



Pittosporum kororoense (Pittosporaceae, Apiales), a new species from Coffs Harbour, Mid North Coast of New South Wales

Andrew S. Benwell

3 Short St, New Brighton, NSW 2483, Australia
Email: andrewbenwell@bigpond.com

Abstract

A new species of rainforest shrub, described here as *Pittosporum kororoense* Benwell (Pittosporaceae, Apiales), was recently discovered at Kororo, 3 km north of the centre of Coffs Harbour on the Mid North Coast of New South Wales. Current information on the distribution, habitat, and population of this highly localised, endemic species is presented. An updated key to *Pittosporum* species in NSW is provided.

Introduction

During a flora survey in January 2021, in preparation for translocation of the threatened species *Niemeyera whitei* (Aubrév.) Jessup (Rusty Plum) for the Coffs Harbour Bypass project, an unidentified shrub was collected at the northern end of the bypass footprint. This taxon was thought to possibly belong to the Pittosporaceae but remained unidentified until April when fruits were found. Specimens sent to the National Herbarium of New South Wales (NSW) and *Pittosporum* experts Lindy Cayzer and Robert Makinson were identified as a probable new species of *Pittosporum*. Flowers were collected in September 2021 and this material confirmed the taxon as a new species.

Unpublished genetic analysis by the Royal Botanic Gardens (RBG), Sydney, produced molecular support for the morphology-based determination of a new species of *Pittosporum* (M. Rossetto and S. Yap, RBG Sydney, pers. comm.). The new *Pittosporum* was listed in the of Australian Plant Census (APC) online database under the phrase name *Pittosporum* sp. Coffs Harbour (A.S.Benwell 342, NSW1102028).

The Pittosporaceae is an old East Gondwanan family of nine genera mainly confined to Australasia except for the largest genus *Pittosporum* with about 350 species that occur in tropical and temperate regions of Australia (19 mainland species), New Zealand (26 species), Malesia (52 species), Southeast Asia, Japan, islands in the eastern Pacific basin, including Hawai'i, and lands bordering the Indian Ocean, including Madagascar and Africa (39 species) (Cayzer *et al.* in press).

Pittosporum sp. Coffs Harbour is described here as *Pittosporum kororoense*. It is morphologically similar to the group of taxa with reduced inflorescences, mainly borne on short shoots, that now includes the small *Citriobatus* A.Cunn. ex Putt. group of taxa synonymised into the genus *Pittosporum* by Cayzer *et al.* (2000). This placement of *Citriobatus* taxa within a monophyletic *Pittosporum* has been confirmed by molecular data

Chandler *et al.* 2007), and more recent morphological revisions by Cayzer (2021) for the *Flora of Australia* series, and Cayzer *et al.* (in press).

In eastern Australia, the *Citriobatus* group has reduced inflorescences on short, spinescent or non-spinescent shoots, followed by single or few, small fruits. The small fruits may be indehiscent, or dehiscent as in the present taxon and *P. oreillyanum* C.T.White (F.M.Bailey) L.W.Cayzer, Crisp & I.Telford. The fruits in these species are small (<12 mm long), green, yellow or orange, with thin walls and the few red seeds inserted basally in a liquid to viscid resin. In contrast to this group, the second group of *Pittosporum* taxa in this area, including *P. undulatum* Vent. and *P. revolutum* W.T.Aiton have terminal, determinate, paniculate inflorescences of larger flowers and thick walled, woody fruits >16 mm in length with multiple seeds inserted base to apex.

Methods

Specimens of *Pittosporum* sp. Coffs Harbour and co-occurring *P. undulatum* and *P. revolutum* were collected and examined under an Olympus binocular dissecting microscope, along with additional specimens of *P. multiflorum* and *P. lancifolium* from the Lismore district and Coffs Harbour Botanical Gardens.

A detailed, informal report describing the morphology of the new taxon was supplied by Bob Makinson and drawings and descriptions prepared by Lindy Cayzer. Description of the new species was prepared in consultation with the above experts. Formal identification of the taxon as a new species was supplied by the National Herbarium of New South Wales (A. Orme) and specimens of *Pittosporum* sp. Coffs Harbour were deposited at the National Herbarium of New South Wales (NSW). Targeted surveys were carried out in 2021 to record the distribution, habitat, population size and phenology of *Pittosporum* sp. Coffs Harbour, which focused on the Coffs Harbour and Kororo Basins and surrounding ranges.

In summary, *Pittosporum* sp. Coffs Harbour, named *P. kororoense* in this paper, was determined as a new species based on previous morphometric and molecular analyses of the family in Australia (Cayzer *et al.* 2000; Cayzer 2021) and overseas (Gemmill *et al.* 2001; Chandler *et al.* 2007). The unpublished genetic analysis of *Pittosporum kororoense* was performed at the Royal Botanic Garden, Sydney by M. Rossetto and S. Yap (pers. comm.).

Taxonomy

Pittosporum kororoense Benwell, *sp. nov.*

Diagnosis: *Pittosporum kororoense* differs from other species of *Pittosporum* in eastern Australia in its short, monopodial (although clonal) growth-habit and an inflorescence in the terminal leaf whorls of 1–3 creamy yellow flowers on aggregated, reduced, short shoots, each subtended by a leaf. It appears to belong to the short-shoot taxa group of *Pittosporum*, as it has indeterminate, reduced inflorescences at the end of short shoots. The dehiscent fruits of *Pittosporum kororoense* are similar to *P. oreillyanum*, but this latter species, endemic to rain forests in the Border Ranges of NSW/Qld, is a spinose shrub with pink or mauve flowers, not creamy yellow as displayed in the new species, and has much smaller leaves. *Pittosporum kororoense* differs from its close relative *P. lancifolium* (F.M.Bailey) L.W.Cayzer, Crisp & I.Telford in having larger leaves, shorter stature, absence of spines and fruits that are dehiscent (indehiscent in *P. lancifolium*).

Type: New South Wales: North Coast: West Kororo Road, 0.9 km from the Pacific Hwy, 1.6 km from the sea, Map Ref: -30.269372° 153.123066°, 31 March 2021, A.S. Benwell 342 (holo: NSW 1102028; iso: CANB, BRI).

Shrub to 1.2 m high, single-stemmed, rhizomatous, often growing in dense, clonal patches 1–4 metres diameter, sometimes in small aggregations (<10 stems), rarely as a lone stem; stems arising from horizontal roots. *Stems* with grey-brown bark, knobbly with many petiole/branchlet scars and short, smooth sections; branching verticillate, bi- or trifurcate, ascending; twiglets brown, glabrous, vertically ridged, lenticellate, cataphylls ± persisting at ultimate nodes; shoots non-spinescent. *Indumentum* of white T-hairs only, very sparse on leaves, denser on pedicles, otherwise plant glabrous. *Leaves* alternate but becoming whorled/congested/verticillate (through shortening of internode distances) at terminal nodes; oblanceolate to almost obovate and elliptical, up to 85–112 mm long, 22–30 mm wide, petiole up to 5–8 mm; apex acute, finely mucronate, hooked; base almost sessile, winged to a thick triangular base; adaxial surface smooth, secondary veins slightly impressed, mid-vein in slightly raised groove; abaxial surface much paler, smooth, 7–8 pairs secondary veins, very slightly raised, tertiary venation not visible when fresh, becoming more pronounced on drying on both surfaces, reticulum faint but distinct; scattered white T-shaped hairs only; margins when fresh are flat with the apices slightly down turning, spines absent. *Inflorescences* aggregated in ultimate leaf whorls; each terminal on a slender shoot up to 10 mm long, arising from a basal involucre 1–2 mm long and wide; 1–3 single flowers,

each flower subtended by a leaf; indeterminate growth (becomes axillary as shoot develops next season); pilose with T-shaped hairs: short base, longer arm, white; flower buds bullet-shaped; pedicels pilose to 3 mm long; flowers actinomorphic, unisexual, functionally male with vestigial pistil, corolla hypocrateriform/salverform, persisting slightly tubular with the petal apices reflexing; sepals to 5 mm long, very narrow, linear/acuminate, appressed, sparsely hairy on outer surface, not recurving and not caducous; petals 10–11 mm long, 3 mm wide, initially creamy yellow becoming slightly darker yellow with age. *Male flowers*, only male flowers seen. *Stamens* 6–8 mm long. *Anthers* nearly 2 mm long, slender rectangular, apices recurving backwards revealing slits and pollen; filaments adnate to petal, joined at anthesis; pistil to 7 mm long, ovary barely differentiated, 2 mm long, on a 2 mm stipe from the basal nectary. *Style* 4 mm long with little stigmatic development. *Fruit* a subglobose capsule held upright, 8–12 mm long, 10 mm diam, plus a 2 mm long basal, lobed nectary, dehiscence loculicidal, 4-grooved, 2-valved, pedicel elongating to 7 mm as fruit ripens; exocarp yellow, glabrous, rugulose, on a 2 mm thick, erect stalk; valves bright, glossy yellow on inside surface; fruit very rare. *Ovary* funicles inserted basally in 2 loculi; seeds 2–6 per fruit, angular to reniform, fresh seed to 5 mm long with succulent, red outer layer, sticky/resinous; valves open to 90° and held flat to present red seeds, then after seeds are taken or fall, reflexed 180° to touch pedicel and curl up. Figs 1, 2.

Etymology: Kororo is the name of the locality where the new species was found. The locality may be spelt ‘Korora’, as in the name of the suburb and local school, or ‘Kororo’, as in Kororo Nature Reserve and Kororo Basin. The latter spelling is thought to reflect more closely the original aboriginal place name (Muurrbay Language and Cultural Cooperative, Nambucca Heads, pers. comm.).

Common Name: Big Banana Pittosporum (after the tourist landmark located 0.5 km from where the new species was found).

Distribution: *Pittosporum kororoense* occurs in a small area on the northern outskirts of Coffs Harbour, within 3 km of the ocean at the eastern end of the Kororo Range and adjacent lower slopes of the Coffs Harbour and Kororo Basins. There are six known locations within this area: Jordans Creek (CHB project and private property), Kororo Nature Reserve, the headwaters of Bucca Bucca Creek in Bruxner Park Flora Reserve (Orara East State Forest), MacKays Rd and Coramba Rd (CHB project) and one further site on private property (Benwell 2022). A second population was recently found on the southern slopes of Mount Yarrahappini, 50 km south of Coffs Harbour by W. Steggall (photos confirmed by author).

Phenology: Flowers for 5–6 weeks from late August to the end of September. Flowering starts and ends abruptly. Fruit ripens March–April.

Population size: A total of approximately 70 patches of *Pittosporum kororoense* have been recorded at Coffs Harbour, containing a total of about 4,000 stems. About 30 patches or 40% of the known population is found in the narrow strip of remnant forest along 1 km of Jordans Creek at Kororo (Benwell 2022). Each patch is a discrete, dense cluster of stems that appear to be clonal so the total number of genetic individuals may be quite small.

Habitat: Recorded in *Lophostemon confertus* (Brush Box) tall wet sclerophyll forest with a well-developed rainforest understorey. Also present are *Eucalyptus pilularis* (Blackbutt), *E. grandis* (Flooded Gum) and *E. microcorys* (Tallowwood) but usually subdominant to Brush Box. The rainforest mid-stratum is composed of small to medium sized rainforest trees, 5–20 m high, including *Dysoxylum mollissimum* (Red Bean), *Cryptocarya microneura* (Murrogun), *Cryptocarya rigida* (Forest Maple), *Elaeocarpus reticulatus* (Blue-berry Ash), *Endiandra discolor* (Domatia Tree), *Synoum glandulosum* (Scentless Rosewood), *Niemeyera whitei* (Rusty Plum), *Archontophoenix cunninghamiana* (Bangalow Palm) and *Ficus watkinsiana* (Strangler Fig). Ferns, sedges, shrubs and vines dominate the lower stratum where the *Pittosporum* grows. The soil type is a medium fertility, red-yellow clay podzol formed on metasediment. Coffs Harbour has a mean annual rainfall of approximately 1,700 mm. The proximity of Kororo to the ocean and the coastal range enhances rainfall and humidity and reduces temperature extremes. *Pittosporum kororoense* occurs in the most protected habitat in south facing gullies where soil moisture is higher and fire exposure less. Brush Box dominated forest is rare in the Coffs Harbour area, nearly all wet sclerophyll forest being dominated by *Eucalyptus*. Absence of *Pittosporum kororoense* from the western half of the Coffs Harbour Basin and further west along the Kororo Range (and elsewhere in this botanically well-surveyed region), suggests that the microclimate and topography of the Kororo area acted as a refugium for this species, enabling survival during Quaternary climatic oscillations (Benwell 2022).



Fig. 1. *Pittosporum kororoense*. A. Clonal patch of more than 200 stems. B. Root suckers, stems attached to roots. C. Single-stemmed plant about 80 cm high. D. Leaves alternate in pseudo-whorls, glabrous, sub-sessile, note persistent cataphyll. E. Flowering shrub about 1 m high, flowers in condensed, terminal inflorescences of 2–4 flowers on numerous short (spineless) branchlets. F. Terminal inflorescences of 2–4 male flowers. Images from A.S. Benwell 342.



Fig. 2. *Pittosporum kororoense*. A. Male flowers with tubular corolla and appressed calyx lobes. B. Branch showing short, spineless, side branches with terminal inflorescences. C. Rare ripening fruits, lobed with residual nectary disc below. D. Fruit opened by a mammal or bird in search of the seed. E. Ripe fruits are held erect on a stout pedicel, note finely warty fruit surface. F. The fruit valves dehisce widely to display red seeds against a shiny yellow background, a bird attracting strategy. G. Seeds and inside of fruit valves are coated in a sticky substance.

Breeding system: Reproduces vegetatively by sucking from roots close to existing stems to form a dense thicket of stems. A few single, isolated stems recorded during surveys may represent rare seed dispersal and seedling recruitment events. All flowers examined were found to be male, so it appears at this stage that sexual reproduction is hardly functional, and populations are maintained mainly by vegetative reproduction. About 20 developed fruits with filled out seeds were found during searches of all known patches in 2021–22, indicating that a small amount of sexual reproduction and cross- or self-pollination of flowers is still taking place. The fruits were found only in three adjoining patches in the Jordans Creek population. Australian

Pittosporum generally have unisexual flowers and a dioecious breeding system; however, occasional fruits can be found on ‘male’ plants (or in male populations as occurring here), and occasional flowers with fertile anthers are found in ‘female’ plants (Cayzer 2021). Similar variation in flower structure and sex strategy has been observed in *P. spinescens* (another member of the short-shoot group), possibly triggered by climatic conditions (Makinson 1992).

Conservation status: The NSW Threatened Species Scientific Committee has made a Determination for provisional listing of *Pittosporum* sp. Coffs Harbour (A.S.Benwell 342, NSW1102028) on an emergency basis as a Critically Endangered species in Part 1 of Schedule 1 of the NSW Biodiversity Conservation Act, 2016. The main reasons for listing were very small population size (genets not ramets), restricted distribution and the current threat from development.

Table 1: Comparison of selected morphological attributes of *Pittosporum* species found in the region from Coffs Harbour to NSW/Qld border.

	Indeterminate, short-shoot, reduced inflorescence group				Determinate, floriferous group	
	<i>P. kororoense</i>	<i>P. oreillyanum</i>	<i>P. lancifolium</i>	<i>P. multiflorum</i>	<i>P. undulatum</i>	<i>P. revolutum</i>
Habit	shrub	shrub/small tree	shrub/small tree	shrub	tree	shrub
Spines	no	yes	yes	yes	no	no
Short lateral shoots	yes	yes	yes	yes	no	no
Height	to 1.2 m	to 5 m	to 4 m	to 3 m	to 15 m	to 3 m
Shape	oblancoate-elliptical	ovate to circular	elliptical, narrow-ovate	broad-ovate, circular, obovate	elliptical	elliptical-lanceolate
Texture	soft	soft	soft	leathery	leathery	soft
Size (l x w)	70–112 mm x 19–30 mm	2–10 mm x 2–5 mm	15–40 mm x 5–20 mm	3–12 mm x 2.5–8 mm	60–150 mm x 15–40 mm	50–150 mm x 15–60 mm
Petiole	1–3 mm, decurrent	1–2 mm	1–3 mm	0–2 mm	12–15 mm	5–13 mm
Pseudo whorls present	yes	no	no	no	yes	yes
Floral arrangement	terminal cluster of 1–4 flowers mostly, appearing umbel-like	axillary	axillary	axillary	terminal cluster with branching	terminal cluster
Flowers/inflorescence	few	solitary	solitary	solitary	several to many	few to several
Flower colour	pale yellow	pink	cream	white	white to cream	yellow
Shape	globose	globose	globose	globose	globose to ellipsoid	ovoid to ellipsoid
Dehiscence	dehiscent	dehiscent	indehiscent	indehiscent	dehiscent	dehiscent
Size (diam.)	9–12 mm	7–10 mm	6–10 mm	4–10 mm	10–15 mm	12–30 mm
Colour	yellow	yellow brown	purplish-black	orange	orange	brown
Surface	rough	smooth	smooth	smooth	smooth	rough
Seed colour	red	orange to red	red	-	red brown	orange
Seeds in resin	no, scarcely	no, scarcely	yes	no, scarcely	yes	no, scarcely

Key to *Pittosporum* species in NSW (modified from key in the Flora of NSW)

1. Short shoots present; adult leaves clustered or alternate, usually not whorled at end of branches (not *P. kororoense*) 2
- 1: Short shoots absent; adult leaves usually appearing whorled at end of branches..... 10
2. Short shoots spinescent in most developmental stages; stems usually scabrid; fruit indehiscent (dehiscent in *Pittosporum oreillyanum*) 3
- 2: Short shoots never spinescent; stems ridged and generally glabrescent, never scabrid; fruit dehiscent, always 2- or 3-valved 7

3. Flowers with petals pale orange on inner surface and maroon on outer surface; leaves with lamina c. 6 mm long *P. oreillyanum*
- 3: Flowers cream-coloured; leaves with lamina greater than 8 mm long 4
4. Leaves almost orbicular; margin angular-dentate; petals hairy on inner surface; fruit orange *P. multiflorum*
- 4: Leaves elliptic or obovate; margin lacking angular teeth; petals glabrous; fruit green, maturing to black-brown 5
5. Leaves alternate, not stem clasping *P. lancifolium*
- 5: Leaves mainly clustered in groups of 3 or more, stem clasping 6
6. Leaves 8–15 mm long; fruit to 25 mm diameter, thick-walled *P. spinescens*
- 6: Leaves 20–25 mm long; fruit less than 10 mm diameter, thin-walled *P. viscidum*
7. Sepals with distinctive woolly fringe of hairs; flowers held below leaves on long, pendant stalks; fruit 3-valved *P. erioloma*
- 7: Sepals without woolly hairs; flowers held amongst leaves; fruit usually 2-valved 8
8. Leaves oblong or linear to narrowly elliptic, falcate, glabrous; petiole c. 10 mm long *P. angustifolium*
- 8: Leaves not falcate; petiole 2–3 mm long, flowers yellow 9
9. Leaves narrow ovate to narrow oblong, abaxial surface densely hairy *P. bicolor*
- 9: Leaves oblanceolate to elliptical, glabrous *P. kororoense*
10. Fruit with thick woody, often warty valves; valves >2 mm thick; shrub to c. 3 m high *P. revolutum*
- 10: Fruit leathery, not woody nor warty; valves c. 1–2 mm thick; tall shrub or tree to 15 m high 11
11. Leaf margin undulate, occasionally flat; lamina ovate or elliptic to narrowly obovate, 6–15 cm long, 1.5–4 cm wide, glabrous, with apex acute to acuminate; petals white to cream-coloured *P. undulatum*
- 11: Leaf margin flat, slightly revolute; lamina obovate to narrowly so, (3–)4–7(–9) cm long, 1.3–2(–2.5) cm wide, abaxial surface pale green with whitish hairs, with apex bluntly acute to obtuse; petals purplish red *P. crassifolium*

Acknowledgments

Thanks to Lindy Cayzer and Bob Makinson for examining specimens and providing comments and much useful information during preparation of this paper. Editorial input from Richard Jobson, Russell Barrett and a reviewer improved the quality of the manuscript and is gratefully appreciated.

References

- Benwell AS (2022) *Targeted surveys 1–3 for Fontainea sp. Coffs Harbour and Pittosporum sp. Coffs Harbour*. (Unpublished report to Transport for NSW).
- Cayzer LW, Utteridge TMA, Chandler GT (in press) *Pittosporum* (Pittosporaceae) in Malesia. *Australian Systematic Botany*
- Cayzer LW (2021) Pittosporaceae. In: PG Kodela, AM Wheeler (eds.) *Flora of Australia*. (Australian Biological Resources Study, Department of Environment: Canberra) <https://profiles.ala.org.au/opus/foa/profile/Pittosporaceae> [Date Accessed: 29 November 2021]
- Cayzer LW, Crisp MD, Telford IRH (2000) Revision of *Pittosporum* (Pittosporaceae) in Australia. *Australian Systematic Botany* 13, 845–902. <https://doi.org/10.1071/SB99021>
- Chandler GT, Plunkett GM (2004). Evolution in Apiales: nuclear and chloroplast markers together in (almost) perfect harmony. *Botanical Journal of the Linnean Society* 143, 123–147. <https://doi.org/10.1111/j.1095-8339.2003.00247.x>
- Chandler GT, Plunkett GM, Pinney SM, Cayzer LW, Gemmill CEC (2007) Molecular and morphological agreement in Pittosporaceae: phylogenetic analysis with nuclear ITS and plastid *trnL-trnF* sequence data. *Australian Systematic Botany* 20, 390–401. <https://doi.org/10.1071/SB07004>

- Gemmill, CEC, Allan, GJ, Wagner WL and Zimmer, EA (2001) Evolution of insular Pacific *Pittosporum* (Pittosporaceae): origin of the Hawaiian radiation. *Molecular Phylogenetics and Evolution* 1019: 1–12. <https://doi.org/10.1006/mpev.2001.1019>
- Makinson RO (1992) Pittosporaceae. In: G Harden (ed.) *Flora of New South Wales*, Vol. 3: 65–74. (New South Wales University Press: Kensington).

Manuscript received 20 August 2022, accepted 7 January 2023