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Three new species of *Planchonella* Pierre (Sapotaceae) with a dichotomous and an online key to the genus in New Caledonia

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**ABSTRACT**

In spite of a recent publication of eight new species of *Planchonella* (Sapotaceae) from New Caledonia, three additional novelties are here described and illustrated (*P. cauliflora*, *P. ericiflora*, and *P. minutiflora*). *Planchonella cauliflora* was discovered in 2006 near La Foa and is the first and sole member in the archipelago with a cauliflorous inflorescence, a genus otherwise having axillary flowers (rarely ramiflorous). The other two were discovered among herbarium material but not earlier identified as new. A recent suggested hypothesis (Swenson et al. 2007b) that fruit morphology indicates phylogenetic relationships within *Planchonella* is supported. A ridged fruit with acuminate apices and a short style place *P. cauliflora* in their Clade D1, a clade confined to New Caledonia. Fruits of *P. minutiflora* are unknown, but based on ITS sequence data it belongs to the same clade as *P. cauliflora* and it is predicted that the fruit is similar. Molecular sequences of *P. ericiflora* are still missing, but based on a pear-shaped fruit, round apices and a fairly long style, we believe it is closely related to a different clade of *Planchonella* that is also restricted to New Caledonia. All three species have very narrow distributions and match the criteria of the IUCN red list as Critically Endangered. *Planchonella* contains henceforth 36 species in New Caledonia to which we here provide a diagnostic and an interactive online key under Xper2, available at ftp://ftp.ird.nc/pub/outgoing/biologie/herbier-nou/.

**KEY WORDS**

Sapotaceae, *Planchonella*, Xper2, IUCN status, New Caledonia, new species.
**INTRODUCTION**

New Caledonia is recognized worldwide as a “hotspot” for its terrestrial (Myers 1988; Myers et al. 2000) and marine biodiversity (Roberts et al. 2002). Its very peculiar flora was noticed early by the French botanist Balansa (1873a, b), and some of his successors have attributed the flora a special status such as “New Caledonian Sub-Region” (Thorne 1963), “New Caledonian Region” (Good 1964) or “New Caledonian Sub-Kingdom” (Takhtajan 1969). Guillaumin (1921), for example, stated that the “Flora of New Caledonia is strongly characterized by the special development of Cunoniaceae, Araliaceae and Sapotaceae.” The latter family was first to be treated in the *Flore de Nouvelle-Calédonie et Dépendances* (Aubréville 1967). At that time, 80 species were recorded and several, such as *Pyenandra (?) paniensis* Aubréville, were described on poor or even sterile material. As a consequence, our knowledge of species and generic limits of Sapotaceae in New Caledonia remained unsatisfactory.

Three decades later, Sapotaceae were considered as the seventh biggest family of dicotyledons in New Caledonia, including the 80 species listed by Aubréville and three undescribed species (Jaffré et al. 2001). Two were well known and given provisional numbers such as “*Planchonella* sp1 Veillon 6585” and “*Leptostylis* sp1 Veillon 6850” (Bouchet et al. 1995), and even given IUCN status in order to allow protection of these undescribed taxa (Jaffré et al. 1998). Ecological studies during the 1990s in rainforests of New Caledonia revealed many troubles with species identification of Sapotaceae, many collections remained undetermined or referred to as supposed new taxa (Jaffré & Veillon 1990, 1995). A revision of the family...
in the region was strongly needed; this is why we seriously embarked on systematic and phylogenetic studies of Sapotaceae in 2002. One main problem of Sapotaceae classification in Australasia emerged when Pennington (1991) lumped *Planchonella* Pierre with *Pouteria* Aubl. Both van Royen (1957) and Aubréville (1967) recognized *Planchonella*, but Pennington’s view was adopted in the checklist of the family (Govaerts et al. 2001). Nevertheless, subsequent phylogenetic studies based on both molecular and morphological data have shown that *Planchonella* is a monophyletic group, not at all related to *Pouteria* which is (as far as known) restricted to tropical America (Bartish et al. 2005; Swenson & Anderberg 2005; Triono et al. 2007; Swenson et al. 2007a).

*Planchonella* circumscribes 60 species of trees and shrubs with a distribution range from the Seychelles in the west to Tahiti in the east, and with a diversification centre in Australasia. The latest contribution to *Planchonella* systematics put forward a molecular phylogeny, an amended generic circumscription, and eight new species from New Caledonia (Swenson et al. 2007b). However, recent field and herbarium work in the archipelago has identified three additional taxa not recognized earlier. Also, Swenson et al. (2007b) showed that there are three main evolutionary lineages within the genus (clades D1-D3, their fig. 1) and suggested that fruit morphology may indicate phylogenetic relationships. They suggested that species with a ridged fruit, almost no pulp, acuminate apex, and short style most often distinguish Clade D1; a flesher, apple-like fruit with retuse apex and short style is characteristic for Clade D2; and fruits that are generally smaller, round, poor in pulp, and an apex that is non-acuminate would fit Clade D3.

The purpose of this paper is to describe and illustrate these three species, each with a conservation assessment (IUCN 2001; IUCN & SSC 2005), and to discuss their phylogenetic relationships based on unpublished nrDNA data and/or fruit morphology. We finally provide botanists, ecologists, and conservationists with a new diagnostic key and an interactive online key, available at ftp://ftp.ird.nc/pub/outgoing/biologie/herbier-nou/, based on the software Xper2 (Chalubert et al. 2006), available at http://lis.snv.jussieu.fr/apps/xper2/.

**SYSTEMATICS**

**Genus Planchonella** Pierre

**REMARKS**

Swenson et al. (2007b) provided an updated nomenclature and a revised generic description of *Planchonella*. This description and common generic characters are not reiterated here for the new taxa, morphological terminology follows Harris & Harris (1994).

**Planchonella cauliflora**

Munzinger & Swenson, sp. nov.  
(Fig. 1)

*Species haec Planchonellae luteocostatae affinis sed inflorescentiis caulifloris, fructibus majoribus, foliis majoribus et corollis carneis differt.*


**DESCRIPTION**

Small tree reaching 8-10 m high, 20 cm in diameter, bark grey, often with burls; young twigs grey, glabrous, old twigs dark with few lenticels. Leaves dark green above, light green below, clustered at tips of branches, obovate-oblanccolate, 15-17 x 4-6(-8) cm (juvenile up to 20 cm long), glabrous; brochidodromous venation, secondaries of 14-17 pairs (up to 20 in juvenile), tertiaries reticulate, somewhat parallel near midvein; petiole 15-25 mm long (up to 40 mm in juvenile), glabrous. Inflorescence cauli- and ramiflorous, often forming burls up to 15 x 3 mm. Flowers 5(-6)-merous, bisexual or female, 1-3 in each fascicle, sessile. Sepals broadly elliptic, 2.5-3.5 mm long, tomentulose outside, the inner with a glabrous margin, glabrous inside.
Fig. 1. — Planchonella cauliﬂora Munzinger & Swenson, sp. nov.: A, habit; B, leaf venation (lower surface); C, leaf of juvenile individual; D, cauliﬂorous ﬂower; E, open corolla of a female ﬂower with staminodes and reduced anthers; F, open corolla of bisexual ﬂower with stamens and staminodes; G, ovary and pistil; H, fruit (nearly ripe, seeds aborted on the right); I, cotyledons. Munzinger et al. 3495. Scale bars: A-C, H, I, 1 cm; D-G, 1 mm.
Corolla 2.5-3.0 mm long, flesh-coloured, corolla tube slightly longer than the lobes; lobes suborbicular. Stamens shorter than the corolla; anthers 0.5-0.6 mm long, without appendage. Staminodes triangular or oblong, 0.5 mm long. Gynoecium broadly obovoid, 1 × 1.5 mm, hairy; style slender, glabrous, c. 1 mm long. Fruit obovoid, ridged, acuminate, 25-55 × 15-30 mm (acumen 4-12 mm), glabrous, (1-)5-seeded; seeds keeled, 20 × 9 × 5 mm; seed scar covering 100% of the seed length, 4 mm wide; testa nitidous, pale brown. Cotyledons thick and flat, smooth, white; radicle exserted; endosperm scarce.

**REMARKS**

*Planchonella cauliflora* is known only from the type locality at low elevation in mesophyll forest near La Foa (Fig. 2). The location is situated on grauwackes, which is a volcano-sedimentary soil. As far as known, it flowers between July and September, when young fruits have been observed. It is easily distinguished from all other congeners in being cauliflorous with large burls on the trunk, but also by the small flesh-coloured flowers.

Fruits of *Planchonella cauliflora* are ridged, acuminate, poor in pulp, and have short styles. The species should then, as per prediction, belong to Clade D1 (Swenson et al. 2007b). In fact, results of a jackknife analysis based on unpublished nrDNA (ITS) sequence data place *P. cauliflora* as sister to *P. luteocostata*, another member of Clade D1. Thus, the hypothesis that fruit morphology conveys on a phylogenetic signal is here supported. We therefore further predict that members of this clade have keeled seeds, an embryo with thick but flat cotyledons, and a scarce endosperm.

**ETYMOLOGY**

The species epithet refers to the flowers on the trunk (*caulis*), which is odd to the genus where flowers almost always are axillary or seldom along the branches.

**CONSERVATION STATUS**

*Planchonella cauliflora* is only known from one population in a small valley, estimated to 1.2 km², without any protection or present conservation plan. The adjacent valleys were prospected but we failed finding other populations until now. Thus, the plant matches criteria D, “Very small or restricted population”. Then, introduced rusa deer is known to be a threat against the native flora of New Caledonia (de Garine-Wichatitsky et al. 2005), which seems to prevent seedlings to survive and develop into reproducing individuals in the site where only adult trees are present. Hence, *Planchonella cauliflora* matches the criteria B1ab (iii, v) + 2ab (iii, v) and is here assigned a preliminary status of Critically Endangered (IUCN 2001).

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**Planchonella ericiflora**

Munzinger & Swenson, sp. nov.

(Fig. 3)

*Species haec Planchonellae povilanae similis sed foliis glabris et pusillis, corollarum tubis longioribus, piliferis et roseis, fructibus glabris et pyriformibus differt.*


**DESCRIPTION**

Small, much branched shrub, mostly prostrate, up to 1 m tall, branches hanging and layering; young twigs ferruginous hairy, soon glabrous, old twigs grey-whitish, scaly. Leaves shiny green on both sides, clustered at tips of branches, narrowly obovate, 1.5-3.5(-4.5) × 0.4-1(-1.3) cm, glabrous; brochidodromous venation, secondaries of 4-6 pairs, indistinct, tertiaries weak, reticulate; petiole 2-5 mm, glabrous or with a few greyish hairs. Flower 5-merous, bisexual, solitary, pendulous; pedicel 7-10 mm, glabrous. Sepals broadly elliptic, 4-7 mm, green, glabrous, the inner being larger and...
Fig. 2. — Map of New Caledonia with some protected areas (for conservation discussion) and the distribution of *Planchonella cauliflora* Munzinger & Swenson, sp. nov. (●), *P. erici-florea* Munzinger & Swenson, sp. nov. (+) and *P. minutiflora* Munzinger & Swenson, sp. nov. (▲). Ultramafic soils (including serpentinites) appear in grey.
Fig. 3. — *Planchonella erici*flora Munzinger & Swenson, sp. nov.: A, habit; B, leaf venation (lower surface); C, flowering branch; D, flower; E, calyx, transection of ovary, and pistil; F, open corolla of bisexual flower with stamens and staminodes; G, fruit (erected); H, seed, side view (left) and ventral view (right). *Munzinger et al. 4197*. Scale bars: A, C, 1 cm; B, 2.5 mm; D-F, H, 2 mm; G, 6 mm.
with a scarious margin. Corolla 9-11 mm long; tube longer than lobes, 6-8 mm long, pink, hairy outside; lobes greenish, 3-4 mm, ± rectangular, clawed. Stamens shorter than corolla, pink; anthers 1.2-1.5 mm long, without appendage. Staminodes oblong, c. 1.5 mm long. Gynoecium ovoid, hairy, 1.2 × 1.2 mm, slightly lobed; style slender, 9-10 mm long, slightly longer than the corolla. Fruit ovoid or pear-shaped, rounded, erect (while the flower is hanging), purple when mature, 30-32 × 10 mm, including a 10 mm long persistent style, glabrous, 1-3 seeded; seeds 8-9 × 3-4 mm; seed scar covering 60-85% of the seed length, 1-1.5 mm wide; testa nитidous, dark brown, 0.2 mm thick. Cotyledons thin and foliaceous, smooth, white; radicle exserted below the cotyledons; endosperm copious.

**REMARKS**

*Planchonella ericiflora* is restricted to a small area of Tontouta valley in the south of New Caledonia (Fig. 2). It occurs here in open to dense maquis vegetation and grows on serpentine soil at low altitudes. Flowers have been observed in July after intensive rains and fruits are recorded in March, July, and October. We therefore suspect that rain can be an important factor to induce blooming, which seems to take place all around the year. No congener is particularly similar to *P. ericiflora*, but sterile individuals might be confused with some *Rapanea* species (Myrsinaceae), though, the white sap is diagnostic.

Fruits of *Planchonella ericiflora* are pear-shaped, rounded, poor in pulp, and with a non-acuminate apex. In addition, it has a long (not short) style, an embryo with thin and foliaceous cotyledons, and copious endosperm. This character combination fits with Clade D3, which circumscribes many species in Australia, West Pacific, and a monophyletic group (Clade D3b1) that is restricted to New Caledonia (Swenson et al. 2007b). However, sequence data of *P. ericiflora* is still unavailable, but we believe it belongs here and could be closely related to *P. crenata* and/or *P. povilana*.

**ETYMOLOGY**

The name refers to the aspect of the flower, which with its pendulous habit and long corolla tube is superficially similar to an *Erica* (Ericaceae) flower.

**CONSERVATION STATUS**

*Planchonella ericiflora* is only known from small and scattered populations in Tontouta valley, a valley known for at least 17 local endemic species such as *Xanthostemon francii* Guillaumin, *X. longipes* Guillaumin, and *Syzygium laxeracemosum* (Guillaumin) J.W.Dawson (Myrtaceae; Dawson 1992, 1999; Jaffré et al. 2003). The tontouta valley was deeply investigated, what for example allowed rediscovering the *Ochrosia bodenheimarun* Guillaumin (Apocynaceae), which was only known from the type collection from 1951 (Boiteau 1981). Field researches were also done in Dumbea valley, which is slightly in the south and also presents serpentinites and some floristic affinities with Tontouta, but failed finding the plant. Tontouta valley possesses still no legal protection. Soils of the lower parts of the valley are of peridotitic alluvial deposits and cover about 26 km². Within this area is the total distribution of *P. ericiflora*, estimated to only 0.7 km². Although mining companies do not exploit the alluviums here, the peridotites are mined in some places on the higher slopes. New mining projects will evidently have serious impact on the remaining natural vegetation if new roads are opened. Indeed, this leads to an influx of human activities and risk of fires, especially when the valley becomes more frequently used for recreation, hiking, and camping. For example, Dumbea valley was severely damaged in 2006 from fires caused by young campers. Thus, based on a very restricted distribution, present and future mining projects, and an area without conservation plan, we suggest that *P. ericiflora* is given the IUCN status as Critically Endangered (CR B1+2ab(iii)).

*Planchonella minutiflora*

Munzinger & Swenson, sp. nov. (Fig. 4)

Species haec Planchonellae pinifoliae similis sed foliis glabris, floribus minitis et stylos brevissimos differt.


**DESCRIPTION**

Slender shrub to 2 m tall; twigs grey, smooth, scaly. Leaves shiny green on both sides, clustered at tips of branches, linear, 20-50 × 2-6 mm, coriaceous, glabrous; brochidodromous venation, secondaries of 4-6(-7) pairs, tertiaries weak, reticulate; margin thick, slightly recurved; petiole 1-3 mm long, sparsely tomentulose. Flowers 5-merous, bisexual, 1 or 2 in each fascicle; pedicel 0.5-1.5 mm long, tomentulose. Sepals 1.5-2.0 mm long, tomentulose outside, glabrous inside. Corolla 2.5 mm long, cream, corolla tube longer than lobes; lobes suborbicular. Stamens shorter than corolla; anthers 0.2 mm long, without appendage. Staminodes lanceolate, 0.5 mm long. Gynoecium ovoid, ovary hairy; style slender, glabrous, included, 1.0-1.5 mm long. Fruits unknown.

**REMARKS**

*Planchonella minutiflora* is only known from two collections in northwest New Caledonia, between Koumac and Kaala-Gomen, approximately 10 km apart (Fig. 2). It grows here in rocky maquis vegetation on serpentine soil at fairly low altitudes, most probably between 200 and 300 m. The two collections were made in April 1967 (within 24 hours) when it was in full flower. In the same region, north of Koumac, grows *P. pinifolia*, another local endemic that can be confused with *P. minutiflora*. The species have almost identical leaves in form and size, but the leaves of *P. minutiflora* are glabrous below (not tomentulose). However, the minute, 2-3 mm long flowers and short styles of *P. minutiflora* distinguish it from the larger, 30-40 mm long flowers and long styles of *P. pinifolia*.

The herbarium material of *Planchonella minutiflora* from 1967 is still in such a good condition for being used for nrDNA extraction. A jackknife analysis place *P. minutiflora* in a strongly supported sister relationship with *P. koumaciensis*, i.e., another member of Clade D1, just like *P. cauliflora*. This sister pair is united by minute flowers on short pedicels but distinguished by linear leaves in *P. minutiflora* versus obovate in *P. koumaciensis*. We therefore predict that fruits of *P. minutiflora* are ridged, acuminate, and have a short style.

**ETYMOLOGY**

The name refers to the very small flowers.

**CONSERVATION STATUS**

*Planchonella minutiflora* has not been collected since MacKee’s two original collections in 1967. In his field book, it is specified for specimen 16639 that he saw only one individual, and for specimen 16666 he wrote, “seems to be rare in the locality”. Recent important botanical inventories of the maquis on the main ultramafic mountains in northwest Grande Terre, from Boulinda in the south to Poum in the north, have not recorded the plant again. Without doubt, it is an uncommon species and its possible distributional range around the base of Mount Kaala is estimated to 13 km². This kind of vegetation is threatened by deliberately and accidental set fires. Altogether we therefore assign *P. minutiflora* a provisional IUCN (2001) status of Critically Endangered (CR B1ab(iii, v)+2ab(iii, v)).

**IDENTIFICATION TOOLS**

One important task for taxonomists is to provide users with identification keys. Standard dichotomous keys are often frustrating and impractical when usually both flowers and fruits are used. In many cases the user looks for distinctive characters such as a crenate leaf margin or a white dot on the seed, but search in vain for these characters in the key. Online interactive keys provide therefore new opportunities as they can quickly be updated, improved, and distributed around the world (Farr 2006). However, a dichotomous and online key combined is even a better plant identification tool. Together with a traditional diagnostic key we here introduce an online key, using Xper² (Chalubert et al. 2006), to all species of *Planchonella* in New Caledonia (see ftp://ftp.ird.nc/pub/outgoing/biologie/herbier-nou/).

The dichotomous key below uses to a large extent leaf, sepal, and fruit characters. Some mutually exclusive couplets have similar character states. In such cases, all diagnostic characters must fit. Leaf measurements refer only to the blade, excluding the petiole. The number of secondary veins (pairs) is...
Fig. 4. — Planchnella minutiiflora Munzinger & Swenson, sp. nov.: A, habit of a flowering branch; B, leaf venation (lower surface); C, axillary flowers; D, ovary and pistil; E, open corolla of bisexual flower with stamens and staminodes. MacKee 16639. Scale bars: A, 1 cm; B, 2.5 mm; C, 5 mm; D, E, 0.5 mm.
Planchonella (Sapotaceae) in New Caledonia

sometimes helpful and used. Measurements (mm, cm) always refer to the length of a structure. If two measures are stated, the second is the width. Flowers of Sapotaceae vanish quickly and are used as little as possible.

Sapotaceae possess malpighian hairs that are unicellular with two arms and one stalk, which attach them to the organs. As long as the stalk is short, a *tomentulose* pubescence is formed, which is the most common type, but the length of both arms and stalks may vary. If the stalk and arms are of similar length, or one arm branch off near the stalk and is short while the second is long, a “Y-shaped” hair is formed that gives a longer pubescence, here termed *tomentose*. Both arms can also be reduced (?) to form a simple hair, a pubescence that is rather *villus* in appearance. Homology of these structures, however, is unclear because several species have different combinations of hair types. The last type is the *adpressed* hair (not present among these species), formed of a very short or absent stalk. In principle, hairs are present on young leaves of nearly all *Planchonella* species, but indeed, some species are glabrous, others have glabrate leaves, and some have a persistent pubescence. Hairs are frequently ferruginous on young organs, but often turn greyish. It is therefore important to study the foliage carefully and decide if hairs are ferruginous, grey, or change with age.

Fruit morphology seems to convey a phylogenetic signal in *Planchonella*. Swenson *et al.* (2007b) identified three main clades (clades D1-D3) in the genus, each represented by a more or less consistent fruit type. One important character is whether the fruit, from base to apex, is ridged or round (Fig. 5). A ridged fruit has, as far as known, ridged seeds, whereas a round fruit has not. The fruit type is used in the diagnostic key.

**KEY TO THE SPECIES OF PLANCHONELLA PIERRE IN NEW CALEDONIA**

1. Leaves linear ........................................................................................................................................ 2
   — Leaves ovate, elliptic, obovate, oblanceolate, or spatulate (not linear) ............................... 6

2. Leaves glabrous on both surfaces ....................................................................................................... 3
   — Leaves pubescent below, old leaves sometimes glabrescent .................................................... 4

3. Length of leaves 2-5 cm; midvein glabrous; apex rounded ............................... *P. minutiflora*
   — Length of leaves 30-45 cm; midvein with some hairs; apex ± acuminate .... *P. pronyensis*
4. Upper surface of leaves glabrous, apex often retuse; sepals ≥ 12 mm .......... *P. baillonii*  
   — Upper surface of leaves tomentulose, apex rounded or apiculate; sepals ≤ 12 mm ...... 5
5. Leaves (3-)6-12 × 1.0-1.5 cm; sepals 7-10 mm, greyish villous ............... *P. kaalaensis*  
   — Leaves 3-5 × 0.3-0.5 cm; sepals 9-11 mm, brownish tomentulose ........... *P. pinatifolia*  
6. Leaves glabrous on both surfaces, even on young leaves (or with a few scattered hairs below) ................................................................................................................................. 7  
   — Leaves evenly pubescent below, even on young leaves, persistent or glabrescent .... 19  
7. Leaf margin crenate, apex often mucronate; craspedodromous venation ........ *P. crenata*  
   — Leaf margin entire; apex not mucronate; brochido- or eucamptodromous venation .... 8  
8. Sepals, all five glabrous; corolla 9-11 mm, tube pink, lobes greenish .......... *P. ericiflora*  
   — Sepals, at least the inner ± hairy ........................................................................ 9
9. Outer three sepals glabrous, inner two ± hairy ................................................. 10  
   — All five sepals hairy ............................................................................................ 12  
10. Leaves oblanceolate; flowers subsessile ....................................................... *P. laetevirens*  
    — Leaves obovate-elliptic (rarely oblanceolate); flower pedicel > 3 mm ................ 11
11. Petiole (20-)25-45 mm; primary nerve distinctly prominent acute below, secondaries 10-15 pairs, arcuate; sepals 3-4 mm ................................................................. *P. dothioensis*  
    — Petiole 20-30 mm; primary nerve prominent flat or rounded below, not acute, secondaries 20-30 pairs, straight; sepals 5-6 mm ......................................................... *P. endlicheri*  
12. Leaves oblanceolate(-oblong); sepals tomentose; corolla orange; growing on schist, along water streams ........................................................................................................... *P. saligna*  
    — Leaves different; sepals tomentulose, often sparsely; corolla not orange .......... 13
13. Flowers sessile, axillary or borne along branches and/or stems; fruit ridged ........ 14  
    — Flowers borne among leaves, pedicel ≥ 5 mm; fruit round ................................ 16
14. Secondaries ≥ 14 pairs; cauliflorous, burls present; corolla flesh-coloured ... *P. cauliflora*  
    — Secondaries ≤ 12 pairs; ramiflorous, burls absent; corolla differently coloured .... 15
15. Petiole and midvein yellow; corolla greenish (on fresh material), dry forest .... *P. luteocostata*  
    — Petiole and midvein grey to greenish; corolla white with pink lobes (on fresh material), humid forest ................................................................. *P. roseoloba*  
16. Leaves elliptic; petiole glabrous or with a few ferruginous hairs; fruit c. 45 mm; growing on schist ................................................................................................. *P. mandjeliana*  
    — Leaves ± obovate; pedicel with at least some scattered grey hairs; fruit ≤ 30 mm ...... 17
17. Petiole ≤ 5(-15) mm; pedicel ≥ 10 mm; corolla cream, 6-8 mm, ultramafic soils on Main Island and Isle of Pines ................................................................. *P. reticulata*  
    — Petiole ≥ 5 mm; pedicel ≤ 10 mm; corolla greenish, 2-4 mm (unknown in *P. lifuana*), coastal tree on Main Island or Loyalty Islands tree ........................................ 18
18. Leaves obovate; petiole 10-20 mm; sepals 3-6 mm; from calcareous soils .... *P. lifuana*  
    — Leaves also oblanceolate; petiole 5-10 mm; sepals 2-3 mm; grows on various soil types ....................................................................................................................... *P. linggensis*  
19. Sepals and leaves below and/or leaf margin and petiole tomentose or villous .......... 20  
    — Sepals and leaves below tomentulose .................................................................. 23
20. Leaves 17-20 × 7-11 cm; fruit globose, not acuminate, velvety hairy .......... *P. thiensis*
— Leaves smaller; fruit acuminate, sparsely tomentulose, ridged ................................. 21
21. Leaves with margin strongly revolute ................................................................. P. crassinervia
— Leaves with margin flattened, not revolute ......................................................... 22
22. Leaves obovate or elliptic, 4-12 × 3-5 cm; sepals tomentose; secondaries 6-10, volcano-
    sedimentary and serpentinites soils ......................................................... P. rufocostata
— Leaves ± orbicular, 6-13 × 5-9 cm; sepals ± villous; secondaries 8-12 pairs, only known
    from upper part of Montagne des Sources, on ultramafic soil ................... P. skottsbergii
23. Leaves below cinereous pubescent; littoral forests on calcareous soils .............. P. cinerea
— Leaves below ferrugineous pubescent, often turning greyish and/or glabrescent ... 24
24. Leaves broadly obovate or elliptic, often ≥ 10 cm long ........................................ 25
— Leaves spathulate-obovate-oblanceolate, often ≤ 10 cm long ............................. 29
25. Style hairy at base; fruit ridged, acuminate ....................................................... 26
— Style glabrous, fruit round, generally not acuminate (exceptions in P. wakere, P. glauca,
    P. lauracea) .................................................................................................. 27
26. Leaves glossy green above; secondaries 5-7 pairs; corolla greenish ............... P. amieuana
— Leaves glaucous above; secondaries 8-11 pairs; corolla cream ....................... P. kuebiniensis
27. Leaves quickly glabrescent below; corolla red; fruit globose ......................... P. sphaerocarpa
— Leaf pubescence ± persistent below; corolla white or cream; fruit obovoid ........ 28
28. Fruit 20-35 × 10-15 mm; leaves obovate-oblanceolate, 5-13 cm long; secondaries 8-10
    pairs; corolla lobe margin ciliate ................................................................ P. lauracea
— Fruit 40-60 × 25-40 mm; leaves obovate-oblong, 8-20 cm; secondaries 9-12 pairs; corolla
    lobe margin eciliate .................................................................................. P. wakere
29. Leaves spathulate-orbicular ................................................................................... 30
— Leaves obovate-oblanceolate ............................................................................. 31
30. Leaves pubescence below brown; corolla greenish; fruit fusiform ............... P. povilana
— Leaves pubescence below dark brown; corolla white; fruit obovoid .............. P. lauracea
31. Sepals 12-20 mm; corolla 17-35 mm, cream or white; style exerted out of corolla; from
    Koumac in the north to Tontouta Valley in the south, a difficult group where size of leaves,
    sepals and corolla varies .............................................................................. P. leptostylidifolia and P. rheophytopsis
— Sepals and corolla, respectively, < 10 mm long; style included in corolla .......... 32
32. Fruit ridged with a style remnant < 1 mm; petiole ≤ 5 mm ......................... P. koumaciensis
— Fruit round with a style remnant ≥ 2 mm; petiole ≥ 3 mm ............................ 33
33. Leaves oblanceolate, glossy green above, glabrescent below, hairs only persistent along
    midvein, finally glabrous ............................................................................. P. microphylla
— Leaves obovate-oblanceolate, dark green or glaucous above, tomentulose below, turning
    grey .......................................................................................................... 34
34. Leaves glaucous, pubescence below light brown, soon grey; sepals ≤ 5 mm .......... 35
— Leaves green above, pubescence below dark brown, soon grey; sepals ≥ 5 mm ....... 36
35. Corolla 4-4.5 mm, white; peduncle 4-6 mm in fruit; leaves 4-8 cm ............... P. glauca
— Corolla 5-6 mm, greenish; peduncle 8-10 mm in fruit; leaves 7-10 cm .......... P. latihila
36. Petiole 3-10 mm; secondaries 4-6 pairs; fruit 10-15 mm .............................. P. contermina
— Petiole 10-20 mm; secondaries 8-10 pairs; fruit 20-35 mm ........................ P. lauracea
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