

# *Philothea papillata* (Rutaceae), a new endangered species from north-eastern New South Wales

Ian R.H. Telford and Lachlan M. Copeland

*Botany, Centre for Ecology, Evolution and Systematics, The University of New England, Armidale, NSW, 2351*

## Abstract

*Philothea papillata* I.Telford & L.M.Copel., apparently endemic to Sherwood Nature Reserve, north-eastern New South Wales, is described as new. Notes on its distribution, habitat and conservation status are provided. The species is illustrated, its distribution mapped and some of its attributes compared with related taxa.

## Introduction

In 2000, while collecting material of *Homoranthus floydii* in Sherwood Nature Reserve near Glenreagh for a revision of that genus, one of us collected material of an associated species of *Philothea*, then thought to be the widespread and variable *P. salsolifolia*. Recent revisionary studies in *Philothea* sect. *Philothea* (Wilson 1998) and the treatment of *Philothea* for *Flora of New South Wales* (Weston & Harden 2002), however, present no taxon with the unique combination of attributes of our material. The species which appear closest morphologically are *P. reichenbachii* Sieber ex Spreng., particularly similar vegetatively, and *P. salsolifolia* (Sm.) Druce.

## Methods

Specimens of *Philothea reichenbachii* and *P. salsolifolia* representing the known range of the taxa in New South Wales were borrowed from the National Herbarium of New South Wales (NSW) to augment the collections held in the N.C.W. Beadle Herbarium (NE). In this study, eight populations of *P. reichenbachii* and 21 of *P. salsolifolia* were scored. For morphological observations and measurements, dried herbarium material was reconstituted. Leaf characters (direction relative to axis of stem, length, shape in transverse section, presence of enlarged oil glands and indumentum) and floral characters (pedicel length, petal length, petal indumentum, petal colour, anther shape and indumentum of anther apicula) were recorded.

## Discussion

*Philotheca reichenbachii* is restricted to the Sydney region (Wilson 1998, Weston & Harden 2002). Wilson (1998) recognised two subspecies of *P. salsolifolia* with their distributions recorded (Wilson 1998, Weston & Harden 2002) as follows. *P. salsolifolia* subsp. *salsolifolia* is widespread in coastal and near-coastal New South Wales from near Taree south to near Bega, inland to Pilliga and West Wyalong. *P. salsolifolia* subsp. *pedicellata* Paul G. Wilson is restricted to the Angourie district of coastal north-eastern New South Wales.

The *Philotheca* population closest geographically to the locality of the new collection is of *P. salsolifolia* subsp. *pedicellata* at Sandon, c. 80 km to the north. This taxon differs from the Glenreagh plants in its triquetrous, non-verrucose, spreading leaves, long pedicellate flowers, glabrous keel of the petals and anther shape. *P. salsolifolia* subsp. *salsolifolia* has its closest population at North Haven, c. 180 km to the south. Specimens from here and other coastal populations differ in almost terete, non-verrucose leaves, petal indumentum and anther shape (Table 1). Inland populations of *P. salsolifolia* show considerable morphological differences and will not be discussed further here. This morphological variability and the disjunct distribution pattern of this species suggest a species complex in need of further investigation. Attributes scored for *P. salsolifolia* subsp. *salsolifolia* in Table 1 are for coastal 'type' populations from between Port Macquarie and Bega.

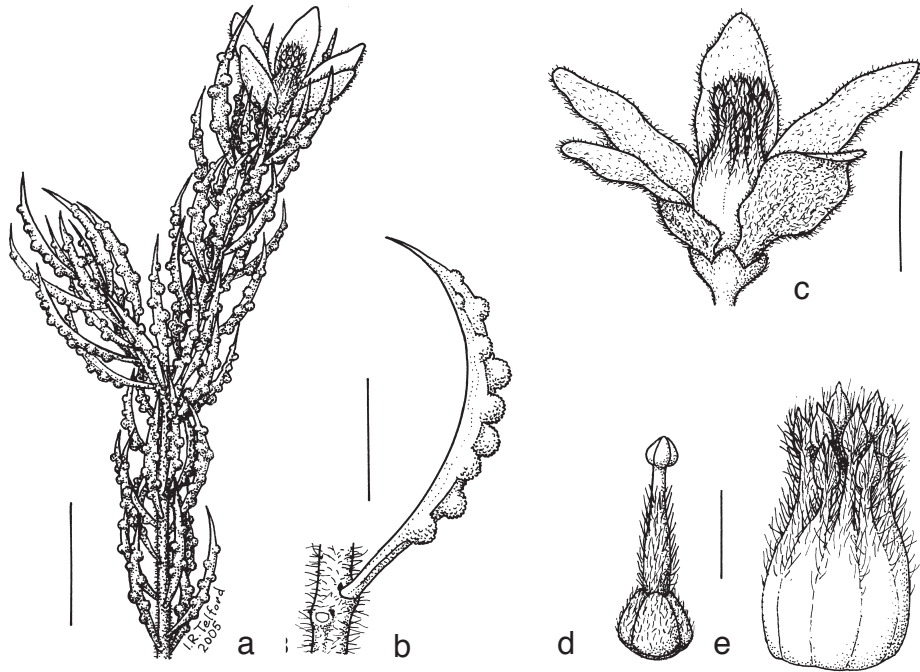
Comparison of the Glenreagh collections with *P. reichenbachii* show a remarkable similarity in vegetative attributes. In floral characters they differ in bearing smaller flowers with white to pale pink petals, the petal keel pubescent, anther shape and anther apicula lacking hair tufts (Table 1). It could be postulated that this new species and *P. reichenbachii* constitute a vicariant pair, but testing of relationships must await elucidation of end taxa. The Glenreagh material clearly represents a new species, described below.

***Philotheca papillata*** I. Telford & L.M. Copel. *sp. nov.*

*P. reichenbachii* similis sed petalis minoribus albidis vel subroseis atque pubescentibus in mediano abaxiali et antheris ad apicem glabris differt.

**Type:** New South Wales: North Coast: Sherwood Nature Reserve, I.R. Telford 12786, J.J. Bruhl & L.M. Copeland, 14 Sep 2004 (holo: NSW; iso: BRI, CANB, HO, K, MEL, MO, NE, PERTH). (Specific locality details withheld for conservation purposes)

*Shrub*, erect, multistemmed, to 60 cm tall, bearing root suckers. *Branchlets* pilose, pale green beneath the white indumentum. *Leaves* incurved, narrow-elliptic, 9–12 mm long, 1–1.5 mm wide, acute, the margins recurved, crenate, verrucose with 4 or 5 glands on each side of lower surface, both surfaces papillate. *Stipules* minute, dark purple to black. *Flowers* solitary, terminal, on pedicels c. 0.5 mm long. *Sepals* 5, suborbicular, 1.5–2 mm long, pubescent. *Corolla* of 5 free petals, white to pale pink. *Petals* elliptic, 7–10 mm long, pubescent on both surfaces, the abaxial surface sparsely verrucose. *Stamens* 10, 6.5–8 mm long. *Filaments* fused at base for 4–5 mm. *Anthers* ovate, apiculate, c. 1.2 mm long, the apicula glabrous or minutely papillate. *Gynoecium* of 5 basally-fused carpels, the carpels tomentose, pale green; style terete, broadening towards the base, c. 4 mm long, pilose on lower three-quarters; stigma capitate, minutely 5-lobed. *Disc* obscure. *Fruit* not seen. (Fig. 1).



**Fig. 1.** *Philotheca papillata* **a**, flowering branch; **b**, leaf; **c**, flower; **d**, androecium; **e**, gynoecium. Scale bar: a = 10 mm; b, c = 5 mm; d, e = 2 mm. (all from L.M. Copeland 2605 & P.R. Sherringham).

**Additional specimens examined:** New South Wales: North Coast: Sherwood Nature Reserve, L.M. Copeland 2605 & P.R. Sherringham, 2 Sep 2000 (NE); L.M. Copeland 3758, 4 Jul 2004 (CANB, NE, NSW); I.R. Telford 12787, J.J. Bruhl & L.M. Copeland, 14 Sep 2004 (NE). (Specific locality details of all specimens withheld for conservation purposes).

**Distribution:** *Philotheca papillata* is known only from the type locality in Sherwood Nature Reserve, east of Glenreagh (Fig. 2). In spite of widespread searches in areas of similar geology and geomorphology (sandstone cliff lines and rocky slopes of the Grafton Formation and Kangaroo Creek Sandstone) between Chambigne Nature Reserve, Whitemans Creek, Coaldale and Flaggy Creek Nature Reserve, no further populations were discovered. The dissected sandstone country between Glenreagh and Woolgoolga provides habitat for several other narrowly endemic species including *Homoranthus floydii*, *Boronia umbellata*, *B. hapalophylla* and an undescribed species of *Lasiopetalum*.

**Flowering:** flowers have only been observed in September although the species is likely to flower from mid August through to at least early October.

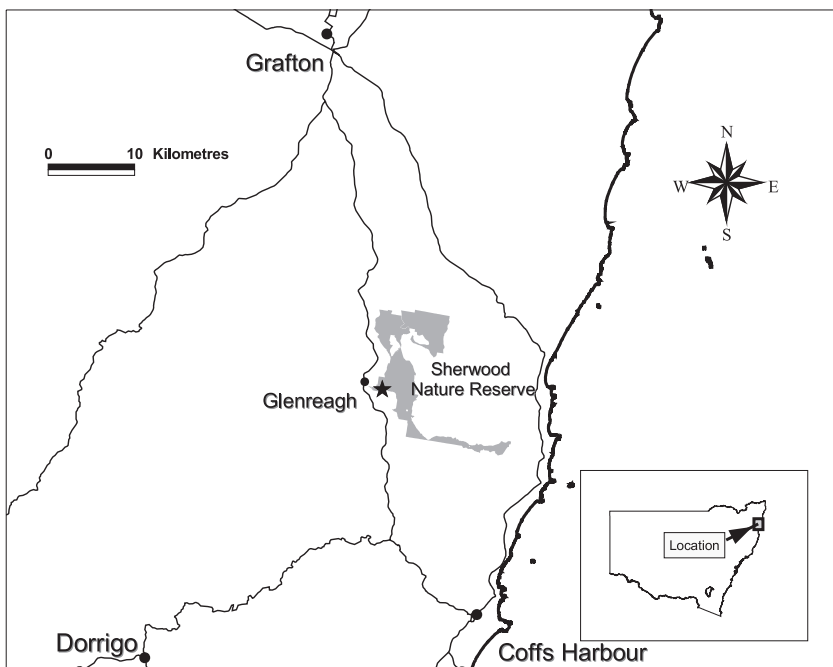
**Habitat:** this species occurs in a heath community with *Banksia oblongifolia*, *Leptospermum trinervium*, *Phebalium woombye*, *Bossiaea rhombifolia*, *Xanthorrhoea johnsonii* and *Philothrix deusta* with occasional emergent malleed *Eucalyptus planchoniana*. The substrate is a shallow sandy soil over sandstone (Grafton Formation) along escarpment cliff tops at an altitude of c. 350 m. The site appears to have a high fire frequency and the root-suckering habit of the species probably assists in maintaining the population.

**Table 1. Comparison of some distinguishing attributes between *Philothea papillata*, *P. reichenbachii* and *P. salsifolia* s.s.**

Character	<i>P. papillata</i>	<i>P. reichenbachii</i>	<i>P. salsifolia</i> s.s.
Leaf lamina	incurved	± incurved	± straight
Leaf surface	papillate	hispid, papillate	glabrous–sparsely ciliate
Leaf margin	verrucose	verrucose	smooth
Petal length	7–8 mm	8–13 mm	6–10 mm
Corolla outer surface	keel tomentose	keel ± glabrous	keel glabrous
Corolla colour	white–pale pink	purple	pink–purple
Anther apex	glabrous	with hair tuft	glabrous
Anther shape	ovoidal	cylindroidal	narrow-ellipsoidal

**Conservation status:** *Philothea papillata* is apparently restricted to Sherwood Nature Reserve where a single population is known of c. 150 individuals along c. 200 m of escarpment edge. An inappropriate fire regime could present a major threat but resprouting by root suckers could potentially allow survival. The population is also close to an informal lookout and a series of obscure walking tracks. Although all known plants occur within the reserve, the species should still be considered endangered due to its highly restricted distribution and small population size. Following the criteria of Briggs and Leigh (1996) a conservation code of 2ECit is recommended.

**Etymology:** the epithet *papillata* is from the Latin (*papillatus*=bearing papillae), in reference to the distinctive leaf surfaces.



**Fig. 2.** Approximate location of *Philothea papillata* (denoted by ★) in Sherwood Nature Reserve, north-eastern New South Wales.

## Acknowledgments

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## References

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# *Pimelea cremnophila* (Thymelaeaceae), a new species from the New England Tablelands escarpment of northern New South Wales

Lachlan M. Copeland and Ian R.H. Telford

*Botany, Centre for Ecology, Evolution and Systematics, The University of New England, Armidale, NSW 2351*

## Abstract

*Pimelea cremnophila* L.M.Copel. & I.Telford, a rare new species endemic to the Macleay Gorges east of Walcha, is described. Notes are given on its distribution, habitat and conservation status. Although all plants are known from a conservation reserve the species is considered to be endangered due to its restricted distribution and small population size.

## Introduction

The gorge country of the eastern escarpment of the New England Tableland is well known as a 'hot spot' for endemism. Narrowly endemic taxa in the Macleay and Guy Fawkes River gorges include *Hakea fraseri*, *Phebalium squamulosum* subsp. *verrucosum*, *Leucopogon trichostylus*, *Zieria floydii* and *Bertya ingramii*. Other taxa thought to be endemic to the area include undescribed members of *Westringia*, *Persoonia*, *Acalypha*, *Zieria*, *Callistemon*, *Eucalyptus*, *Leionema* and *Olearia* (Briggs & Leigh 1996; Copeland 1997). Recent fieldwork in Oxley Wild Rivers National Park has yielded a species of *Pimelea* which did not fit any currently known taxa in the treatments of Threlfall (1983), Rye (1990) and Harden (1990). An examination of *Pimelea* specimens held in CANB, NSW and NE also supported the recognition of the Macleay Gorges *Pimelea* as distinct (herbarium abbreviations follow Holmgren et al. 1990). This paper describes the new species and gives notes on its distribution, habitat and conservation status.

*Pimelea cremnophila* L.M.Copel. & I.Telford *sp. nov.*

*P. umbratica* similis sed indumento foliari caulinoque longiore densioreque et filamentis staminum distinctis differt.

**Type:** New South Wales: Northern Tablelands: Oxley Wild Rivers National Park, c. 40 km ENE of Walcha, 30° 55' S, 151° 52' E, *L.M. Copeland 3816, I.R. Telford & P.J. Lupica*, 13 Oct 2004 (holo NSW; iso BRI, CANB, CHR, HO, K, MEL, MO, NE). (Specific locality details withheld for conservation purposes).

*Erect shrub* to 2.5 m tall. *Stems* red-brown, hirsute with strigose white antrorse hairs to 3 mm long, glabrescent with age. *Leaves* opposite, petiolate; petioles c. 1 mm long, densely

hairy; lamina narrow-elliptic to narrow-ovate, acute, 10–37 mm long, 2.5–6 mm wide, secondary venation indistinct, the adaxial surface glabrous or sparsely hairy mainly along the midvein, the abaxial surface paler and hirsute with scattered white, strigose hairs, the hairs denser and longer, to 2.5 mm long, on the margins. *Inflorescences* axillary or terminal, extending up to 15 nodes below shoot apex, 1–4 flowered, condensed racemes 2–3 mm long; peduncle c. 1 mm long, strigose; bracts leaf-like, c. 2.5–5 mm long, caducous. *Flowers* functionally male, bisexual or functionally female; sessile. *Hypanthium* antrorse hairy outside, glabrous inside, greenish-white; sepals 4, narrow-ovate. *Male flowers* with hypanthium 6–8 mm long; sepals 3–4 mm long; stamens 2, rarely 3, inserted near summit of hypanthium; filaments c. 1 mm long; anthers narrow-oblong, c. 1.7 mm long; pistillode c. 1 mm long. *Bisexual flowers* protandrous, with hypanthium 4–6.5 mm long; sepals 3–4 mm long; stamens similar to male flowers; ovary c. 1.5 mm long, with erect hairs at apex; style eventually exerted; stigma brush-like. *Female flowers* with hypanthium 3–4.5 mm long, circumscissile c. 1 mm below sepal attachment; sepals 1.5–2.5 mm long; staminodes minute; gynoecium similar to bisexual flowers. *Fruit* dry, ovoid, enclosed in the persistent base of the hypanthium, pale green. *Seed* ovoid, 3–3.5 mm long, c. 2 mm wide, with minute longitudinal, foveate furrows, red-brown (Fig.1).

**Additional specimens examined:** New South Wales: Northern Tablelands: Oxley Wild Rivers National Park: c. 40 km ENE of Walcha, 30°55'S, 151°52'E, *L.M. Copeland 3444* & *P. Lupica*, 24 Oct 2002, (BRI, CANB, MEL, NSW, NE); c. 40 km ENE of Walcha, 30°55'S, 151°52'E, *L.M. Copeland 3608* & *S. Doak*, 8 Oct 2003, (CANB, MEL, NE, NSW); rim of gorge of Spring Ck., c. 38 km E of Walcha, 30°55' S, 151°51'E, *L.M. Copeland 3735*, *J.J. Bruhl* & *I.R. Telford*, 4 May 2004, (BRI, CANB, NSW, NE); c. 38 km ENE of Walcha, 30°55'S, 151°51'E, *L.M. Copeland 3819*, *I.R. Telford* & *P.J. Lupica*, 13 Oct 2004, (AD, NSW, NE); c. 37 km ENE of Walcha, edge of gorge of Redmans Ck, 30°56'S, 151°51'E, *L.M. Copeland 3822*, *I.R. Telford* & *P.J. Lupica*, 13 Oct 2004, (AD, AK, BRI, CANB, CHR, HO, MEL, NSW, NE). (Specific locality details of all specimens withheld for conservation purposes).

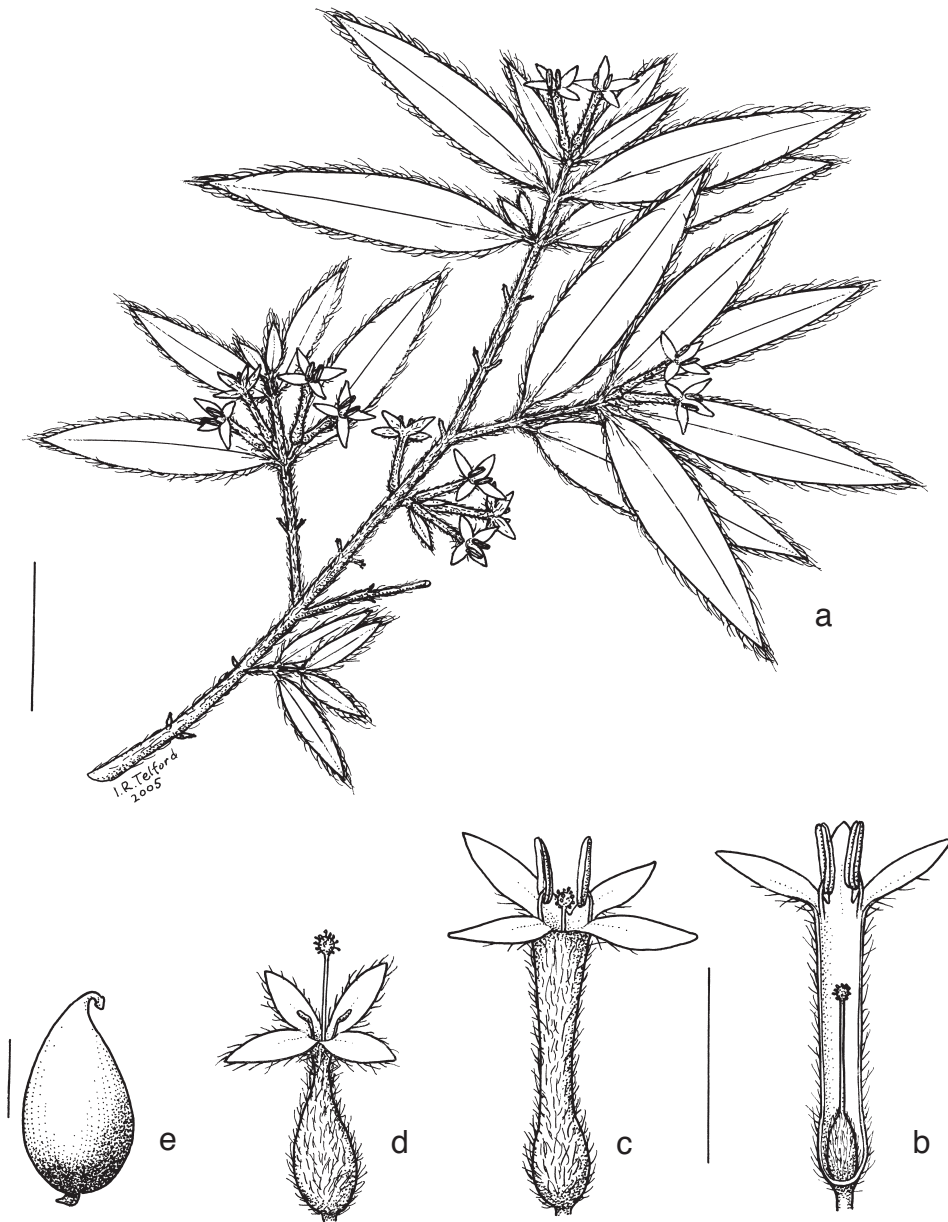
**Distribution:** apparently confined to gorge rims in the southern part of Oxley Wild Rivers National Park, approximately 40 km E of Walcha. Several small populations are scattered along a 5 km stretch of gorge rim. A large area of similar habitat exists within the park and further searches of this area of gorge rim could potentially yield additional populations.

**Habitat:** all plants observed grow in a shallow, skeletal loam over metasediments on exposed cliff tops or more sheltered cliff-side sites with south-westerly to south-easterly aspects. Altitude ranges from 1050–1090 m. Associated species include *Allocasuarina littoralis*, *Eucalyptus retinens*, *E. campanulata*, *Acacia blakei* subsp. *diphylla*, *Maytenus silvestris*, *Prostanthera rhombea*, *Dodonaea rhombifolia*, *Astrotricha longifolia*, *Ozothamnus obcordatus*, *Persoonia media*, *Callistemon* sp. nov., *Correa reflexa* var. *reflexa*, *Lepidosperma elatius* s.l., *L. laterale*, *Rhodanthe* sp. nov. and *Notodanthonia longifolia*.

**Flowering:** flowers have only been observed in early to mid October, but the presence of unopened floral buds and young fruits on specimens suggests that the species is likely to flower throughout spring.

**Conservation status:** the species is currently known from fewer than 100 individuals and relatively few juveniles have been observed. Potential threats include an inappropriate fire regime and grazing by feral goats. Several mature individuals appeared to die during





**Fig. 1.** *Pimelea cremnophila* **a**, flowering branch; **b**, bisexual flower prior to elongation of style, with part of hypanthium and one sepal removed; **c**, bisexual flower; **d**, functionally female flower; **e**, seed. Scale bar: a = 10 mm; b–d = 5 mm; e = 1 mm. (a, b, e, from *L.M. Copeland 3608* & *S. Doak*; c, d, from *L.M. Copeland 3816*, *I.R. Telford* & *P. Lupica*)

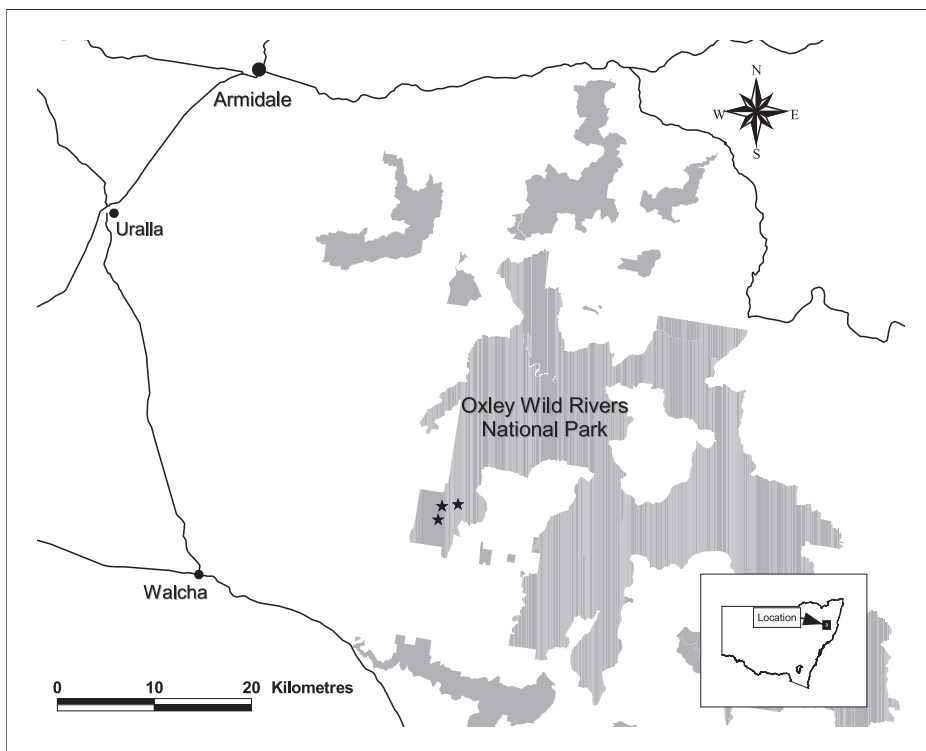


Fig. 2. The distribution of *Pimelea cremnophila* (denoted by ★) in northern New South Wales.

the period 2002–2003, presumably due to the extreme drought conditions endured at the time. Although all known plants are reserved in Oxley Wild Rivers National Park, the species should still be considered endangered due to its highly restricted distribution, small population size and the potential threats. A ROTAP code of 2ECit is recommended following the criteria of Briggs & Leigh (1996).

**Etymology:** the specific epithet *cremnophila* is derived from the Greek *cremnos* (cliff) and *philos* (loving), in reference to its habitat.

**Comparison with similar species:** *Pimelea cremnophila* belongs to section *Epallage* (Endl.) Benth. and appears to be most similar to *P. umbratica*. It differs from *P. umbratica* by its longer, denser indumentum, less prominent secondary leaf venation, predominantly axillary inflorescences, and smaller anthers on distinct filaments (Table 1).

Sexuality in sect. *Epallage* requires further study. Threlfall (1983) stated that in *P. umbratica*, male, female and bisexual flowers may occur on the same individual. However, Threlfall included *P. leptospermoides* under *P. umbratica* and did not cite which specimens had been studied for that observation. Rye (1990) claimed *P. umbratica* has bisexual and female flowers. We have observed apparently functionally male (with pistillodes) and functionally female (with staminodes) flowers on the same plant. In *P. cremnophila*, plants appear to be polygamous, with functionally male and bisexual flowers on the same plants and only functionally female on others.

Note that in Harden (1990) the description of *P. umbratica* follows Threlfall (1983) with *P. leptospermoides* (a central Queensland serpentinite endemic) included in the circumscription. The leaves of *P. leptospermoides* are alternate while those of *P. umbratica* are in fact opposite.

**Table 1. A comparison of the distinguishing features between *Pimelea cremnophila* and *P. umbratica*.**

Character	<i>P. cremnophila</i>	<i>P. umbratica</i>
Secondary venation	obscure	prominent
Secondary venation angle	25–35°	40–50°
Inflorescence	mostly axillary	mostly terminal
Bisexual flower hypanthium length	4–6.5 mm	5–7.5 mm
Bisexual flower sepal length	3–4 mm	2–2.5 mm
Stamens	filaments present	anthers sessile
Anther length	1.7 mm	2–2.5 mm
Seed colour	red-brown	black

### Acknowledgments

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