and at the edge of dense, low, humid forest on ultramafic soils, at low elevation.

**CONSERVATION STATUS.** The known distribution of *Geissois belema* is very limited since it is confined to the northern plateau of Ile Art. This species is apparently rare since just two mature individuals were seen by Barrabé (pers. comm.) in 2009, all collections are probably from the same population, and it is not known to have been collected by Montrouzier (Guillaumin & Beauvisage 1914; Montrouzier 1860). *Geissois* trees are striking plants that are generally well-collected so the scarcity of collections of this species may be an indication of genuine rarity. *G. belema* might possibly occur on other islands in the Belep archipelago, such as Ile Pott (Phwoc), or on the near-by island of Yandé, since they also have ultramafic soils (although we do not know whether they have suitable forest habitats), but we have seen no specimens of this or any other *Geissois* from these other small islands. The total surface of Art is 50.77 km<sup>2</sup> so the area of occupancy and extent of occurrence are much smaller than this. Threats to this species include fire, through the burning of vegetation, and occasional wood-cutting by local people for domestic firewood. Prospecting for nickel has taken place in the Belep islands and newspaper reports indicate that a major mining company, SLN, is interested in exploiting these deposits. Although threats to the habitat of *G. belema*



**Fig. 2.** *Geissois belema*. A twig with 5-foliolate leaf and racemes in flower; B apical bud of A showing bases of opposite stipules enclosing small hairy apical bud with a minute hairy leaf in front; C stipule; D 3-foliolate leaf; E flower, some of stamens removed; F fruit; G seed, with apical wing and placental attachment towards the base. A – C, E Barrabé *et al.* 1961; D, F – G Barrabé *et al.* 1960. DRAWN BY MARGARET TEBBIS.



**Fig. 3.** *Geissois belema*. A habit of tree in flower; B apex of vegetative shoot showing opposite petioles and several pairs of intrapetiolar stipules. A from Barrabé *et al.* 961; B from Barrabé *et al.* 960. PHOTOS BY LAURE BARRABÉ.

are only moderate, its extremely restricted distribution means that we assign a provisional conservation status of Critically Endangered: CR B1ab(iii) + B2ab(iii) + C2a(i) + D, following IUCN (2001).

**PHENOLOGY.** Flowers and nearly mature fruits have been collected in August.

**ETYMOLOGY.** The epithet “belema” is the name which inhabitants of the Belep islands give themselves and it is also the adjective they use for things related to these islands. Here we treat “belema” as a noun in apposition (and see Art. 60 ex. 27 & 28 of the *International Code of Botanical Nomenclature* (McNeill *et al.* 2006)).

**NOTES.** This is one of a number of species of *Geissois* from New Caledonia that have leaves with three or five leaflets (or a mixture of both) and a glabrous ovary, and within this group it is similar to *G. pruinosa*, *G. montana* Vieill. ex Brongn. & Gris and *G. magnifica*, and to a lesser degree to *G. velutina* Guillaumin ex H. C. Hopkins (Table 1). *G. belema* has a unique combination of features of the leaves, stipules and inflorescences, although it lacks characters that are novel for the genus except for its unusually large seeds. It is the only species of *Geissois* known from Ile Art.

The size and shape of the mature adult leaves in *Geissois belema* resemble those of *G. pruinosa* although populations of the latter usually have leaves with a ±

uniform number of leaflets. The stipules are similar in size and shape in both species although *G. pruinosa* usually has stipules of type 1, in which the apical bud is not surrounded by the persistent, already-separated stipules of the subdistal node, whereas fertile stems of *G. belema* with mature adult foliage have stipules of type 2B, in which the subdistal node fails to elongate and so the most distal pair of separated stipules continues to cover the apical bud (see Hopkins 2008). *G. belema* and *G. pruinosa* also differ from one another in the size of their flowers and fruits, which are much smaller in *G. pruinosa*, except for in a handful specimens from around Montagne des Sources and Vallée de Thy in southern Grande Terre that have unusually large flowers (e.g. Hartley 14926, NOU; McPherson 2077, NOU, P; Tirel 1172, P; Veillon 3569, NOU).

*Geissois belema* somewhat resembles *G. montana* in the size and shape of its adult leaves and both taxa have type 2 stipules (see Hopkins 2008). Although *G. montana* often has larger flower buds than *G. pruinosa*, those of *G. belema* are larger still, as are its flowers and fruits. *G. montana* is nearly glabrous, with hairs confined to the shoot apex and the inner surface of the calyx lobes. Its ecology also differs from that of *G. belema* as it occurs in forest on mica-schist substrates in north-eastern Grande Terre, often at high elevation.



**Table 1.** Comparison of characters for *Geissois belema* with *G. pruinosa* (both varieties), *G. magnifica*, *G. montana* and *G. velutina*.

	<i>G. belema</i>	<i>G. pruinosa</i> var. <i>pruinosa</i>	<i>G. pruinosa</i> var. <i>intermedia</i>	<i>G. magnifica</i>	<i>G. montana</i>	<i>G. velutina</i>
<b>Stipules</b>						
type <sup>a</sup>	2B	1	1	2B	usually 2, A or B	1
size when separated (cm)	(1.5–) 2–3.5 × 1.2–2.5	1.3–3.5 × 0.6–1.8	c. 0.8 × 0.4	(2–) 2.7–5 (–7) × (1.5–) 1.7–6.5	to 2 (–3.7) × 1.5 (–2)	1.8–3.7 × 1–1.5
persistent at 1–3 subdistal nodes?	sometimes	sometimes	never	usually	sometimes	sometimes
persistent at > 3 subdistal nodes?	never	rarely	never	often	sometimes	never
<b>Leaves</b>						
# leaflets per leaf	3 or 5	(3) 5	3	3 or 5	3 or 5	3 or 5
median leaflet blade (cm)	(5–) 7.5–15 × (2.5–) 4.5–9	6.8–16 × 3.4–8.6	8–17 × 3.5–7	9.5–22 (–32.5) × 5.3–13.5	4–8.5 (–10) × 2.7–4.2 (–5.3)	8–18 × 3.2–7.5
lower surface of blades in mature adult leaves	glabrous	glabrous	glabrous	glabrous	glabrous	velutinous
<b>Reproductive characters</b>						
pedicel length (mm)	7–18	7–11	5–7	9.5–16	8.5–14	8.5–13
calyx lobes (mm)	10 × 5	5–6.5 × 2.5–4	4.8–5.5 × 1.5–3.3	6.5–8 × 3–6.3	5.6–6.2 × 3–3.7 (–4.8)	5–7 × 2.5–3.5
ovary	glabrous	glabrous	glabrous or slightly hairy	glabrous	glabrous	glabrous or slightly hairy
fruit length (mm)	(25–) 35–42 × 4–6	(10–) 13–20	15–25 × 5	(20–) 25–45 × 6–9	(15–) 21–27 × 4–5	c. 16 × 6
maximum seed length (mm)	13	(–27) × 5–6 (–8)	c. 5	8	?	5
<b>Ecology</b>						
substrate <sup>b</sup>	UM	UM	UM & NUM	UM	NUM	UM
habitat	in and at edge of low forest	medium-height forest and maquis	forest	open forest, maquis and near coast	forest, often at high elevation	forest
<b>Distribution</b>	Ile Art	S (+ intermediates in S and NW)	NE	E coast	NE	S

<sup>a</sup> see Hopkins (2008).

<sup>b</sup> UM = ultramafic; NUM = non-ultramafic.

The large inflorescences, flowers and fruits of *Geissois belema* are comparable in size to those of *G. magnifica* and both species have stipules of type 2B (see Hopkins 2008). However, the stipules in *G. magnifica* are usually broader, more rounded at the apex and more persistent, sometimes clothing the stems. Also, typically its leaves are much larger than those of *G. belema* and although both taxa occur on ultramafic substrates, their distributions are disjunct since *G. magnifica* is restricted to a band along the east coast of Grande Terre, largely from Ponérihouen to south of Port Bouquet.

*MacKee* 30438 is a sterile specimen from a shrub 4 m high with large 5-foliolate leaves (petiole to 26 cm, velutinous; median leaflet blades to 25 × 12.5 cm, pubescent beneath, with entire margins); the stipules in bud are ovate, 2.2 × 1.8 cm and velutinous, and the stems are also velutinous. This material almost certainly comes from an individual of *Geissois belema* and may comprise leaves from a branch growing in shade or from a non-reproductive shoot that retained some juvenile characters. The locality suggests that it belongs to this species and it appears to have come from the same population as the recent collections, although compared with *Barrabé et al.* 960 bis, *MacKee* 30438 has larger, broader leaflets and is more hairy. The velutinous indumentum on *MacKee* 30438 is reminiscent only of *G. velutina*, which grows in forest on ultramafic substrates in the extreme south of Grande Terre, but in the latter, the indumentum is persistent on the mature adult leaves on reproductive shoots whereas in *G. belema* it is not.

Ile Art has a small but unique Cunoniaceae flora. Besides the endemic *Geissois belema*, it also home to *Codia belepensis* H. C. Hopkins (*Barrabé et al.* 957, K, NOU, P; *Montrouzier* 64, P), which is otherwise known only from Iles Pott and Yandé (Hopkins *et al.* 2007). A third member of the family is *Pancheria ternata* Brongn. & Gris (*Barrabé et al.* 956, K, NOU, P; *MacKee* 19323, P), which is a complex taxon widespread ± throughout Grande Terre and Ile des Pins, and represented by a distinctive population in the Belep archipelago, where it is also known from Ile Pott (*MacKee* 19388, P).

Species endemic to Ile Art in other families include *Cyclophyllum cardiocarpum* (Baill.) Guillaumin (Rubiaceae, Baillon 1878; Guillaumin 1930), *Phyllanthus artensis* M. Schmid, *P. rozennae* M. Schmid and *P. veillonii* M. Schmid (Phyllanthaceae, previously Euphorbiaceae, Schmid 1991), *Pittosporum artense* Guillaumin (Pittosporaceae, Trel & Veillon 2002) and *Rapanea belepensis* M. Schmid (Primulaceae, Schmid 2009; also on Ile Pott), and we are aware of several other micro-endemics awaiting description. Although Ile Art has not yet been well collected, it is clearly an important centre of endemism worthy of conservation.

### *Geissois pruinosa*

In the south of Grande Terre, from the southern tip to around Dumbéa in the west and the Pourina valley in the east, *Geissois pruinosa* Brongn. & Gris *sensu stricto* is a common tree in low to medium height forest and in tall maquis on ultramafic soils, mostly at low elevation (20 – 400 m). Among the *Geissois* species that have three and/or five leaflets and a glabrous ovary, *G. pruinosa sensu stricto* has young stems and petioles that are glabrous and often pruinose, leaves with five, fairly broad, coriaceous leaflets that are glaucous beneath and often brittle when dry, and with rather few pairs of well-spaced 2° veins that are prominent beneath (Table 2). Most collections are morphologically uniform except for some localised variation, e.g. in the Valley de Thy and near Yaté, probably due to hybridisation.

*Geissois intermedia* Vieill. ex Pamp. has previously been recognised as distinct from *G. pruinosa* (Guillaumin 1941; 1948b; Hopkins 2006; Pampanini 1905). It belongs to the same species group but the type and morphologically similar specimens from north-eastern Grande Terre have 3-foliolate leaves, the young stems and petioles are ± glabrous but not pruinose, the leaflet blades are chartaceous and not glaucous with their 2° veins scarcely prominent beneath, and the racemes and flowers are more delicate than in *G. pruinosa sensu stricto*. *G. intermedia* grows largely in damp forest, including gallery forest, at low elevation (10 – 500 m). Collections from the

**Table 2.** Comparison of the varieties of *Geissois pruinosa* in New Caledonia.

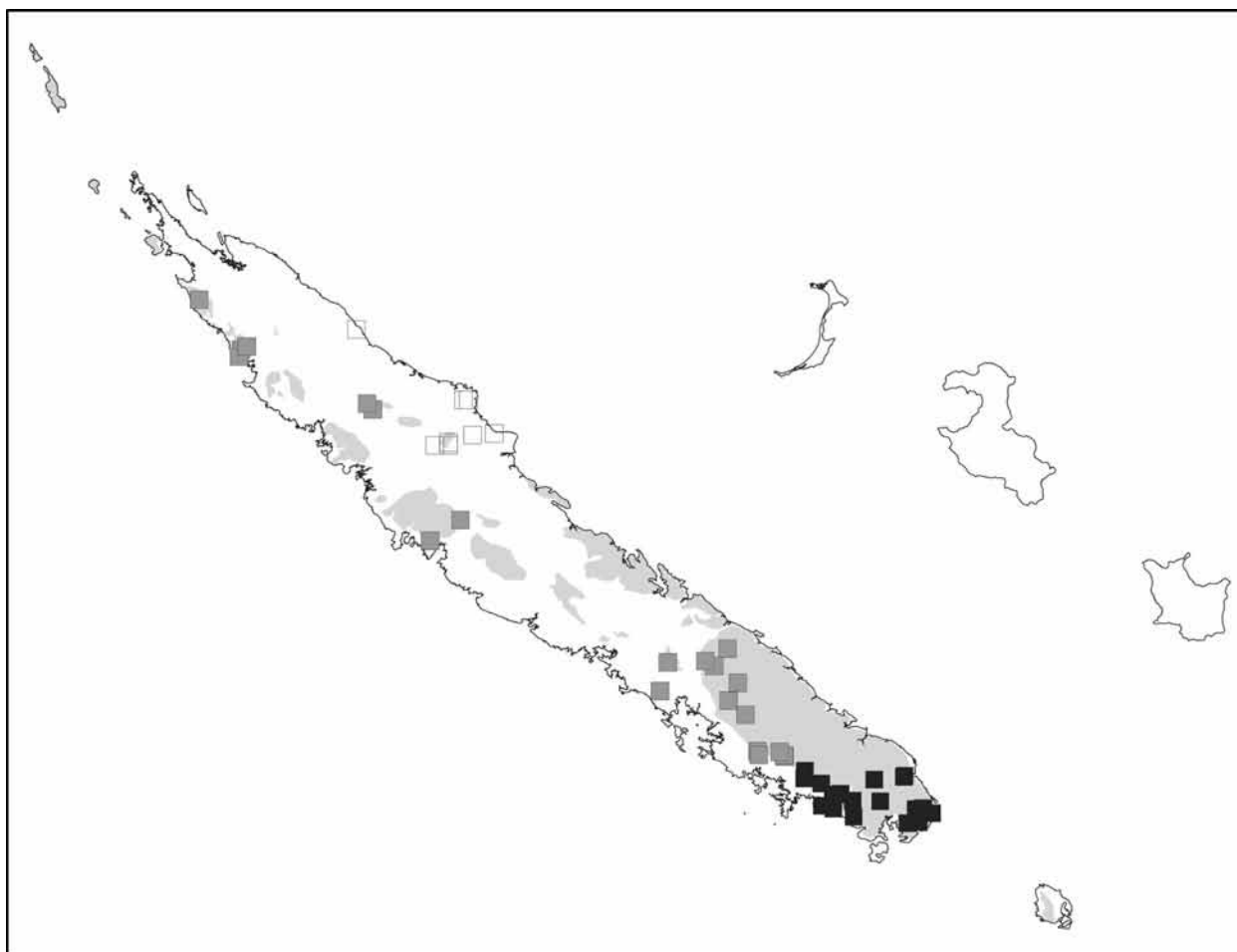
	<i>Geissois pruinosa</i> var. <i>pruinosa</i> (previously <i>G. pruinosa sensu stricto</i> )	<i>Geissois pruinosa</i> var. <i>intermedia</i> (previously <i>G. intermedia</i> )
<b>Distribution</b>	South	North-east
<b>Substrate</b>	Ultramafic	Non-ultramafic and ultramafic, including serpentinite
<b>Young stems</b>	± robust, glabrous, pruinose	Slender, often with small, sparse hairs, not or scarcely pruinose
<b>Stipules</b>	Briefly persistent, indumentum on outer surface variable but often yellow-velutinous in bud	Fugaceous, indumentum on outer surface thin, greyish or pale yellow in bud
<b>Leaflets</b>	5, coriaceous, glabrous, often glaucous beneath; 2° veins in 8 – 9 pairs, prominent beneath	3, chartaceous, glabrous, not glaucous beneath; 2° veins in 7 – 14 pairs, scarcely prominent beneath
<b>Racemes, flowers</b>	Relatively robust	Relatively delicate
<b>Ovary</b>	Glabrous	Glabrous or almost so

base of Mt Panié are from non-ultramafic soils, although label data on several from between Touho and Pondimié and near Mt Grandié indicate the substrate as ultramafic. The latter localities are in areas with complex geology, including a mixture of non-ultramafic and ultramafic rocks, and at least some specimens are from pockets of “true” serpentine (serpentinite).

Although typical specimens of *Geissois pruinosa sensu stricto* and *G. intermedia* differ in several characters (Table 2), a relatively large number of collections are morphologically intermediate (Map 2). One group of such specimens comes from the area northwards from Mt Mou to and around Mt Do (including Col de Vulcain, Mt Humboldt, the Tontouta valley, Dent de St Vincent and Sindoa). This region forms a transition zone in which the distinction between *G. pruinosa* and *G. intermedia* is gradually blurred, since the number of leaflets can be three, five or a mixture, and the material is less pruinose and less glaucous than in *G. pruinosa sensu stricto* but usually more robust than is

typical of *G. intermedia*. Specimens from this transition zone are from maquis and forest, where field notes indicate that the soil type is ultramafic, and locality data suggest that the remainder of the collections are also from ultramafic soils. The range in elevation is greater than elsewhere for the *G. pruinosa* complex (30 – 1150 m), but some material from high altitude is unusual or poor.

The second group of unplaced specimens is from the north and west (Néhoué, Mt Kaala, Haute Rivière Voh, Oua-Tilou and Mt Boulinda). These collections have three and/or five relatively coriaceous, rather glaucous leaflets and field notes indicate that the plants are uncommon along streams and in forest, maquis and swamps at low elevation (10 – 400 m). When mentioned, the substrate is said to be ultramafic and locality data suggest the remainder are also from this type of soil. Some collections are from the base of ultramafic massifs where rock types often include serpentinite, although northern and western Grande Terre is



**Map 2.** Distribution of the *Geissois pruinosa* complex in New Caledonia, based on specimens at NOU, with the main areas of ultramafic soils shown in grey: ■ *G. pruinosa* var. *pruinosa*; □ *G. pruinosa* var. *intermedia*; ■ material of *G. pruinosa sensu lato* not assigned to a variety.

generally much drier than the north-east where *G. intermedia* sometimes occurs on this substrate.

The morphological gradation between *Geissois pruinosa sensu stricto* and *G. intermedia* suggests that two distinct species cannot be maintained and so the latter is reduced to a variety of the former, which has priority. Although specimens from the transition zone in the southern half of Grande Terre and from the north and west belong to *G. pruinosa sensu lato*, they cannot be placed in either of the named varieties and the key provided below does not work for them.

### Key to the varieties of *Geissois pruinosa*

1. Leaflets 5, coriaceous, often glaucous beneath; young stems and petioles pruinose. Southern Grande Terre ..... ***G. pruinosa* var. *pruinosa***  
 1'. Leaflets 3, chartaceous, not glaucous beneath; young stems and petioles not pruinose. North-eastern Grande Terre ..... ***G. pruinosa* var. *intermedia***

### **Pancheria**

The Forgotten Coast (“Côte Oubliée”) of New Caledonia extends from south of Thio towards Yaté in south-eastern Grande Terre, between the tribal lands of Petit Borindi and Unia. The region owes its name to its inaccessibility, since it has no road, although it can be reached by boat. Steep mountain slopes descend almost straight into the sea so flat land is scarce except around estuaries, and several rivers, including the Ngoye, Ni, Ouinnée and Pourina, have formed deep valleys separated by high ridges. A multidisciplinary expedition in November 2008 provided an opportunity for the second author to collect in the Ni valley and enabled us to confirm the distinctiveness of a rare *Pancheria* found there. In the description and notes below, Roman numerals are used to indicate the number of leaves per node.

### ***Pancheria xaragurensis* H. C. Hopkins & Pillon sp. nov.**

*P. alaternoidi* Brongn. & Gris similis sed foliis ovato-ellipticis vel oblongo-ellipticis ad apicem late acutis vel rotundatis (non angustius ellipticis ad apicem acutis) ad marginem minute incrassatis recurvatis atque dentibus per totam longitudinem uniformiter dispositis (nec ad marginem planis dentibus e parte tertia basali carentibus) differt. *P. gatopensi* Guillaumin similis sed caulibus juvenibus sparsim minute appresse hirsutis (non ferrugineo-lanato-velutinis), stipulis anguste obovatis vel cochleariformibus ad marginem valde recurvatis (non late ovatis neque ellipticis neque recurvatis), petiolis 2 – 5 mm (non 7 – 20 mm) longis, pedunculis c. 0.7 mm (non 1.5 – 2.5 mm) diametro sparsim minute hirsutis (non dense ferrugineo-lanato-sericeis) differt. Ab ambabus speciebus floribus masculinis periantho quadrimero (non

***Geissois pruinosa* Brongn. & Gris var. *intermedia* (Vieill. ex Pamp.) H. C. Hopkins & Pillon comb. et stat. nov.**

<http://www.ipni.org/urn:lsid:ipni.org:names:77115450-1>

*Geissois intermedia* Vieill. ex Pamp., *Ann. Bot. (Rome)* 2: 57 (Pampanini 1905); Guillaumin (1941: 244; 1948b: 138). Type: New Caledonia, Wagap, *Veillard* 607?, distributed by Lenormand in 1867 (lectotype G lvs!, selected by Hopkins (2006); isolectotypes G!, P 00602230!, both with buds, fl. & fr.).

trimero) atque 4 (non 6) staminibus instructis differt. Typus: New Caledonia, Ni Valley, 21°53'S 166°32'E, 0 – 50 m, 10 Nov. 2008, buds (♂), *Pillon* 1231 (holotypus P!; isotypi K!, NOU!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77115451-1>

*Shrubs* or *small trees* to 7 m. Young stems and veins of young leaves sparsely and minutely adpressed hairy ( $\times 10$ ); distal internodes c. 2 mm diam., nodes slightly thicker; stems well-leaved. *Stipules* interpetiolar, narrowly obovate or ladle-like, distally reflexed, with margins strongly revolute, 5.5 – 9  $\times$  2 – 2.5 mm, rounded at apex, minutely pubescent abaxially, briefly persistent. *Leaves* III (– IV) per node, simple,  $\pm$  upright. Petioles 2 – 5 mm, glabrous. Blades ovate-elliptic to oblong-elliptic, mostly 2.5 – 6.3  $\times$  1.2 – 2.7 cm, often varying in size on a single stem, almost rounded to cuneate at base, broadly acute to obtuse or round at apex, coriaceous and stiff but not thick; both surfaces glabrous or with a few minute adpressed hairs on midrib beneath ( $\times 10$ ), often drying chestnut-brown beneath; margins minutely thickened and recurved, serrate-crenate with teeth/notches 8 – 15 on either side, all similar in size and evenly spaced almost to base of blade; 2° veins 8 – 14 on either side of midrib, flat or  $\pm$  impressed above,  $\pm$  prominent beneath; reticulum well-developed, visible beneath. *Inflorescence* of pedunculate capitula in leaf axils at distal node of shoot or grouped into median and/or lateral inflorescence modules (IMs) on a short basal axis; median IMs at distal node, with peduncles in 3 s; lateral IMs at distal and/or subdistal nodes, with peduncles in 2 s. In lateral IMs: basal axis 4 – 6 mm long, nearly glabrous; bracts subtending peduncles oblong, 2 – 3  $\times$  1 mm,

bracts alternating with peduncles triangular or oblong, 2 – 3 × 1.5 mm, both types minutely adpressed hairy (× 40). Peduncles (0.4 –) 1 – 2.5 cm long × 0.7 mm diam., sparsely and minutely hairy (× 10) (hairs adpressed to erect, 0.1 mm). Capitula in bud minutely pale-hairy to ± glabrous. Floral bracts membranous, oblong, 1 × 0.5 mm, sometimes with 3 or 4 distal teeth. *Flowers* 4-merous (except gynoecium). ♂ capitula 5 – 8 mm diam., composed of c. 62 flowers (*Munzinger* 953); ♂ flowers: sepals 4, 1.2 × 0.5 mm, petals 4, 1.5 × 0.5 mm, both whorls membranous, obovate, ± glabrous or distally puberulent-ciliate; stamens 4, filaments 1.7 – 4.5 mm long, anthers 0.4 × 0.4 mm; disc segments 4, free, to 1.5 mm long, very slender, sometimes distally curled, gynoecium vestigial. ♀ capitula 5 mm diam., flowers not counted; ♀ flowers (*Schlechter* 15135): sepals and petals as in ♂, staminodes to 1 mm long; gynoecium 2-carpellate, carpels connate towards the base; ovaries 1.5 mm long, minutely hairy; ovules 1 per carpel; styles 2, each 0.5 mm long. *Capitula in fruit* to 8 mm diam.; follicles in pairs, each 2 × 1 mm (+ persistent styles 0.5 mm long), tapering gradually towards styles, minutely silky (hairs pale, < 0.1 mm). Seeds not seen. Fig. 4.

**DISTRIBUTION.** New Caledonia, Grande Terre. *Pancheria xaragurensis* is confined to south-eastern Grande Terre, around and to the south of Thio. So far it has been found near the rivers Thio, Koum, Ngoye, Ni, and in the lower Kouakoué valley. The locality of Gatope in north-western Grande Terre for the mixed collection *Veillard* 2654 is not considered reliable for the single fragment of *P. xaragurensis* on this sheet. Map 1.

**SPECIMENS EXAMINED. NEW CALEDONIA.** Province Sud: R. Ngoye, 17 Oct. 1914, ♂ fl., *Compton* 2048 (BM 000926071); R. Thio, 21°37'01"S 166°10'45"E, 460 – 490 m, 28 Nov. 2002, fr., *Bradford, Hopkins & Fogliani* 1199 (MO, NOU); s. loc., 1861 – 1867, ♂ fl., *Deplanche* 370 p.p. (K, P 2 sheets, 00143011 & ex herb. Drake p.p.); Mt Kouakoué, contrefort Nord Est, 21°56'46"S 166°29'37"E, 577 m, st., *Grignon, Rigault & Nigote* 394 (NOU); near Thio, ancient Mine Gaillot, 6 Nov. 1968, buds, *Jaffré* 86 (NOU, P); Port Bouquet area, 10 km from Thio, 2 April 1969, fr., *Jaffré* 213 (NOU, P); Port Bouquet, R. Koum, confluence with R. Nema, 20 m, 23 Nov. 2001, ♂ fl., *Munzinger* 953 (MO n.v., NOU, P 00239197); Ni Valley, 21°53'S 166°32'E, 0 – 50 m, 10 Nov. 2008, ♂ buds, *Pillon* 1231 (K, NOU, P); hills near R. Ngoye, 50 m, 29 Nov. 1902, buds, ♀ fl. & old fr., *Schlechter* 15135 (BM, K, NSW, P 00143078); terrace of R. Ni, 22 Nov. 1965, ♂ fl., *Schmid* 823 (NOU); lower Kouakoué Valley, 19 Nov. 1965, ♀ fl., *Schmid* s.n. (P); Gatope [doubtful], 1861 – 1867, ♂ fl., *Veillard* 2654 p.p. (P 00143020, ex CN, fragm. 'A', excl. fragm. 'B' 5 fragments).

**HABITAT.** *Pancheria xaragurensis* grows primarily along streams and in maquis along rivers at low elevation

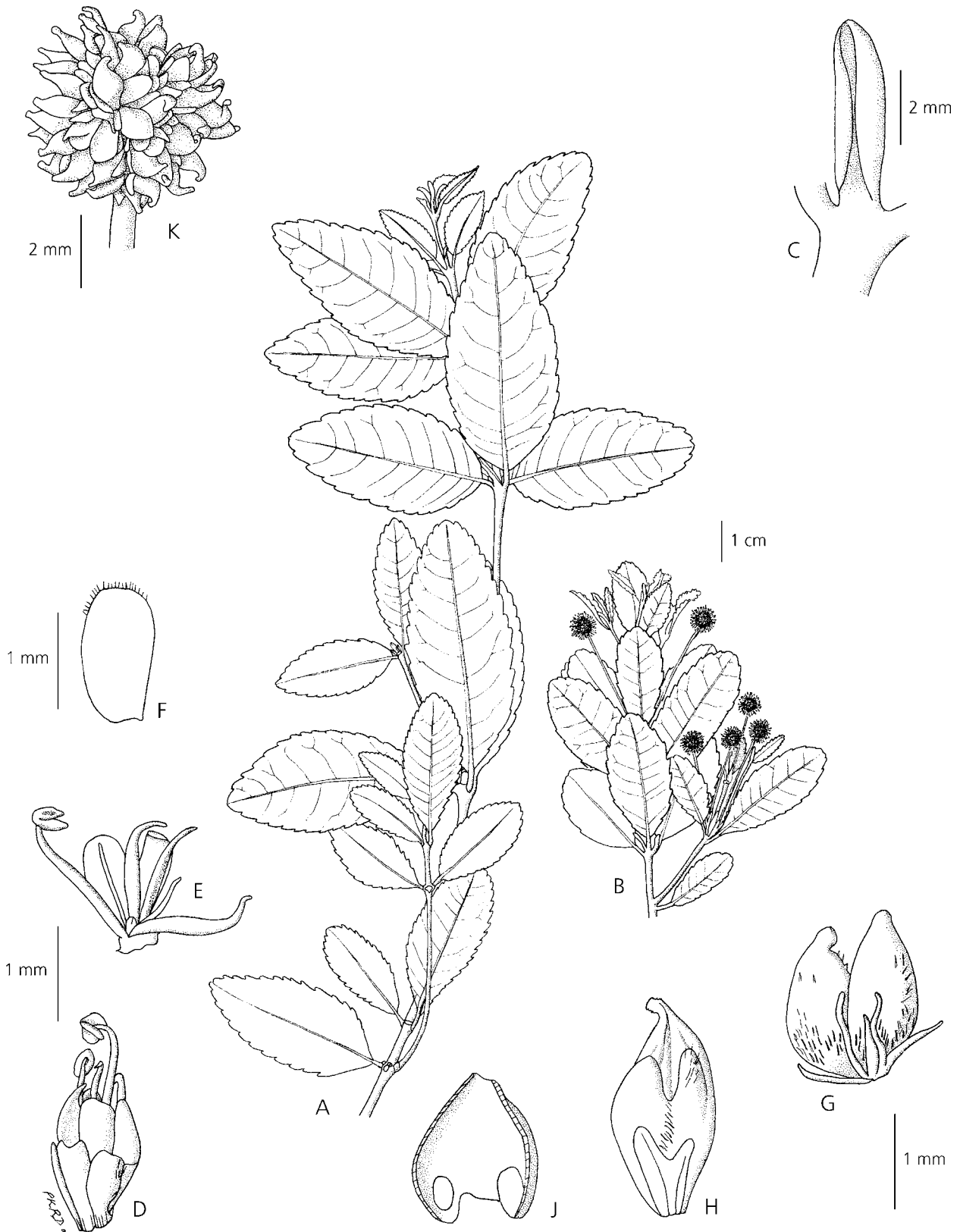
(20 – 50 m) on ultramafic substrates. Three collections were made at slightly higher elevation: *Grignon et al.* 394 from the lower slopes of Mt Kouakoué/upper Ni valley (577 m) in tall maquis; *Jaffré* 86, reported from “maquis de crête” near Thio (no elevation indicated); and *Bradford et al.* 1199, also from near Thio (460 – 490 m). In the Ni Valley, *P. xaragurensis* grows among pebbles along the sparsely vegetated margins of the river bed. *P. elegans* Brongn. & Gris and *P. alaternoides* also grow in this valley, although the latter is rare, and these two taxa are found mostly on the river banks and so are not intermixed with *P. xaragurensis* (*Pillon* pers. obs.).

**CONSERVATION STATUS.** *Pancheria xaragurensis* is known from seven localities: four valleys along the Forgotten Coast, plus one the lower slopes of Mt Kouakoué (in the upper Ni valley) within the “reserve naturelle du massif du Kouakoué” (a protected area) and two near Thio. The Forgotten Coast of New Caledonia is still relatively poorly collected and so it is possible that this species may occur elsewhere, e.g. in the valley of the R. Ouinnée, but it has already been recorded in most valleys between Yaté and Thio and it is unlikely that many additional populations remain to be discovered. The only site for which we have information on local abundance is the Ni valley, where it is uncommon (*Pillon* pers. obs.). The extent of occurrence does not exceed 240 km<sup>2</sup>. As is the case for many species that grow in maquis on ultramafic substrates, the major threats to *P. xaragurensis* are fire and nickel mining. The risk from fire may be limited, however, because this species often grows along rivers and may be fire resistant, as is its apparently close relative *P. alaternoides* (*Jaffré et al.* 1998). Habitat loss due to mining has occurred around Thio and prospecting is currently taking place along the Forgotten Coast. Mining could also trigger a shift in the level of the water table and/or alter the flow of water courses, either of which would have a detrimental impact on the preferred habitat of *P. xaragurensis*. We therefore assign here a provisional threat status for *P. xaragurensis* of Vulnerable: VU B1ab(iii)+2ab(iii) following IUCN (2001).

**PHENOLOGY.** Buds, flowers, immature fruits and old fruits have been collected in October and November.

**ETYMOLOGY.** “Xaragure” is the name of the cultural area and language around and to the south of Thio, the geographical extent of which largely coincides with the distribution of this new species.

**NOTES.** Distinctive characters of *Pancheria xaragurensis* are its simple, oblong-elliptic or ovate-elliptic leaves with a minutely thickened, recurved margin that is evenly rounded between notches, and the 2° veins that are slightly prominent beneath. In addition, the stipules are narrow with strongly revolute margins, the distal half bending away from the shoot axis, and



**Fig. 4.** *Pancheria xaragurensis*. A leafy twig; B leafy twig with ♂ capitula; C interpetiolar stipule; D ♂ flower; E as D with part of perianth removed, showing vestigial gynoecium; F petal from a ♀ flower; G young fruit; H one ovary from G, showing attachment to other ovary (removed); J ovary opened out to show two ovules; K capitulum in fruit. A, F, G, H, J, K *Schlechter* 15135; B, C, D, E *Munzinger* 953. DRAWN BY PATRICIA K. R. DAVIES.

the capitula are small on slender, almost glabrous, peduncles. As commonly found in *Pancheria*, the male flowers are creamish white with white filaments and a sweet scent (field notes of Compton 2048 and Pillon 1231). The description of *P. xaragurensis* brings to 18 the number of species of *Pancheria* in New Caledonia that occur largely or exclusively on ultramafic soils, and a further nine are confined to non-ultramafic soils or occur on both soil types.

*Pancheria xaragurensis* shares several characters with *P. gatopensis*, *P. alaternoides* and *P. engleriana* Schltr. (see below). Its leaf shape is reminiscent of *P. gatopensis* but the latter has longer petioles (7–20 mm), ferruginous indumentum on the young stems and leaves, its stipules are broadly ovate to elliptic and usually flat, and its peduncles are thicker (1.5–2.5 mm diam.) and covered by ferruginous woolly-silky hairs. *P. gatopensis* has leaves in IIIs and is widespread on ultramafic soils in New Caledonia, although it has not been collected in the immediate vicinity of Thio nor from the Ngoye–Koum region of the Forgotten Coast.

Compared with *Pancheria xaragurensis*, *P. alaternoides* has leaves that are more narrowly elliptic and which taper  $\pm$  equally towards the base and apex, their margins are not minutely thickened and teeth/notches are absent from the basal part of the blade and where present, are usually acroscopic; its stipules, which are narrow and revolute, are usually straight. *P. alaternoides* has III–IV leaves per node and is common on ultramafic soils in southern Grande Terre, mostly at low to medium elevation, where it sometimes occurs near streams as well as in dry areas.

*Pancheria alaternoides* is one of a small group of species from ultramafic substrates that are often associated with water (the alaternoides group), the others being *P. communis* Baker f., which grows in marshy areas, and *P. elegans*, which occurs along streams and rivers. All three have long, narrow stipules and simple leaves commonly in IVs; they appear to be closely related to one another and they occasionally hybridise. *P. alaternoides* is the least hydrophilic and unlike the other two, sometimes has leaves in IIIs. *P. xaragurensis* clearly has both morphological and ecological characters in common with this group but also some minor differences, e.g. in the androecium (see below).

Collections of *Pancheria xaragurensis* that have previously been identified as other taxa are as follows:

1) Schlechter (1906) cited his collection 15135 as one of the syntypes of *Pancheria engleriana* var. *potamophila* Schltr., the epithet *potamophila* meaning river-loving. The name of this variety has now been lectotypified on the other syntype (Schlechter 15134) and put into the synonymy of *P. engleriana* (var. *engleriana*) (Hopkins & Bradford 2009). However, the confusion of specimens of these two species under one name by Schlechter suggests a superfi-

cial similarity between them, which includes the presence and nature of the indumentum on young parts, the shape of the stipules, and the stiff, rather erect leaves with a clearly visible reticulum. Although most species of *Pancheria* (including members of the alaternoides group) have twice as many stamens per flower as sepals (or as petals), four species have fewer than twice as many, including *P. engleriana* (K = 3, A = 2–4) and *P. xaragurensis* (K = 4, A = 4), the others being *P. phillyroides* Guillaumin (K = 3–4, A = 3–4) and *P. reticulata* Guillaumin (K = 4, A = 4–6). However, in general appearance *P. engleriana* and *P. xaragurensis* are markedly different from one another and most collections of the former have small, round leaves with few distal acroscopic teeth. With the exception of Schlechter 15134 which was collected at 50 m, *P. engleriana* is confined to forest on ultramafic soils at medium to high elevation (> 500 m and usually > 700 m) and it is not associated with streams or rivers.

- 2) Baker (1921), in his account of the “Saxifragaceae” collected by Compton in 1914, identified Compton 2048 as *Pancheria vieillardii* Brongn. & Gris, which is now treated as a synonym of *P. billardiieri* (D. Don) Pamp. (Hopkins & Bradford 2009). *P. billardiieri* has simple leaves in IIIs but they are less stiff than in *P. xaragurensis* with fewer teeth/notches, the stipules are elliptic or narrowly elliptic, not ladle-like, and its habitat is not riverine although it does occur on ultramafic as well as non-ultramafic soils.
- 3) Fragments on one sheet at K and another at P that are labelled *Deplanche 370* belong to *Pancheria xaragurensis*; a second sheet at P with this number (ex Herb. Drake) is a mixed collection including some material of *P. xaragurensis*. These specimens have previously been identified as *P. lanceolata* (Pamp.) Baker f. and *P. phillyroides*. Vieillard 2654 (P) is also a mixed gathering: fragment “A” matches the material of *P. xaragurensis* on *Deplanche 370* and five other fragments (“B”) remain unidentified. Vieillard wrote the unpublished epithet “*puberula*” on the label of this sheet.

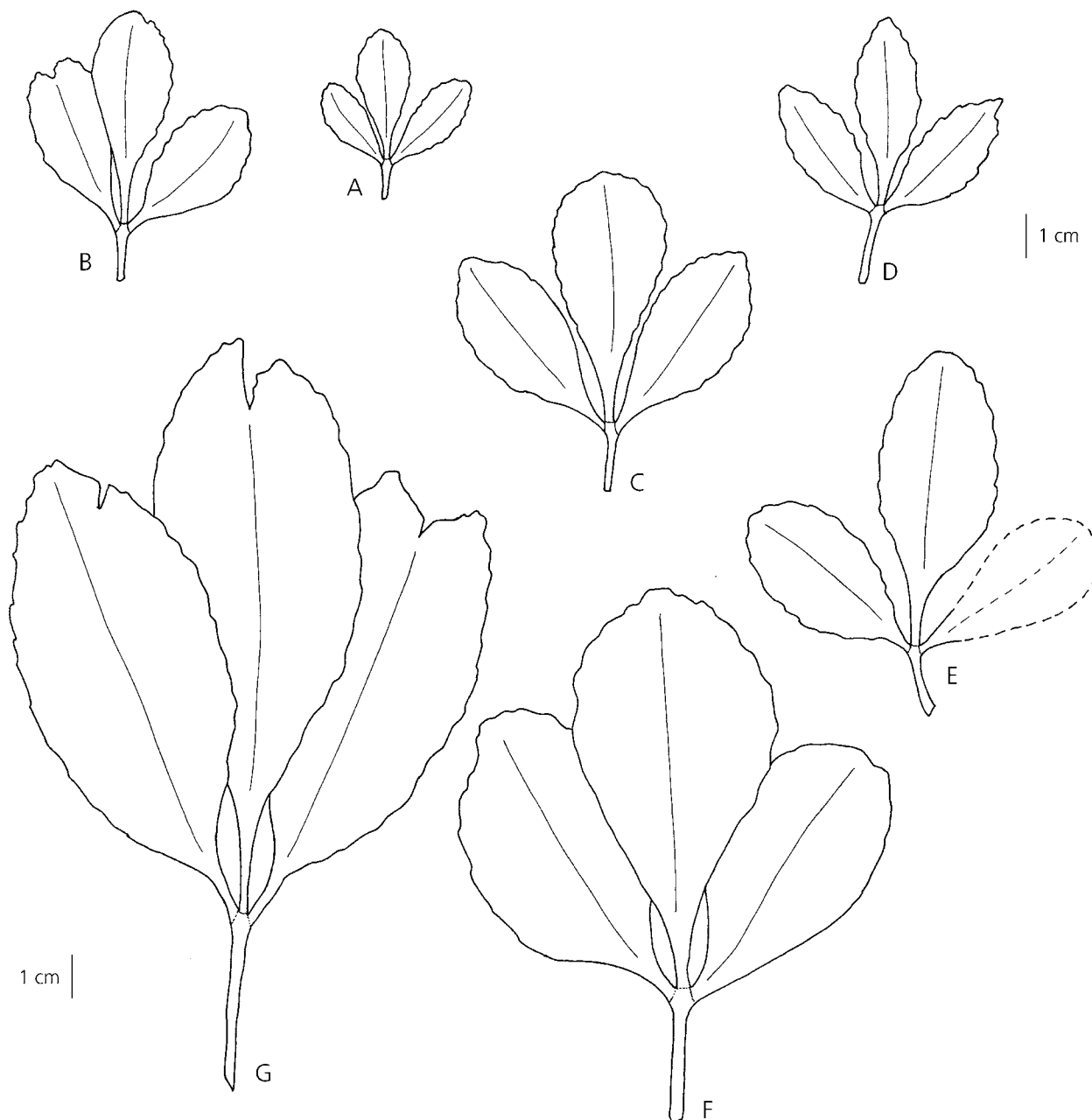
To our knowledge, few species besides *Pancheria xaragurensis* are restricted or nearly restricted to the Forgotten Coast although the area is still rather poorly known botanically. Among Cunoniaceae, *Codia fusca* (Schltr.) H. C. Hopkins has been collected from the valleys of the rivers Ngoye and Ni and from Haute Camboui. In other families, *Phyllanthus sylvicola* S. Moore appears to be restricted to the Forgotten Coast, and other rare species found only on the east coast south of Houailou (including the Forgotten Coast) include *Baloghia anisomera* Guillaumin (Euphorbiaceae *sensu stricto*), *Diospyros margaretae* F. White (Ebenaceae) and *Xylopija pallescens* Baill. (Annonaceae).

**Weinmannia dichotoma**

Hopkins & Hoogland (in Hopkins *et al.* 1998) put *Weinmannia monticola* Däniker into the synonymy of *W. dichotoma* Brongn. & Gris, a widely circumscribed taxon that is distinguished by having a combination of glabrous, 3-foliolate leaves with the margins serrate-crenate but not undulate (except on Mt Mou), an inflorescence of axillary dyads or occasionally triads (i.e.

two or three racemes on a sterile basal axis; see Bradford 1998; Hopkins & Bradford 1998) and dichotomous vegetative branching. *W. dichotoma sensu lato* is widespread in damp forest in Grande Terre and occurs on ultramafic soils (especially in the south) as well as non-ultramafic ones (e.g. in the north-east).

Within this general morphology, leaflet size and shape are variable (Fig. 5). The lectotype of *Weinmannia*



**Fig. 5.** *Weinmannia dichotoma*. Tracings of leaves to illustrate the range in size and shape for *W. dichotoma* var. *dichotoma* (A – E) and *W. dichotoma* var. *monticola* (F – G). A *McPherson* 3547, Mt Panié; B *Vieillard* 569, Balade, lectotype of *W. dichotoma*; C *MacKee* 14408, Mé Péou, Farino; D *MacDaniels* 2316, Mt Mou; E *Veillon* 213, Col des Roussettes; F *Suprin* 1278, Thy; G *MacKee* 39426, Mt Ningua. DRAWN BY HELEN HOPKINS.



*dichotoma* (Vieillard 569, see below) has medium-sized, obovate leaflets whereas the type of *W. monticola* (Däniker 1812), from the same region of Grande Terre, has larger, more elliptic leaflets with a more crenate margin, with the terminal ones narrowing ± abruptly into a petiolule. Collections with leaves smaller than those of Vieillard 569 have narrowly elliptic to obovate leaflets with the terminal one typically narrowing gradually towards the base.

Although the majority of specimens can be separated into large or small to medium-sized leaf forms, as noted by Hopkins *et al.* (1998), intermediates do occur. Leaflet shape does not correlate exactly with size and the length-to-breadth ratio of terminal leaflets is similar irrespective of size. Specimens with larger leaflets sometimes have triads and they generally occur at low to mid-elevation (300 – 850 [– 1300] m) whereas those with smaller leaflets always have dyads and their altitudinal range covers almost the full range of the species (500 – 1600 m).

No other differences in morphology, habitat or distribution were found that correlate with leaflet

size, and no gradation in characters was detected in relation to geography, altitude or ecology. However, names would be useful to refer to material with large or medium to small leaflets and so we are treating the entities *dichotoma* and *monticola* as differing at varietal level, requiring the publication of a new name.

**Weinmannia dichotoma** Brongn. & Gris var. **monticola** (Däniker) H. C. Hopkins & Pillon **comb. et stat. nov.**

<http://www.ipni.org/urn:lsid:ipni.org:names:77115452-1>

*Weinmannia monticola* Däniker in *Vierteljahrsschr. Naturf. Ges. Zürich* 76 = *Mitt. Bot. Mus. Zürich* 137: 165 (1931); Guillaumin (1941: 248); Guillaumin (1948b: 140); Bernardi (1964: 194). Type: New Caledonia, west slope of Mt Ignambi, 6 June 1925, fl., Däniker 1812 (lectotype Z 000005158!, **selected here**; islectotype Z 000005159!).

### Key to the varieties of *Weinmannia dichotoma*

1. Leaflets on fertile stems obovate and comparatively narrow, small to medium-sized, the terminal one 3.5 – 5.5 (– 6.5) × 1.2 – 3 cm, including petiolule if present. Inflorescence of axillary dyads..... **W. dichotoma** var. **dichotoma**
- 1'. Leaflets on fertile stems obovate or elliptic, larger and broader, the terminal one (6.5 –) 7 – 10.5 × (2.6 –) 3.2 – 4.3 cm, including petiolule. Inflorescence of axillary dyads and/or triads..... **W. dichotoma** var. **monticola**

**NOTES.** The protologue of *Weinmannia dichotoma* (Brongniart & Gris 1862) mentioned two collections, Vieillard 569 and Vieillard 570, both with the locality Balade. Although collection dates were not given, the date of the protologue suggests that they must have been collected between 1855 and 1860, rather than 1861 – 1867. (Vieillard's specimens from New Caledonia generally have labels with one of these two date ranges printed on them.) Bernardi (1964) cited only Vieillard 569 (P) as the "typus" for *W. dichotoma*; based on this, Hopkins & Hoogland (in Hopkins *et al.* 1998) ascribed the lectotypification of this name to Bernardi. However, three sheets of Vieillard 569 at P have the locality Balade and the dates 1855 – 1860. The one labelled as the lectotype by Hoogland in 1983 is cited here as the nomenclatural type and the lectotypification is now ascribed to him. The remaining sheets at P were labelled by Hoogland as syntypes, suggesting that he was doubtful that they were part of the same gathering; however, their leaves are similar to those of the lectotype and they are designated here as islectotypes. A sheet at K with the same label data has larger leaves and is unlikely to be part of the same gathering, so it is excluded from being an islectotype.

**Weinmannia dichotoma** Brongn. & Gris, *Bull. Soc. Bot. France* 9: 73 (1862). Type: Balade, 1855 – 1860, fl., Vieillard 569 p.p. (lectotype (of Hoogland) P 00602367!, **selected here**; islectotypes P 00602369!, P 00602370!). Lectoparatypes: Balade, 1855 – 1860, fl., Vieillard 569 p.p. (K); Balade, 1855 – 1860, fl., Vieillard 570 (P 00602368!, P00602371!, P00602372!; also B, LE *vide* Bernardi 1964).

### Acknowledgements

Herbarium facilities were kindly provided by K, NOU and P, and we are grateful to BM for the loan of specimens and to Z for an image not available on their website. The expedition to the Forgotten Coast ("Côte Oubliée") was supported by the Direction de l'Environnement de la Province Sud (DENV) and Pillon thanks the other participants in the expedition for their assistance in the field. Pillon also thanks the members of the botanical laboratory at IRD, Nouméa for their help and advice, and particularly Laure Barrabé for the excellent collections and photographs of Cunoniaceae from Ile Art and Frédéric Rigault for producing the distribution map of *Geissois pruinoso*. Field

work by Hopkins was funded by the EU Human Capital and Mobility Fund, the National Geographic Society (via a grant to Jason Bradford) and a TOBU grant from the Royal Botanic Gardens, Kew, and she thanks Jason Bradford, Bruno Fogliani and Barry Donovan for collaboration in the field. At Kew, we are indebted to Katherine Challis and Melanie Thomas for translating the diagnoses into Latin, to Dick Brummitt for nomenclatural advice, and to Patricia K. R. Davies and Margaret Tebbs for the illustrations of new species. We are grateful to two reviewers for helpful comments on the manuscript.

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