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## **Kermadecia brinoniae (Proteaceae: Macadamieae), a new species from New Caledonia previously confused with *K. elliptica***

Authors: Hopkins, Helen C.F., and Pillon, Yohan

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# Kermadecia brinoniae (Proteaceae: Macadamieae), a new species from New Caledonia previously confused with *K. elliptica*

Helen C.F. Hopkins & Yohan Pillon

## Abstract

HOPKINS, H.C.F. & Y. PILLON (2019). *Kermadecia brinoniae* (Proteaceae: Macadamieae), a new species from New Caledonia previously confused with *K. elliptica*. In English, English and French abstracts. *Candollea* 74: 85–92. DOI: <http://dx.doi.org/10.15553/c2019v741a9>

*Kermadecia brinoniae* H.C. Hopkins & Pillon (*Proteaceae*), which occurs in southern New Caledonia, principally on ultramafic substrates, is described and illustrated. Material of this species was previously included in *Kermadecia elliptica* Brongn. & Gris. An amended description is given for the latter and a lectotype designated. These two species differ in the prominence of the venation on the lower leaf surface and in their ecology. *Kermadecia brinoniae*, like other species of *Proteaceae* growing on ultramafic substrates of New Caledonia, has a relatively high content of manganese in its leaves. A revised key to the species of *Kermadecia* Brongn. & Gris is provided as well as notes on the morphology of the pollen presenter.

## Résumé

HOPKINS, H. C. F. & Y. PILLON (2019). *Kermadecia brinoniae* (Proteaceae: Macadamieae), une nouvelle espèce de Nouvelle-Calédonie auparavant confondue avec *K. elliptica*. En anglais, résumés anglais et français. *Candollea* 74: 85–92. DOI: <http://dx.doi.org/10.15553/c2019v741a9>

*Kermadecia brinoniae* H.C. Hopkins & Pillon (*Proteaceae*), du sud de la Nouvelle-Calédonie, essentiellement sur substrat ultramafique, est ici décrite et illustrée. Les spécimens de cette espèce ayant été auparavant inclus dans *Kermadecia elliptica* Brongn. & Gris, la description de ce taxon est revue et un lectotype est désigné. Ces deux espèces se distinguent par le relief des nervures sur la face inférieure des feuilles et leur écologie. Comme les autres espèces de *Proteaceae* se développant sur les substrats ultramafiques de Nouvelle-Calédonie, les feuilles de *Kermadecia brinoniae* ont une teneur élevée en manganèse. Une nouvelle clé d'identification des espèces de *Kermadecia* Brongn. & Gris est fournie ainsi qu'une discussion sur la présentation secondaire du pollen.

## Keywords

PROTEACEAE – *Kermadecia* – New Caledonia – New Species – Pollen Presenter – Taxonomy – Manganese – Serpentine flora

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Address of the authors:

HCFH: Herbarium, Dept. Identification & Naming, Royal Botanic Gardens, Kew, Richmond TW9 3AE, UK.

E-mail: [h.fortune-hopkins@kew.org](mailto:h.fortune-hopkins@kew.org)

YP: LSTM, IRD, INRA, CIRAD, Montpellier SupAgro, Univ. Montpellier, Montpellier, France.

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## Introduction

VIROT (1968) included four species of *Kermadecia* Brongn. & Gris (Proteaceae) in his account for *Flore de la Nouvelle-Calédonie et Dépendances*. This small genus is currently considered to be endemic to New Caledonia (SMITH & HAAS, 1975; SMITH, 1985; WESTON & BARKER, 2006; WESTON, 2007). According to VIROT (1968) and WESTON (2007), *Kermadecia* is characterised by having simple adult leaves and racemose inflorescences (conflorescences) in which the flowers are in pairs, borne either on free pedicels or sessile on a common peduncle. Each flower has an oblique receptacle, all the tepals are revolute at anthesis, and the hypogynous disk is anterior, crescentic or bilobed-oblong; the subsessile ovary contains two pendulous, collateral ovules and bears a straight or slightly curved style with a pollen presenter at the distal end. The drupaceous fruit has an outer mesocarp that is succulent (P. Weston, pers. comm.) or fibrous to coriaceous and the inner mesocarp (endocarp in VIROT, 1968) forms a hard, woody-bony layer (SMITH & HAAS, 1975). The most recent classification of the family places *Kermadecia* in the tribe *Macadamieae* Venk. Rao, subtribe *Gevuininae* L.A.S. Johnson & B.G. Briggs (WESTON, 2007).

In VIROT (1968)'s treatment, *Kermadecia elliptica* Brongn. & Gris had a broad distribution and ecology, occurring in the south of Grande Terre, on or near ultramafic substrates, and in the centre and north of the island, on non-ultramafic substrates. Species in New Caledonia with such broad distributions and ecologies may hide cryptic species (PILLON et al., 2009), and a number of morphological differences allow the separation of the northern populations of this taxon, to which the type of *K. elliptica* belongs, from the southern populations, which are placed here in a newly described species, *K. brinoniae* H.C. Hopkins & Pillon. Because VIROT (1968)'s concept of *K. elliptica* included more collections of *K. brinoniae* than of *K. elliptica* s.s., a new description and distribution map are also given for the latter. Unfortunately, VIROT (1968)'s illustration of *K. elliptica* did not give the details of the specimens from which it was drawn so it is unclear which species is (or are) represented. The adult foliage of both species is illustrated here in Fig. 1 to show the principal differences; the flowers and fruits are rather similar in both. The remaining species in this genus, *K. pronyensis* (Guillaumin) Guillaumin, *K. rotundifolia* Brongn. & Gris and *K. sinuata* Brongn. & Gris, were described and illustrated in VIROT (1968).

All material at P, K and BM was studied, plus some at NOU and G. Images of the collections at P, including types, were also viewed online (SONNERAT, 2019) and a search was made for other images of types using JSTOR Global Plants [http://plants.jstor.org]. GeoCAT (Geospatial Conservation Assessment tool; BACHMAN & MOAT, 2012) was used to derive the area of occupancy (AOO) and extent of occurrence (EOO)

for *K. brinoniae* and the provisional conservation assessment (see IUCN 2012, 2017) for this species uses these calculations.

## Key to the species of *Kermadecia*

1. Flowers sessile, paired, each pair on a short peduncle (to 2 mm long), peduncles arranged along the length of an otherwise unbranched inflorescence axis .. *K. pronyensis*
  - 1a. Flowers pedicellate (pedicels 8–16 mm long), arranged in collateral pairs along the length of a branched or unbranched inflorescence axis ..... 2
  2. Abaxial surface of adult leaves densely covered by a ferruginous indumentum of minute hairs; inflorescence axes robust ( $\geq 7$  mm diam. near the base) ..... *K. sinuata*
    - 2a. Abaxial surface of adult leaves glabrous or almost so; inflorescence axis less robust (3–4 mm diam. near the base) ..... 3
    3. Adult leaves with secondary and tertiary venation sharply raised on abaxial surface of blades; base of blades cordate ..... *K. brinoniae*
      - 3a. Adult leaves with secondary and tertiary venation slightly raised on abaxial surface of blades; base of blades obtuse, rounded or slightly cordate (rarely markedly cordate) ...4
      4. Main inflorescence axis unbranched ..... *K. elliptica*
        - 4a. Main inflorescence axis commonly with 2–4 side branches ..... *K. rotundifolia*

## Taxonomic Treatment

*Kermadecia brinoniae* H.C. Hopkins & Pillon, **spec. nova** (Fig. 1A–K).

**Holotypus:** NEW CALEDONIA. Prov. Sud: Thy River Valley, c. 12 air-km NE of Nouméa [22°14'S 166°32'E], 200 m, 12.X.1979, *McPherson 1945* (P [P02363286]); iso-: MO, NOU!, NSW).

*Kermadecia brinoniae* H.C. Hopkins & Pillon is most similar to *K. elliptica* Brongn. & Gris but differs by the more markedly raised venation on the lower leaf surface and by the base of the leaves, which is usually clearly cordate, rather than rounded, obtuse or weakly cordate.

Trees to 20 m tall, trunk to 30 cm diameter. Young twigs 4–7 mm diameter, with a dense covering of minute, ferruginous or greyish trichomes, these also present on the axillary buds and expanding adult leaves. Older twigs (proximal to the leaves) 5–8 mm diameter, glabrous, bearing some obscure lenticels and somewhat prominent heart-shaped to circular leaf scars. Bark brown, marked with grey and somewhat rough, or obscure, longitudinal furrows. *Leaves in seedlings* (based on *MacKee 16340* & 37333): simple, petiolate; petioles 2–5 cm long, slender, hairy; blades variable in shape in a single



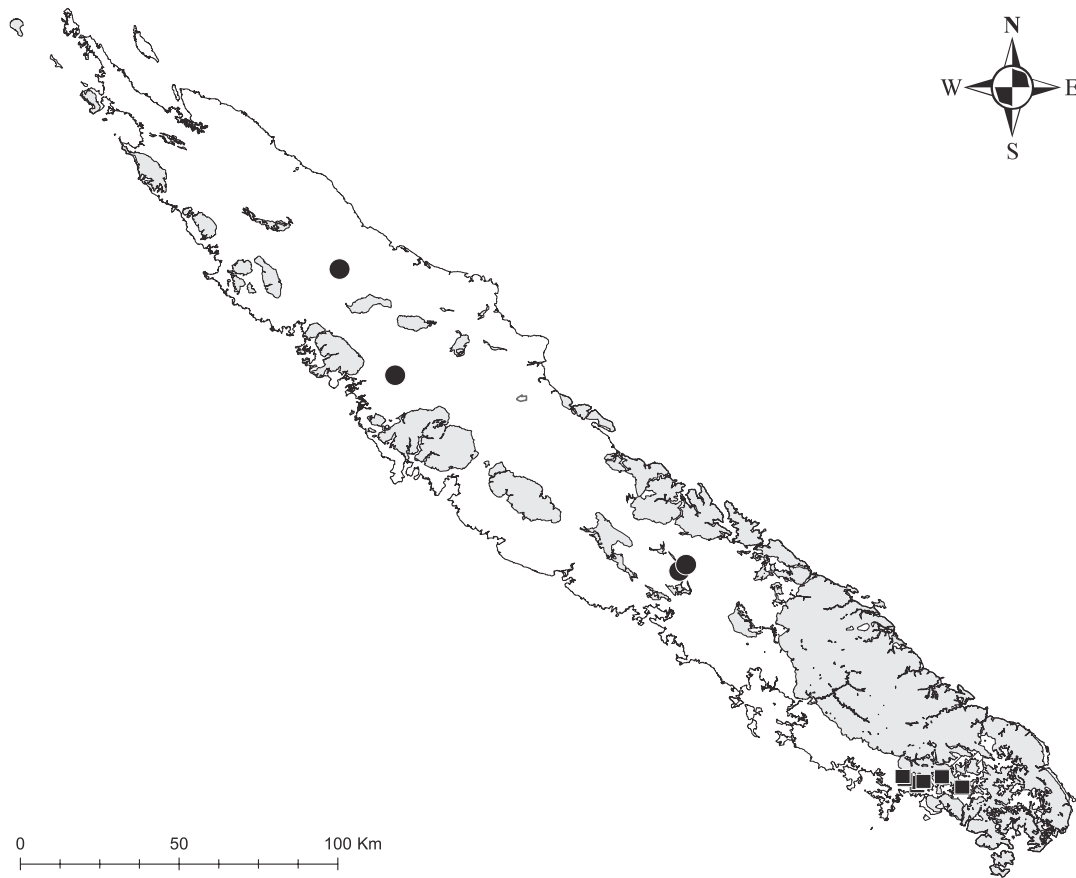
Fig. 1. – *Kermadecia brinoniae* H.C. Hopkins & Pillon (A–K) and *K. elliptica* Brongn. & Gris (L–M).

A. Vegetative shoot; B. Detail of leaf, abaxial surface, all veins raised except the finest branches, these shown as dotted lines; C. Inflorescence (total length 21.5 cm), showing flowers in pairs; D. Pair of flowers from C, each flower on a free pedicel (apex of axis to the left); E–F. Lateral and ventral view of opened flower with only one tepal remaining, to show the disc; G. Inner face of distal portion of tepal, showing a stamen; H–I. Apical and lateral views of mature fruit; J–K. L.S. and T.S. of mature fruit (black shading = very dense endocarp); L. Leaf, adaxial surface; M. Detail of L, abaxial surface, midrib and secondary veins raised, note numerous small areoles. [A–G: McPherson 1945, P; H–K: MacKee 16339, P; L–M: Vieillard 1106, K] [Drawing: Andrew Brown]

seedling, elliptic, ovate, obovate or rhomboidal to partly lobed, sometimes asymmetric,  $5.7 \times 2.8$  to  $14 \times 7$  cm, papyraceous; base variable, cuneate to cordate, symmetric or not; apex acute; margins coarsely toothed, more strongly so towards the apex, teeth apiculate; abaxial surface coarsely hairy on the veins. *Leaves in more advanced juvenile stages* (including regrowth foliage; based on MacKee 16020 & 37332) imparipinnate, petiolate; petioles 9–27 cm long, 4–5 mm in diameter near the base, finely pubescent to glabrescent. Lateral leaflets in 5–6 opposite pairs, proximal ones with petiolules c. 1 cm long, distal ones  $\pm$  sessile; blades ovate, oblong-elliptic or oblong,  $8.5\text{--}17 \times 4\text{--}9$  cm, base cordate or rounded, asymmetric and often oblique, apex acute-acuminate to somewhat truncate, margins entire or with a few coarse apiculate teeth towards the tip, papyraceous to coriaceous. Terminal leaflet similar in length to the most distal laterals, obovate to  $\pm$  round, sometimes asymmetric with a large lobe prefiguring a lateral leaflet, in symmetric leaflets base cuneate to subcordate, apex acute-acuminate, margins entire or with a few coarse apiculate teeth near the tip. *Leaves in adult plants* simple, petiolate; petioles 2–8.5 cm long, pulvinate at the base, terete above, with faint longitudinal striations and an indumentum of minute, curled, ferruginous (plus sometimes a few white) trichomes, glabrescent; blades oblong-elliptic, ovate, broadly ovate or elliptical-obovate,  $(6.2\text{--})9.5\text{--}18.5 \times (3.8\text{--})7\text{--}10.5$  cm, cordate at the base, rounded or broadly obtuse towards the apex, apex often retuse or splitting in older leaves, margins  $\pm$  entire to somewhat irregular or sinuate (rarely coarsely toothed distally); secondary veins c. 5–7 on either side of midrib, angle to midrib  $40\text{--}50^\circ$  in mid-part of leaf, venation brochidodromous; abaxial surface said to be light shiny green when fresh but commonly drying mid-brown, with scattered minute ferruginous or whitish trichomes on the midrib, secondary and tertiary veins (hairs c. 0.1 mm), intervenium and higher order venation almost glabrous, with minute “glands” (hair bases) associated with higher order venation, midrib markedly prominent for its entire length and usually sharply so, secondary, tertiary and at least some quaternary veins also sharply prominent, this readily visible in dried material; adaxial surface said to be dark shiny green when fresh, usually drying yellowish green except for youngest leaves which dry dark brown, glabrous except for some minute trichomes at the base of the midrib, midrib, secondary and tertiary venation flat or slightly indented, or tertiary and quaternary venation sometimes minutely raised, areoles visible or not in dried material. *Inflorescences*: axes either proximal to the leaves, arising singly on woody stems to 2 cm diameter or sometimes axillary (supra-axillary?), each axis 11–25 cm long  $\times$  3–5 mm diameter just above the basal attachment (which is broader), somewhat ridged longitudinally, unbranched, erect or somewhat spreading, the flowers opening simultaneously in any inflorescence (at least in herbarium material); pairs of free pedicels or their scars  $\pm$  evenly spaced

along the entire length of the axis, almost to its base; pedicels 13–16 mm long (–22 mm soon after flowering)  $\times$  1 mm diameter, terete, arising in collateral pairs, each pedicel subtended by a small, thick bract, or bracts fused (and then sometimes bract bilobed at the tip); pedicels oblique at their distal end, up to 4 mm longer on one side than the other; rachis, pedicels and bracts covered by a dense indumentum of minute, curled, ferruginous trichomes. *Flowers*: buds on the point of opening to 16 mm long, unequal and expanded at the base, then forming a narrow tube above ( $9\text{--}12 \times 1.5$  mm), and distal part globose ( $4 \times 4$  mm); apical lobes of tepals thick, each bearing a single anther with 2 thecae on the inner surface; outer surface of tepals covered by a dense indumentum of minute, ferruginous, curled trichomes, inner surface glabrous except at the margins and drying almost black except for the lobes which have a paler, granular surface; post anthesis, tepals splitting apart to the base of the flower,  $\pm$  spoon-shaped, all reflexed and/or somewhat curled; *anthers*  $2.5 \times 1$  mm, thecae dehiscing longitudinally, connective minutely prolonged at the apex; *disc* semi-circular or crescent-shaped around the base of the ovary, well developed on the side of the flower where the pedicel is shorter, lacking on the side where the pedicel is longer, glabrous, drying almost black; *ovary* cylindrical-conical, c.  $5 \times 1.5$  mm, gradually tapering into the style, outer surface with a dense indumentum of ferruginous trichomes, less curled than those on the outer surface of the tepals; *style* c. 13 mm long, slightly furrowed longitudinally, hairy towards the base with a few scattered hairs distally, drying almost black, straight except for the distal 2 mm which are often narrower and slightly bent and sometimes flattened on the lower surface in flowers post anthesis, forming a densely hairy pollen presenter at anthesis, the hairs readily breaking off. *Fruits* when fresh: epicarp shiny black when ripe (fide MacKee 16339), outer mesocarp quite thick and fibrous or succulent, inner mesocarp very hard; dried fruits (MacKee 16339) appearing hard, woody, with the surface  $\pm$  smooth to slightly corrugated, sometimes developing a few irregular fissures associated with the corrugations (artefact of drying),  $4.5\text{--}4.8 \times 2 \times 2.5$  cm, elliptic-obovate and inequilateral in lateral view, evenly curved along the ventral line, slightly angled distally along the dorsal line; base cuneate with the scar almost centrally placed, 4 mm in diameter; blunt towards the apex, apex with a small mucro (remnant of the style-base) located towards the ventral margin; in cross-section, inner mesocarp  $\pm$  trullate, angled especially at the dorsal line.

*Etymology*. – The epithet of this new species honours Helen Brinon, who had a keen interest in the New Caledonian flora and who collected more than 800 numbers between 1976 and 1987, mostly from the Thy (or Thi) Valley, where *K. brinoniae* has been found. Helen Brinon was British but a long-term resident in New Caledonia, where she was the wife of Marcel Brinon, who worked for the Service des Eaux et Forêts de



**Fig. 2.** – Map showing the distribution of *Kermadecia brinoniae* H.C. Hopkins & Pillon (open squares) and *K. elliptica* Brongn. & Gris (solid circles, omitting collections by Vieillard as the localities are imprecise). Areas with ultramafic substrates are shown in grey.

la Nouvelle-Calédonie. Before coming to New Caledonia, she had done ethnobotanical work in the north of Australia (T. Jaffré pers. comm.; G. McPherson, pers. comm.; MORAT, 2010).

*Distribution, habitat and phenology.* – This species is a rainforest tree known from only a few localities in the south of Grande Terre, New Caledonia (Fig. 2). The substrate is either ultramafic or unclear, in areas where a mosaic of rocks is known to occur.

Buds have been collected from October to December, flowers in October and November and mature fruit in January.

*Conservation status.* – The new species is known from 4 or 5 populations, only one of which occurs within a protected area (Réserve naturelle de la Vallée de la Thy). Its habitat, rainforest, is fragmented and declining because of fire. Dispersal of this large-fruited, large-seeded taxon may be problematic because of hunting pressure on its putative dispersers (flying foxes and New Caledonian Imperial Pigeons). *Kermadecia brinoniae* will be evaluated by the New Caledonia Red List Authority but would probably qualify as “Endangered”

[EN B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v)] under the IUCN Red List Categories and Criteria (IUCN 2012, 2017), based on its AOO of 30 km<sup>2</sup> and EOO of 20 km<sup>2</sup> and the fact that it is known from fewer than 10 locations.

*Notes.* – In *K. brinoniae*, the secondary, tertiary and at least some quaternary veins are sharply raised on the lower surface of the leaf blades in adult leaves, whereas on the lower leaf surface of *K. elliptica*, the secondary veins are less strongly raised, and the tertiary and higher order venation are flat or almost so. In *K. brinoniae*, the areoles are typically less visible in dried material than they are in *K. elliptica* and the base of the blade is clearly cordate, whereas in *K. elliptica* it is rounded, obtuse or scarcely cordate and often slightly unequal. The two species also occur on different substrates, *K. brinoniae* on ultramafic ones or mosaics including ultramafic, and *K. elliptica* on non-ultramafic substrates.

The following details of floral colour have been noted on specimen labels: *MacKee 29240*, tepals brown on outside, yellow inside; ovary brown, style greenish yellow; *MacKee 37331*, tepals in full bloom pale yellow with reddish pubescence on the outside; *McPherson 1945*, perianth brownish yellow

outside, cream-coloured within; style brown at base, green distally, apex cream-coloured, often with a central purple dot.

Measurements with a handheld X-Ray Fluorescence (XRF) spectrometer (GEI et al., 2018) indicated that *K. brinoniae* can accumulate a moderate amount of manganese in its leaves: 665  $\mu\text{g g}^{-1}$  in *MacKee 16019*, 769 in *Sarlin 75*, 906 in *MacKee 5284*, 1233 in *MacKee 16399*, and 2158 in *MacKee 29240*. The accumulation of manganese is a typical characteristic of New Caledonian *Proteaceae* growing on ultramafic substrates (JAFFRÉ, 1979). According to JAFFRÉ (1980), 21 % of the species growing on ultramafic substrates in New Caledonia have a leaf Mn concentration exceeding 1000  $\mu\text{g g}^{-1}$ , thus, the Mn content of *K. brinoniae* is not unusual considering its ecology.

*Paratypes*. – NEW CALEDONIA. Prov. Sud: Thy, upper Home Track, 250 m, 12.X.1980, buds & old fl., *Brinon 873* (NOU); Robinson, forêt “Lavoix”, 14.XI.2011, buds, *Chambrey [leg. S. Grenda et al.] 130* (NOU); Forêt “Demazures”, 14.XI.2011, old fl., *Chambrey [leg. S. Grenda et al.] 131* (NOU [2 sheets]); Forêt de la Thy, 20.XII.1983, seedling, *Lauri 116* (NOU); Vallée de Thy, slope towards Mt Koghi, 300–400 m, 22.IX.1956, buds, *MacKee 5284* (BM, K, P); Pente au N de la Conception, 200–400 m, 6.XII.1966, buds & old fl., *MacKee 16019* (K, NOU, P [2 sheets]); *ibid. loco*, rejet du tronc (see *MacKee 16019*), *MacKee 16020* (K, NOU, P [2 sheets]); Pente au N de la Conception, 200 m, 23.I.1967, fr. & st., *MacKee 16339* (K [1 sheet, carpo.], NOU, P [2 sheets, carpo.]); *ibid. loco*, seedling, *MacKee 16340* (P); Route de Yate, Les Dalmates, 150 m, 8.IX.1974, fl., *MacKee 29240* (NOU, P); Forêt de Thy, 100 m, 21.IX.1979, fl., *MacKee 37331* (K, NOU, P); *ibid. loco*, juv. lvs., *MacKee 37332* (NOU, P [2 sheets]); *ibid. loco*, seedling, *MacKee 37333* (NOU, P); Forêt de Thy, s.d., buds & fl., *Sarlin 75* (P [2 sheets]).

*Kermadecia elliptica* Brongn. & Gris in Bull. Soc. Bot. France 10: 228 (Fig. 1L–M).

**Lectotypus** (designated here): NEW CALEDONIA. Prov. Nord: “Balade”, 1855–1860, *Vieillard 1104* (P [P00607467]); isolecto-: P [P00607468]).

*Trees* to 10 m tall, trunk to 40 cm diameter. Young twigs 4–6 mm diameter, with a dense covering of minute, light ferruginous trichomes (turning straw-coloured when old), these also present on very young adult leaves, quickly or slowly glabrescent. Older twigs 5–7 mm diameter, glabrous, bearing pale lenticles and somewhat prominent heart-shaped to circular leaf scars. Bark light brown and somewhat rough (*MacKee 17744*). *Leaves in seedlings* unknown. *Leaves in more advanced juvenile stages* (based on *Vieillard 1104 p.p.*) imparipinnate, petiolate; petiole to 8–12 cm long, 2–3 mm in diameter near the base, slender, finely hairy to glabrous. Lateral leaflets 4–6, opposite or alternate, shortly petiolulate (petiolule  $\leq$  5 mm) to subsessile; blades oblong-elliptic, increasing in size distally along the rachis from 4  $\times$  1.8 cm to 11.5  $\times$  4 cm, base asymmetric, usually oblique, apex acute to obtuse, margins entire, glabrous on both surfaces,  $\pm$  coriaceous. Terminal leaflet ovate or markedly asymmetric with a large lobe prefiguring a lateral

leaflet, symmetric leaflets c. 15  $\times$  8.5 cm. *Leaves in adult plants* simple, petiolate; *petioles* 3–8 cm long, pulvinate at the base, terete above, with longitudinal striations, either glabrous or with a dense indumentum of minute, light ferruginous to straw-coloured, curled trichomes especially towards the base, glabrescent; *blades* elliptic, 6.5–12.5(–16)  $\times$  3.7–7(–8.5) cm, rounded or broadly obtuse at the base and often somewhat unequal, rounded or obtuse towards the apex (sometimes damaged), apex minutely retuse, margins somewhat irregular, sinuate (or sometimes coarsely toothed); secondary veins 5–6(–9) on either side of midrib, sometimes a few less well developed than others, angle to midrib 40–50° in mid-part of leaf; venation brochidodromous; abaxial surface said to be light green when fresh but commonly drying light brown, glabrous throughout, midrib prominent especially towards the base, secondary veins slightly prominent, tertiary and higher order veins flat or almost so in dried material; adaxial surface said to be dark shiny green when fresh, drying mid-green, sometimes with blotches of yellow-green, glabrous throughout, midrib, secondary and other venation  $\pm$  flat, areoles usually clearly visible in dried material. *Inflorescence*: axes proximal to the leaves, arising singly or in pairs on woody stems 1–1.5 cm diameter, each axis 18–25 cm long  $\times$  4 mm diameter just above the basal attachment (which is broader), somewhat ridged longitudinally, unbranched, erect or somewhat spreading, the flowers either all opening simultaneously or the basal flowers opening first; pairs of free pedicels or their scars  $\pm$  evenly spaced along the entire length of the axis, almost to its base; pedicels 8–9 mm long (–13 mm soon after flowering)  $\times$  1 mm diameter, terete, arising in collateral pairs (rarely singly or pedicels fused in pairs), each pedicel subtended by a small bract, or bracts fused in pairs; pedicels oblique at their distal end, c. 2.5 mm longer on one side than the other; axis and pedicels covered by a dense indumentum of minute, curled, light ferruginous trichomes. *Flowers*: buds on the point of opening 15–18 mm long, unequal and expanded at the base especially on one side, then forming a narrow tube above (10–12  $\times$  1.5 mm), and distal part globose (4  $\times$  4 mm); apical lobes of tepals thick, each bearing a single anther with 2 thecae on the inner surface; outer surface of tepals covered by a dense indumentum of minute, ferruginous or straw-coloured, curled trichomes, inner surface glabrous except along margins and drying reddish black except for the lobes which have a paler, granular surface; post anthesis, tepals splitting apart to the base of the flower, spoon-shaped, all reflexed and/or somewhat curled; *anthers* c. 2  $\times$  1 mm, thecae dehiscing longitudinally, connective minutely prolonged at one or both ends; *disc* semi-circular or crescent-shaped around the base of the ovary, well developed on the side of the flower where the pedicel is shorter, lacking on the side where the pedicel is longer, glabrous, drying almost black; *ovary* cylindrical-conical, 4.5  $\times$  1.5 mm, gradually tapering into the style, outer surface with a



dense indumentum of ferruginous trichomes, somewhat less curled than on the outer surface of the tepals; style 12–14 mm long, furrowed longitudinally when dry, hairy towards the base and glabrous above, drying almost black, straight or slightly curved, distal 2 mm forming a  $\pm$  clavate, densely hairy pollen presenter. *Fruits* (based on Pillon 1171): epicarp smooth; fruit c. 4.7  $\times$  2.8 cm, obovate and inequilateral in lateral view, evenly curved along the ventral line, more markedly curved along the dorsal line and slightly angled distally; base cuneate with attachment scar oblique; blunt towards the apex with a small mucro (remnant of the style-base) located towards the ventral margin; shape in cross-section not determined.

*Distribution, habitat and phenology.* – *Kermadecia elliptica* is endemic to Grande Terre, New Caledonia and occurs in the north-east and central parts of the island (Fig. 2), in forest on non-ultramafic substrates.

Buds have been collected in December, flowers in August and September, and mature fruits in March, but further collections are needed with the precise date of collection.

*Notes.* – VIROT (1968) remarked on the similarity between *Kermadecia elliptica* (including *K. brinoniae*) and *K. rotundifolia*, and the need to have specimens with inflorescences and mature flowers in order to distinguish between them. Both *K. elliptica* and *K. rotundifolia* have glabrous or almost glabrous leaves in which the tertiary and quaternary venation are scarcely raised to  $\pm$  flat on the abaxial surface and the leaf bases are rounded or obtuse to slightly cordate (rarely distinctly cordate in *K. rotundifolia*). *Kermadecia elliptica* is distinguished from *K. rotundifolia*, with which it is sympatric, by the main inflorescence axes, which are usually branched (i.e. a panicle of racemes of flower-pairs) in *K. rotundifolia* and unbranched (a simple raceme of flower-pairs) in *K. elliptica*. However, the field notes of McPherson 2977 from Mt Panié state that both branched and unbranched inflorescences can occur on the same plant. Although VIROT (1968: 80) mentioned a few other small differences between these two species, we may eventually find that they are insufficient to retain the two as distinct.

The field notes of MacKee 17744 record the colour of the flowers in *Kermadecia elliptica* as very pale brown.

In the protologue of *Kermadecia elliptica*, BRONGNIART & GRIS (1863) gave the following information: “*Arbor; crescit in silvis montium Novae Caledoniae prope Balade (Vieillard, n° 1104)*”. It is well known that Vieillard used numbers to indicate material that he considered all belonged to a single species, rather than to refer to individual gatherings, and that label data were repeatedly copied for duplicate specimens, leading to the possibility of errors and omissions.

Several sheets at P and elsewhere bear the collector’s name and number *Vieillard 1104* and all those we have seen

are sufficiently alike to be conspecific. However, not all are part of the type. Only material of *Vieillard 1104* from Balade dated “1855–60” can be considered as types because those specimens with labels showing they were collected in the period “1861–67” would not have been in Paris in 1863 at the time the name was published. The lectotype and isolectotype indicated above, with the locality Balade and the date 1855–1860, both have adult leaves and racemes of flowers either at anthesis or with the perianth fallen and they are sufficiently similar to each other to be considered part of the same collection.

Sheet P00607471 (ex Caen) also indicates the locality “Balade” but has no date and gives the number as “1104 = 1106”. It has adult leaves but the flowers are in bud so it is not certain that it is part of the same collection as the lectotype and thus it is excluded from being an isolectotype. Sheets P00607470 and P00607469 both consist of pinnate juvenile or regrowth leaves and old flowers. Sheets at HBG and MPU both give the locality of “Wagap” and the date “1861–67”; they have adult leaves and flowers in bud, as does a sheet at BM. These last five sheets, with the locality Wagap or without a locality, are excluded from being part of the type material.

Material of *Vieillard 1106* is conspecific with *1104* but does not form part of the type. At P, this material comprises three sheets with different localities and phenology. Other sheets of *Vieillard 1106* are present at G, K, and L (see additional material examined).

*Additional material examined.* – NEW CALEDONIA. Prov. Nord: Haute Koné, Plateau de Tango, 350 m, 17.X.1967, buds, MacKee 17744 (K, P [2 sheets]); Haute Temala, Poami, 700 m, 26.VIII.1976, fl., MacKee [leg. Cherrier] 31855 (P [2 sheets]); Wagap, collines de Torio, 1861–1867, juv. lvs & fl., *Vieillard 1104* (P [P00607470]); *sine loco*, s.d., juv. lvs & fl., *Vieillard 1104* (P [P00607469]); Wagap, 1861–1867, buds, *Vieillard 1104* (HBG [HBG508307], MPU [MPU108875]); Ad Wagap, s.d., buds & y.fr., *Vieillard 1104* (BM); Balade, s.d., buds, *Vieillard 1104 = 1106* (P [P00607471]); Ad montes prope Wagap, 1864, fl., *Vieillard 1106* (P [P00607479]); *ibid. loco*, 1861–1867, old fl., *Vieillard 1106* (G, P [P00607478]); *ibid. loco*, s.d., st., *Vieillard 1106* (L [L0039609]); *ibid. loco*, s.d., buds, fl. & juv. lvs, *Vieillard 1106* (K [K000736961]); Montagne de Diaue, 1855–1860, buds, *Vieillard 1106* (P [P00607477]); *sine loco*, s.d., juv. lvs & old fl., *Vieillard 1106* (K). Prov. Sud: Col d’Amieu, Mé Aravera, 18.IX.1989, fl., MacKee [leg. Harbulot] 44619 (NOU, P [2 sheets]); Col d’Amieu, 21°34’21”S 165°49’39”E, 28.III.2008, fr., Pillon et al. 1171 (NOU).

### Note on the pollen presenter and stigma in *Kermadecia*

As in most *Proteaceae*, the distal part of the style in *Kermadecia* forms a pollen presenter (LADD, 1994); however, *Kermadecia* is one of a small minority of genera in this family in which this structure is covered by readily detachable trichomes (LADD et al., 1998). The pollen is deposited from the anthers onto these trichomes in late bud-stage, prior to the separation of the tepal lobes; after anthesis, when the tepal lobes have parted, the trichomes are thought to aid the process of self-pollen removal by detaching from the presenter (LADD et al., 1998),



presumably when the pollen adheres to the body of a pollinator. In *Kermadecia*, as well as in the closely related genera *Turrillia* A.C. Sm. and *Sleumerodendron* Viro, the trichomes appear dark red and translucent in herbarium material, and larger ones are multicellular, the individual cells being circular to elliptic in side view. It is not known whether these structures have spiral wall-thickenings similar to those found by LADD et al. (1998) in the detachable trichomes on the pollen presenters of three other genera of *Proteaceae* that are not closely related to *Kermadecia*.

The pollen presenter in *Kermadecia* corresponds to the distal 2 mm or so of the style and was described as claviform or subcapitate by VIROT (1968) and symmetrically clavate by SMITH & HAAS (1975); these authors referred to it as the stigma. However, only in *K. pronyensis* is it distinctly clavate and in herbarium material of the remaining species, with flowers at and post anthesis, when the trichomes have mostly gone, the pollen presenter is  $\pm$  cylindrical and either slightly constricted relative to the style, slightly wider than the style, or the widest point is the junction between the presenter and the style (collar); the surface bearing the trichomes extends down the style more in one region (ventral surface?) than elsewhere. LADD (1994) indicated diagrammatically that the stigmatic surface in *Kermadecia* covers the style tip, distal to the region bearing the trichomes, but in many flowers, the trichomes appear to extend to the style tip. VIROT (1968) described the apex of the style as bilobed in most cases but this was not confirmed by us, and the style tip usually appears  $\pm$  rounded in dry material, although a small, trichome-lined pore is visible at the apex in a few specimens (e.g. *MacKee* 31855, *K. brinoniae*; *MacKee* 19623, *K. rotundifolia*), perhaps corresponding to the central purple dot mentioned in the field notes of *McPherson* 1945 (see above). More detailed investigation of the pollen presenter and stigmatic surface is needed for this genus, preferably in fresh material.

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