

## Two new species of *Prostanthera* (Lamiaceae) in New South Wales

Barry J. Conn and Trevor C. Wilson

National Herbarium of New South Wales, Royal Botanic Gardens and Domain Trust, Mrs Macquaries Road, Sydney 2000,  
Australia.

[barry.conn@rbgsyd.nsw.gov.au](mailto:barry.conn@rbgsyd.nsw.gov.au); [trevor.c.wilson@rbgsyd.nsw.gov.au](mailto:trevor.c.wilson@rbgsyd.nsw.gov.au)

### Abstract

*Prostanthera gilesii* and *P. makinsonii* (Lamiaceae) are described as new for New South Wales, Australia. These descriptions are accompanied by illustrations and general notes, including distribution and conservation status. A new identification key is provided for the species of *Prostanthera* in New South Wales.

### Introduction

The species richness of *Prostanthera* Labill. (Lamiaceae) is highest in the eastern mainland States of Australia where approximately 36% of the known species occur. Since the most recent taxonomic accounts of the genus in eastern Australia (Conn 1992, 1993 onwards, 1999), there have been several publications describing additional new species (Conn 1998, Conn and Wilson 2012, 2014, 2015, Hunter *et al.* 2006, Williams *et al.* 2006, Wilson and Conn 2015). Typically, species of *Prostanthera* are geographically discontinuous, forming localised populations in open and exposed habitats (such as rocky escarpments and outcrops). This paper describes two new species, *P. gilesii* and *P. makinsonii*, that appear to be extremely localised and distant from other species of the genus. Since the recent systematic research based on nucleotide sequence data (Wilson *et al.* 2012) did not support the sectional classification of the genus as proposed by Bentham (1870), no sectional classification is followed here.

A revised key to the species of *Prostanthera* occurring in New South Wales is provided to incorporate the two new species and to correct errors in previous keys (Conn 1993 onwards). The geographic distribution of each species discussed here is summarised according to the botanical divisions of New South Wales by Anderson (1961), and Jacobs and Pickard (1981) and followed (in parentheses and italics) by Australia's bioregions (IBRA7 2015). General terminology follows previous publications on the systematics of *Prostanthera* by the authors. Inflorescence terminology follows Briggs and Johnson (1979), and as modified by Conn (1995). Note: the use of the term 'Inflorescence' as a header in the description is being used as a generalised term. Provisional assessment of conservation status is according to guidelines of the New South Wales Government (15 August 2015 onwards) and the *Red List of Threatened Species* (IUCN 2015).

## New species of *Prostanthera*

***Prostanthera gilesii*** G.W.Althofer ex B.J.Conn & T.C.Wilson, **sp. nov.** Figs 1, 3

Morphologically most similar to *Prostanthera phyllicifolia* F.Muell., but leaves are 6–10 mm wide (*P. phyllicifolia* 3–4 mm wide), and during anthesis, abaxial and adaxial calyx lobes 5–6 mm (cf. 3–4 mm long).

*Holotype*: New South Wales: Central Tablelands (*South Eastern Highlands*): Mount Canobolas State Conservation Area: *W.E. Giles s.n.*, 30 Nov 1958 (NSW128314); *isotypes*: AD, BRI, CANB, MEL, NSW (see Typification below).

*Illustrations*: Althofer (1978, pp. 120 & 122)

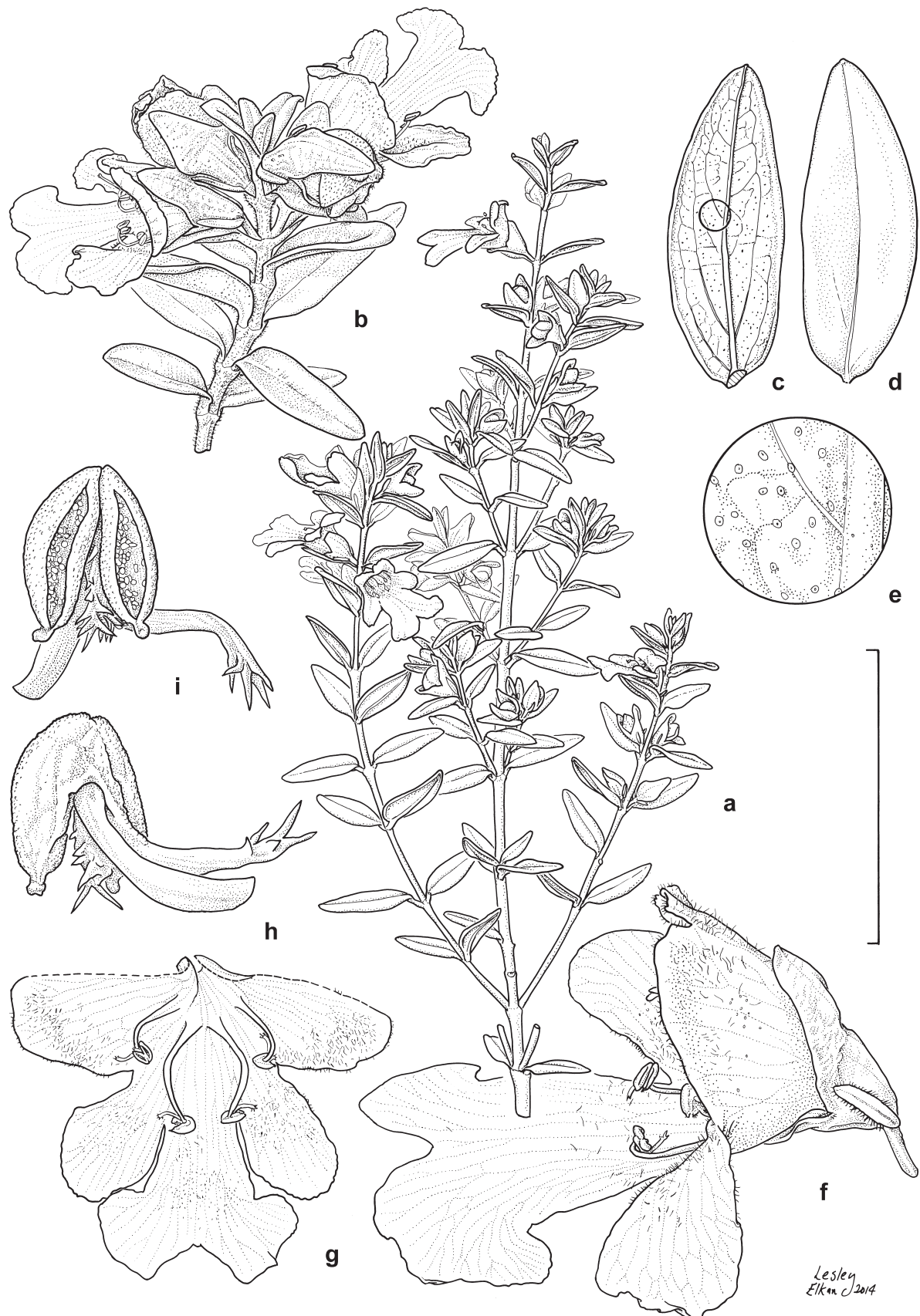
*Informal phrase name*: *Prostanthera* sp. C sensu B.J.Conn (1992) *Flora of New South Wales*, 3: 652.

Small, compact, spreading shrub, up to 1 m high, with the populations formed by a tangle of individual plants. *Branchlets* ± terete, moderately hairy on distal internodes and nodes [up to c. 80 hairs/mm<sup>2</sup>], soon becoming sparsely hairy [15–40 hairs/mm<sup>2</sup>]; hairs subappressed, antrorse, 0.2–0.5 mm long, straight to slightly curled, white; glands indistinct (mostly covered by hairs), hemispherical, subsessile, sparse [up to 20 glands/mm<sup>2</sup>]. *Leaves* dark green, glossy, paler below, aromatic; *petiole* 1–2 mm long; *lamina* narrowly ovate to elliptic, 15–26 mm long, (5–)6–10 mm wide (length to width ratio 2.6–3, length of maximum width from base to total lamina length ratio 0.3–0.5), almost glabrous, a few hairs on midrib of both surfaces and near apex, hairs 0.4–0.8 mm long, antrorse, sparsely glandular; base obtuse, often appearing attenuate because margin more involute towards base; margin entire; apex obtuse; venation indistinct, midrib slightly raised on abaxial surface. *Inflorescence* a frondose botryoidal confluence, uniflorescence monadic; 3–4(–6)-flowered (per confluence). *Podium* (1–)1.5–3 mm long, glabrous or with an occasional hair, sparsely glandular. *Pherophylls* not seen. *Prophylls* ± persistent, inserted near base of calyx ( $a_1$  axis to anthopodium ratio 6–6.7), opposite, narrowly ovate to narrowly elliptic, (2–)3–3.5(–4) mm long, 0.5–0.6 mm wide (length to width ratio 5.8–7, length of maximum width from base to total lamina length ratio up to 0.5), glabrous except with ± patent to spreading hairs along margin (hairs as for leaf lamina), glandular; base slightly attenuate; margin entire; apex obtuse; venation not visible. *Calyx* green; outer surface glabrous, moderately glandular; inner surface of tube glabrous, lobes densely hairy near margin and apex, hairs crinkled, 0.1–0.2 mm long; *tube* (2–)2.5–3 mm long; *abaxial lobe* ovate to broadly ovate, 5–6 mm long, 3.5–4 mm wide at base (length to width ratio 1.2–1.5), apex rounded; *adaxial lobe* broadly to very broadly ovate, 5–6 mm long, (3.5–)4.5–5.5 mm wide at base (length to width ratio 1.1–1.4), apex rounded (adaxial lobe length to abaxial lobe length ratio c. 1). *Corolla* 12–15 mm long, white to yellowish white, with purple to dark mauve markings on the inner surface of the tube and base of adaxial median lobe-pair, with pale orange marking on base of abaxial median lobe; outer surface glabrous basally, distally sparsely to moderately hairy, especially on lobes [up to c. 40 hairs/mm<sup>2</sup>], hairs 0.1–0.3 mm long, ± spreading to appressed; inner surface glabrous in tube, sparsely to moderately hairy on lobes and in sinuses between lobes; *tube* 7–9(–10) mm long; *abaxial median lobe* broadly spatulate, 10–11 mm long, 4–4.5 mm wide (below distal lobing) (length to width ratio 2.4–2.5), apex slightly irregular and rounded, bilobed (sinus c. 3 mm long, 4–4.5 mm wide distally); *lateral lobes* oblong to slightly elliptic, 7–8 mm long, 4–4.5 mm wide (length to width ratio 1.8–2), apex rounded to slightly retuse, irregular; *adaxial median lobe-pair* very broadly to depressed ovate, 4–5 mm long, 8–9 mm wide (length to width ratio 0.4–0.6), apex rounded, irregular, bilobed (sinus 1–1.2 mm long, 1–1.5 mm wide, median margin of lobes slightly overlapping). *Stamens* inserted 5–6 mm above base of corolla; *filaments* white, often with maroon tinge, 6–10 mm long; *anthers* dark mauve, 1.2–1.5 mm long, base of lobes glabrous, usually with a small acumen and short, white trichomes c. 0.2 mm long, connective appendage white, (1.5–)2–2.5 mm long, with a few narrowly triangular trichomes 0.2–0.4 mm long. *Disc* 0.3–0.4 mm long. *Pistil* 10–11 mm long; *ovary* cylindrical obovoid, 0.6–0.8 mm long, at base 0.8–1 mm diam., lobes 0.2–0.3 mm long; *style* 9–10 mm long; *stigma lobes* c. 0.5 mm long (± equal in length). *Fruiting calyx* not or only slightly enlarged (only immature fruits seen). *Mature mericarps* and seeds not seen.

**Distribution**: Known only from Mount Canobolas State Conservation Area, SW of Orange, New South Wales, Australia. This location is situated within the Central Tablelands Botanical Division (*South Eastern Highlands Biogeographic Region*). **Fig. 3**

**Habitat**: This species occurs in montane wet sclerophyll forest dominated by *Eucalyptus dalrympleana* Maiden, *E. dives* Schauer and *E. rubida* H.Deane & Maiden, with understorey shrubs of *Mirbelia oxylobioides* F.Muell., *Polyscias sambucifolia* (Sieber ex DC) Harms, *Asterolasia rupestris* B.J.Mole, *Cassinia longifolia* R.Br., *C. arcuata* R.Br. (*Medd & Bower s.n.*). Soils are recorded as basaltic loams (*Medd & Bower s.n.*). Altitude c. 1000 m.

**Etymology**: The specific epithet ‘gilesii’ was first proposed by Mr George Althofer (Althofer 1978) to acknowledge William (Bill) E. Giles who ‘experimented in growing Australian and exotic plants’ (Althofer 1978, p. 121). Giles discovered this new species in the 1940s (Althofer 1978), with the first known herbarium collection made by him on the 17<sup>th</sup> December 1950.



**Fig. 1.** Illustration of *Prostanthera gilesii*. **a.** habit; **b.** flowering branch; **c.** leaf surface, abaxial view; **d.** leaf lamina surface, abaxial view; **e.** detail of abaxial leaf lamina surface, showing hemispherical glands; **f.** flower, lateral view, showing calyx, corolla, translocated anthers, and slightly exerted style; **g.** open corolla, showing inner surface of lobes and tube, indumentum on lobes, and stamens **h.** anther (adaxial), dorsal view; **i.** anther (adaxial), ventral view (Giles s.n., 30 Nov 1958, NSW). Scale bar: a = 60 mm; b = 24 mm; c, d & g = 20 mm; e = 3.3 mm; f = 12 mm; h & i = 2.5 mm.

**Typification:** The handwritten note (in Giles' hand) attached to the type material (*Giles s.n.*, 30 Nov 1958) records that this collection was “a random collection from the lower (SW) colony ...”. An additional note [in Nerida Ford's hand ex NSW] presumably quotes correspondence from Giles by stating “A random collection of the *Prostanthera* twice previously sent – no attempt at a collection of botanical variants – my eyes fail but no 2 stems should come from the same plant.” Therefore, for the purposes of typification, the material in this collection is regarded as a gathering made at the one time (refer ICN 2012, Art. 8.2) even though the collector intended this to be a population collection of separate plants. The ‘duplicate’ samples, other than the holotype, are regarded as isotypes.

**Conservation status:** This species is known only from two small populations at Mount Canobolas State Conservation Area within less than a 5 km<sup>2</sup> area. The original collector of *P. gilesii* regarded this species as rare (Giles 1961). Since this species easily strikes from layered stems, the genetic diversity of this species is difficult to estimate, and each population could represent a single clone. Soil near two individuals afflicted with dieback symptoms (Steven Woodhall pers. comm.) tested positive for the presence of *Phytophthora* sp. Since no further populations have been discovered, and current populations are also in close proximity to invasive weedy species (*Rubus* sp.) and human activity, we suggest that this species, if assessed for listing under the *New South Wales Threatened Species Conservation Act* (1995), would satisfy the criteria for at least Endangered status, if only because of its very restricted distribution. This species also meets the Endangered category under the *Red List of Threatened Species* (IUCN 2015), since it is not known at more than five locations, and with respect to pests and recent detection of *Phytophthora* sp., there is an observed continuing decline in the habitat quality.

**Other specimens examined** (although the numbers associated with some of the *Giles* collections are possibly not collection numbers, they are cited here as they are unique amongst his collections): AUSTRALIA: NEW SOUTH WALES: Central Tablelands (*South Eastern Highlands*): Mount Canobolas State Conservation Area: Devils Hole: *W.E. Giles* 1, 5 Jan 1960 (NSW128316), *W.E. Giles* 2, 29 Dec 1963 (NSW128317); *W.E. Giles* 3, 17 Dec 1950 (NSW128312), *W.E. Giles* 5, 18 Nov 1957 (NSW128313), 30 Nov 1958 (NSW128315), *R.W. Medd & C.C. Bower s.n.*, 13 Dec 2006 (NSW774769), *T.C. Wilson* 581, *M.A.M. Renner & R.W. Medd*, 23 Jun 2015 (NSW); Upper Towac Creek, *T.C. Wilson* 577 & *M.A. Winkler*, 20 Jun 2015 (NSW).

***Prostanthera makinsonii* B.J.Conn & T.C.Wilson, sp. nov. Figs 2, 3**

This species is morphologically similar to *Prostanthera granitica* Maiden & Betche but differs by having green leaves, 15–20 mm long, 5–10 mm wide, with petiole 1.5–2 mm long (*P. granitica* has glaucous leaves, that are 6–15 mm long, 2–5 mm wide, and with petiole up to 1 mm long); corolla 15–20 mm long (*P. granitica* with corolla 8–10 mm long); and branchlets and leaves with hairs  $\pm$  patent (*P. granitica* with hairs  $\pm$  antrorse).

**Holotype:** New South Wales: Southern Tablelands: Kosciuszko National Park: along Dinner Time Creek, S of Stokes Hut, *N. Taws* 225 & *A. Scott*, 30 Oct 1993 (NSW624624); isotypes: CBG, MEL.

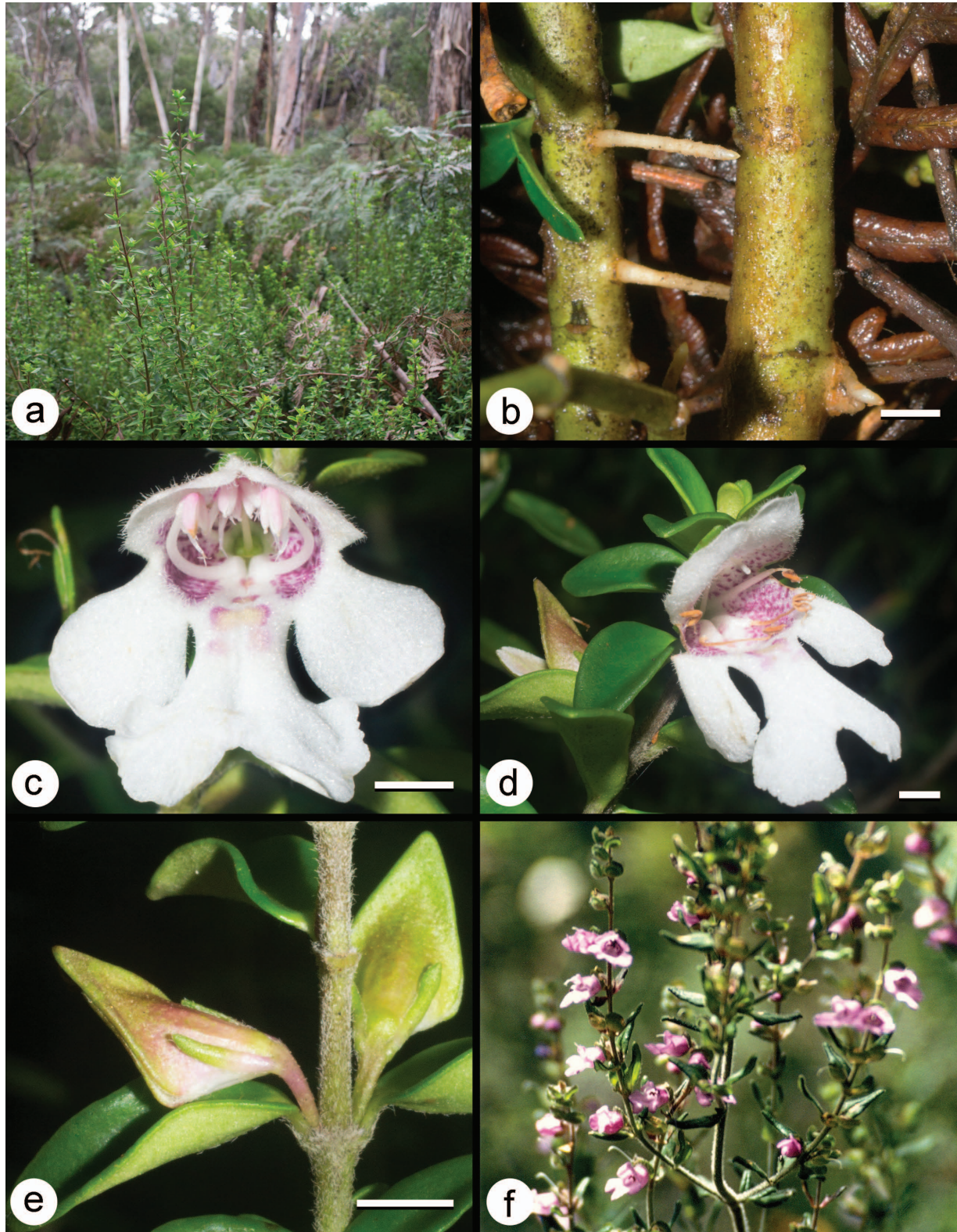
Spreading shrub, up to 2 m high. *Branchlets*  $\pm$  terete, moderately to densely hairy on internodes and nodes [up to c. 60 hairs/mm<sup>2</sup>]; hairs patent or slightly spreading, 0.4–1.2 mm long,  $\pm$  straight to slightly curved distally, white; glands distinct, hemispherical, subsessile, moderate to dense [20–48 glands/mm<sup>2</sup>]. *Leaves* green, paler below, strongly aromatic; *petiole* 1.5–2 mm long; *lamina* ovate to slightly narrowly so, 15–20 mm long, 6–10 mm wide (length to width ratio 1.7–2.5, length of maximum width from base to total lamina length ratio 0.24–0.3), moderately to sparsely hairy [up to c. 20 hairs/mm<sup>2</sup>], on abaxial surface mostly confined to midrib, secondary veins and margin, with hairs 0.2–0.6 mm long, sub-patent to spreading, straight to slightly curved distally, moderately to densely glandular [25–48 glands/mm<sup>2</sup>]; base rounded to obtuse; margin entire, incurved; apex obtuse; venation distinct, midrib raised on abaxial surface. *Inflorescence* a frondobracteose botryoidal superconflorescence, conflorescence bracteose botryoidal (with one pair of leaves basally), uniflorescence monadic; 8–12-flowered (per conflorescence). *Podium* 1.5–2 mm long, hairy, sparsely glandular. *Pherophylls* ovate to obovate, sometimes broadly so, (1.5–)2.5–3.5 mm long, (1.3–)1.5–2 mm wide (length to width ratio (1.2–)1.6–2, length of maximum width from base to total lamina length ratio 0.3–0.6), soon caducous (often not seen). *Prophylls*  $\pm$  persistent, inserted near base of calyx (a<sub>1</sub> axis to anthopodium ratio 2–4), opposite, narrowly elliptic, 2–2.5 mm long, 0.5–0.8 mm wide (length to width ratio 3–4, length of maximum width from base to total lamina length ratio c. 0.5), moderately hairy, with hairs c. 0.2 mm long,  $\pm$  patent, moderately glandular; base slightly attenuate; margin entire; apex obtuse; venation not visible. *Calyx* green, at least sometimes with maroon tinge; outer surface moderately to densely hairy (especially along ridges of main veins) and glandular (hairs and glands as for leaves); inner surface of tube glabrous, lobes densely hairy, hairs crinkled, appressed or  $\pm$  patent, up to c. 0.1 mm long; *tube* 2–2.5 mm long; *abaxial lobe* broadly to very broadly ovate, 2–3 mm long, 3–3.4 mm wide at base (length to width ratio 0.8–1), apex rounded; *adaxial lobe* very broadly ovate, 2.2–3 mm long, 3–3.2 mm wide at base (length to width ratio 0.7–0.9), apex rounded (adaxial lobe length to abaxial lobe width ratio 0.7–1.1). *Corolla* 7.5–8 mm long, purple, markings presumed absent; outer surface glabrous basally, distally with a few scattered hairs (hairs  $\pm$  patent, up to c. 0.2 mm long) and glands, especially on lobes; inner surface glabrous; *tube* 20–25 mm long; *abaxial median lobe* spatulate, c. 5 mm long, c. 3 mm wide (below distal lobing) (length to width



ratio 1.6–1.7), apex slightly irregular and rounded, bilobed (sinus c. 1 mm long, up to c. 1 mm wide distally); *lateral lobes* oblong to slightly elliptic, 4–4.2 mm long, 2.5–2.7 mm wide (length to width ratio 1.5–1.6), apex rounded to slightly retuse, irregular; *adaxial median lobe-pair* depressed ovate, 3.2–3.5 mm long, 5.5–6.5 mm wide (length to width ratio 0.5–0.6), apex rounded, irregular, bilobed (sinus 1–1.2 mm long, c. 1 mm wide, median margin of lobes not overlapping or slightly overlapping). *Stamens* inserted 15–18 mm above base of corolla; *filaments* white, 18–20 mm long; *anthers* (colour not known) 0.8–1 mm long, acumen present, connective appendage 0.6–0.8 mm long, with a few narrowly triangular trichomes basally (up to 0.2 mm long), also on base of locules and acumen. Disc 0.3–0.4 mm long. *Pistil* 7–8 mm long; *ovary* cylindrical obovoid, 0.6–0.8 mm long, at base c. 0.7 mm diam., lobes c. 0.2 mm long; *style* 6–7 mm long; *stigma lobes* 0.2–0.3 mm long ( $\pm$  equal in length). *Fruiting calyx* not or only slightly enlarged (adaxial median lobe-pair 3.5–4 mm long, 4.5–5 mm wide; only immature fruits seen). *Mature mericarps* and seeds not seen.

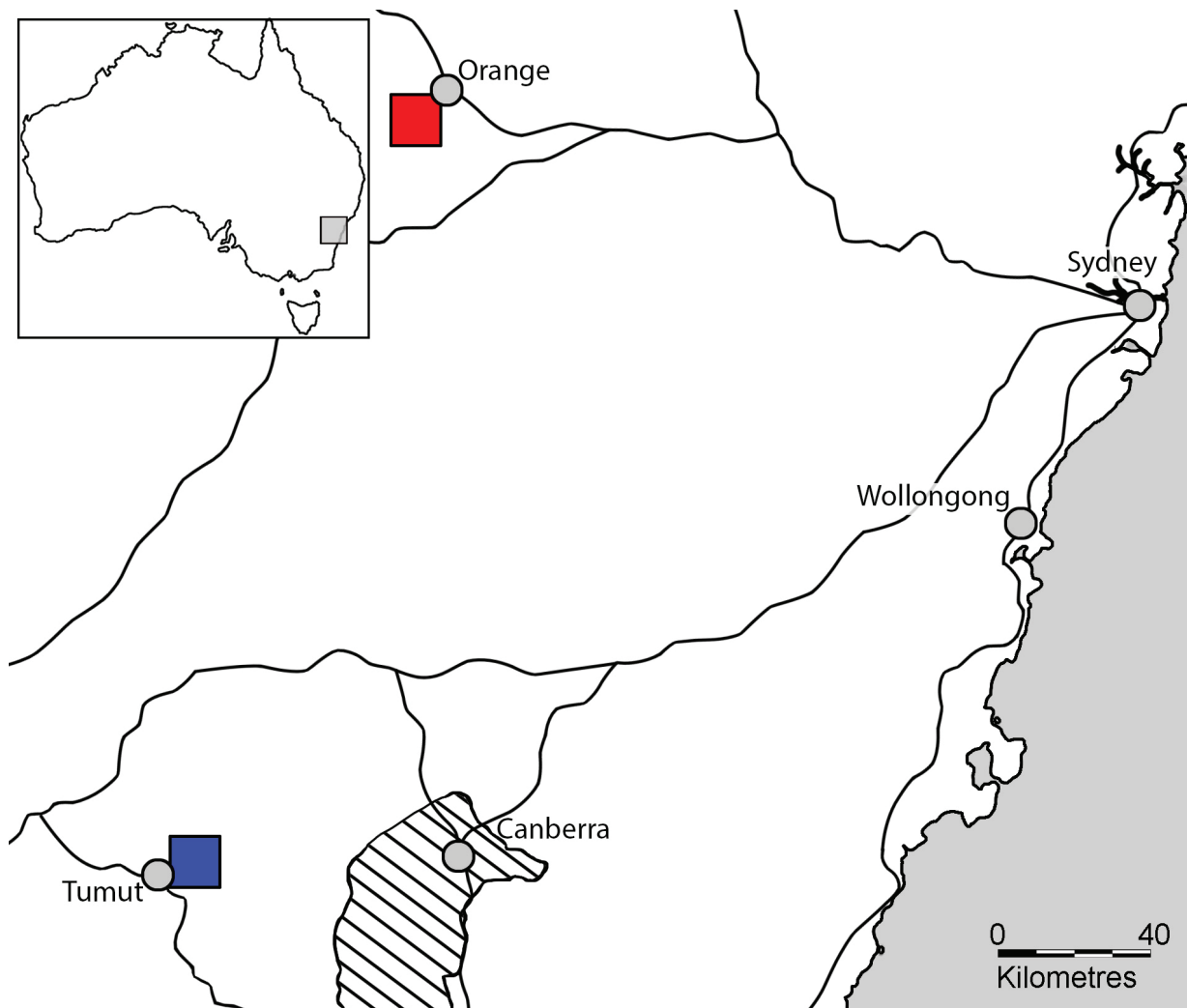


**Fig. 2.** Illustration of *Prostanthera makinsonii*. **a.** habit; **b.** flowering branch; **c.** flower, lateral view, showing calyx, corolla and exerted style; **d.** flower, ventral view, showing corolla inner surface of lobes and tube, stamens and distal half of style; **e.** anther (adaxial), dorsal view; **f.** anther (adaxial), lateral view; **g.** leaf lamina surface, abaxial view, showing details of hairs and hemispherical glands on venation and leaf surface; **h.** leaf surface, abaxial view, showing hairy petiole and lamina surface; **i.** leaf surface, adaxial view, showing hairy petiole and lamina surface (*N. Taws 225 & A. Scott, NSW*). Scale bar: a = 100 mm; b = 30 mm; c & d = 10 mm; e–g = 2.5 mm; h & i = 15 mm.



**Fig. 3.** Photographs of *Prostanthera gilesii* and *P. makinsonii*. **a**, habit and habitat of *P. gilesii*; **b**, older branches of *P. gilesii*, showing adventitious roots; **c**, ventral view of *P. gilesii* flower in male phase, showing corolla lobes, corolla throat, staminal filaments, position of anther locules and anther appendages; **d**, oblique view of dichogamous flower in female phase, showing inner surface and markings of corolla tube and lobes, translocated stamens, and incurved style; **e**, fruiting calyx enclosing developing mericarps (not visible); **f**, habit and inflorescences of *P. makinsonii*. Scale bar = 2.5 mm. Photographs by T. Wilson (*P. gilesii*) and N. Taws (*P. makinsonii*).





**Fig. 4.** Distribution map of *Prostanthera gilesii* (red square) and *P. makinsonii* (blue square) in New South Wales, south-eastern Australia. Australian Capital Territory is marked by hashed lines.

**Distribution:** Known only from the Goobarrangandra Valley area in the Southern Tablelands (*South Eastern Highlands*) of New South Wales, Australia. **Fig. 4**

**Habitat:** This species is locally abundant in a restricted area (c. 20 m × 150 m, *Taws 225*) in open forest dominated by *Eucalyptus radiata* Sieber ex DC., with dense understorey of *Acacia pravissima* F.Muell., *Lomatia myricoides* (C.F.Gaertn.) Domin, *Daviesia ulicifolia* Andrews, *Leucopogon lanceolatus* (Sm.) R.Br. and *Pteridium esculentum* (G.Forst.) Cockayne. It can also be found amongst *Bursaria spinosa subsp. lasiophylla* (E.M.Benn.) L.Cayzer, Crisp & I.Telford in deep shade of a thicket of *Leptospermum* sp. Soils are recorded as clay loams on Goobarrangandra Volcanics on lower slope of steep hillside (*Taws 225*). Altitude 400–730 m.

**Etymology:** The specific epithet ‘makinsonii’ acknowledges the significant contribution that Mr Robert (Bob) Makinson (Conservation Botanist, Royal Botanic Gardens, Sydney) has made to the conservation of the flora of New South Wales. He is a life member of the *Australian Network for Plant Conservation Inc.*, being a member since 1992 and President from 2007–2011. Other key conservation roles that Bob has undertaken include: Chairman of the Endangered Flora Network (1997–2000); Royal Botanic Gardens Trust representative (2001–2003) on New South Wales Native Vegetation Implementation Group; Member of the New South Wales Scientific Committee (2005–2010) responsible for assessment and listing of threatened species, populations, ecological communities, and Key Threatening Processes under the New South Wales Threatened Species Conservation Act; and Member of the New South Wales Office of Environment and Heritage *Saving Our Species Implementation Working Group* and its progenitors (2010–). He has published extensively on conservation issues, and he encouraged us to determine the taxonomic status of this very localised plant.

**Conservation status:** Although this species is afforded some protection by being included in the Kosciuszko National Park, it is known only from two small areas. It is likely that, if assessed for listing under the *New South*

*Wales Threatened Species Conservation Act (1995)*, this species would meet the criteria for at least Endangered status, if only because of its very restricted distribution. Although only two populations of *P. makinsonii* are known to exist, the IUCN status should remain as data deficient until habitat and population fluctuations have been assessed (IUCN 2015).

**Other specimen examined:** AUSTRALIA: NEW SOUTH WALES: Southern Tablelands: (*South Eastern Highlands*): Goobarrangandra River, R.O. Makinson 876, G. Butler & W.M. Molyneux, 9 Nov 1991 (AD, BRI, CANB, K, MEL, NSW, PERTH, US)

### Key to species of *Prostanthera* in New South Wales

Previous modifications to parts of this key to the species of *Prostanthera* occurring in New South Wales (Conn 1997, Conn and Wilson 2014, Hunter *et al.* 2006) and the two new species described here are incorporated in this new key.

- |     |  |                        |
|-----|--|------------------------|
| 1   | Calyx lobes unequal in length; corolla mauve to white, with tube short, broad apically; lower lobe longer and more spreading than the erect upper lobes; fruit enclosed by inward folded lower calyx lobe; upper calyx lobe usually recurved ..... | 2                      |
| 1*  | Calyx lobes $\pm$ equal in length; corolla red to pink, or bluish to yellowish green (never mauve to white) with tube long, slightly expanded apically; median upper and lower lobes $\pm$ equal; fruit not enclosed by the calyx lobes .....      | 54                     |
| 2   | Flowers arranged in bracteose inflorescences (appearing terminal), the floral leaves all or mostly reduced to membranous, usually caducous prophylls .....   | 3                      |
| 2*  | Flowers arranged in leafy botryoids (appearing axillary), with subtending leaves (of flowers) similar to and sometimes smaller than the leaves on the branchlets .....   | 25                     |
| 3   | Leaves with margin entire .....  | 4                      |
| 3*  | Leaves with margin variously toothed .....   | 15                     |
| 4   | Branches glabrous, except for nodes and/or lateral ridges .....  | 5                      |
| 4*  | Branches sparsely to densely hairy .....   | 6                      |
| 5   | Branches with hairs restricted to nodes; leaves narrowly ovate to linear, usually less than 40 mm long, less than 5 mm wide, petiole absent or up to 2 mm long .....   | <i>P. linearis</i>     |
| 5*  | Branches with hairs restricted to lateral ridges and nodes; leaves ovate, 40–70 mm long, 12–26 mm wide, petiole 5–12 mm long .....   | <i>P. petraea</i>      |
| 6   | Anther appendages as long as locule .....  | <i>P. prunelloides</i> |
| 6*  | Anther appendages absent or less than half the length of a locule .....  | 7                      |
| 7   | Leaves with lamina very broadly ovate or almost circular .....   | 8                      |
| 7*  | Leaves with lamina ovate or narrowly ovate .....   | 9                      |
| 8   | Leaves grey-green; lamina very broadly ovate, base truncate; prophylls reduced, soon caducous (in flower); anthers separated during anthesis .....   | <i>P. cruciflora</i>   |
| 8*  | Leaves dark to light green; lamina almost circular, base cuneate; prophylls conspicuous and persistent; anthers held in pairs within corolla tube .....  | <i>P. rotundifolia</i> |
| 9   | Leaf margin flat, leaves glabrous .....  | 10                     |
| 9*  | Leaf margin recurved, leaves hairy .....   | 13                     |
| 10  | Calyx densely hairy; leaves with lamina narrowly ovate .....   | <i>P. discolor</i>     |
| 10* | Calyx glabrous or almost so; leaves with lamina ovate .....  | 11                     |
| 11  | Largest leaves at least 2.5 cm long .....  | <i>P. ovalifolia</i>   |
| 11* | Largest leaves less than 2.5 cm long .....   | 12                     |
| 12  | Indumentum consisting of short, curled hairs .....   | <i>P. cineolifera</i>  |



- 12\* Indumentum consisting of short, straight hairs ..... *P. lanceolata*
- 13 Leaves 8–13 mm long, ovate but appearing rhombic when margin excessively recurved after drying ....  
..... *P. stricta*
- 13\* Leaves 10–30 mm long, narrow ovate to ovate, but never ovate when shorter than 15 mm long ..... 14
- 14 Leaves 1.5–6 mm wide, margins often strongly revolute ..... *P. hirtula*
- 14\* Leaves 6–10 mm wide, margins weakly recurved ..... *P. makinsonii*
- 15 Leaves flat ..... 16
- 15\* Leaves with margin recurved or revolute ..... 23
- 16 Leaves deeply toothed with teeth rounded and directed forward; branches and leaves moderately to densely covered with distinct, long (1–1.5 mm long),  $\pm$  spreading hairs ..... *P. askania*
- 16\* Leaves shortly toothed; branches and/or leaves glabrous or if hairy then hairs short (less than 1 mm long) and curled ..... 17
- 17 Flowers white, or with pale wash of mauve, spots in throat of corolla, inside and outside of corolla hairy, anther appendage at least as long as anther locule ..... 18
- 17\* Flowers deep mauve, corolla markings absent, inside corolla not hairy, anther appendage shorter than locule or absent ..... 19
- 18 Petiole 4–8 mm long, lamina width 20–30 mm ..... *P. lasianthos*
- 18\* Petiole 2–5 mm long, lamina width 4–5 mm ..... *P. tallowa*
- 19 Leaves with lamina almost circular, base cuneate ..... *P. rotundifolia*
- 19\* Leaves with lamina ovate to narrowly ovate ..... 20
- 20 Leaves with usually 3 teeth on each side of margin, older branches sometimes inserted at 90 degree angle ..... *P. incisa*
- 20\* Leaves entire or with teeth, older branches inserted at less than 90 degree angle ..... 21
- 21 Calyx densely hairy; leaves with lamina narrowly ovate to oblong ..... *P. discolor*
- 21\* Calyx glabrous or almost so; leaves with lamina ovate ..... 22
- 22 Branchlets hairy or with hairs at least restricted to decussate grooves ..... *P. ovalifolia*
- 22\* Branchlets glabrous ..... *P. caerulea*
- 23 Leaves glabrous, except for a few short stiff hairs near margin of leaf ..... *P. denticulata*
- 23\* Leaves hairy on both surfaces, margins crenate ..... 24
- 24 Leaves c. 5(–7) mm long, with short, stiff hairs ..... *P. violacea*
- 24\* Leaves (8–) c. 10 mm long, finely and densely hairy ..... *P. incana*
- 25 Leaves convex or with margin recurved to revolute ..... 26
- 25\* Leaves flat or margin conduplicate or incurved ..... 42
- 26 Leaves  $\pm$  terete, oblong, linear, or deeply 3- or 5-fid (in *P. staurophylla*) with lobes linear ..... 27
- 26\* Leaves narrowly ovate to broadly ovate,  $\pm$  circular or obovate, never lobed ..... 33
- 27 Leaves  $\pm$  terete; leaf margin entire or deeply 3- or 5-fid and lobes 3–5 mm long; prophylls not persistent, c. 0.5 mm long; branches densely covered with shortly curled hairs ..... 28
- 27\* Leaves oblong, narrowly oblong or linear; leaf margin entire; prophylls persistent, at least 1.6 mm long; branches glabrous between nodes or sparsely to densely covered with  $\pm$  straight, spreading to appressed hairs ..... 29
- 28 Adult leaves grey-green, strongly revolute such that lamina appears subterete, 5–16 mm long; margin entire or deeply 2- or 3-fid, densely covered with sessile glands; branches densely covered with sessile glands; anther appendage absent or minute ..... *P. teretifolia*
- 28\* Adult leaves lime- to dark green, oblong or linear, if lobed, then lobes linear, never terete-like, 2–9 mm long, deeply (2–)3(–7)-fid, with scattered glandular hairs adaxially; branches densely covered with podiate glandular hairs; anther appendage present ..... *P. staurophylla*

- 29 Branches 4-ridged (often winged), glabrous, except for nodes ..... 30
- 29\* Branches not 4-ridged, hairy throughout..... 31
- 30 Nodes and bases of short shoot distinctly hairy; flower approximately 4 times longer than pedicel; prophylls opposite; adaxial calyx lobe apiculate and approximately equal in size to abaxial calyx lobe ..... *P. linearis*
- 30\* Nodes with a few short hairs present; pedicels as long as or up to 2 times as long as the flower; prophylls  $\pm$  subopposite; adaxial calyx lobe rounded, shorter than abaxial calyx lobe ..... *P. elisabethae*
- 31 Leaves with apex acute; calyx lower lip often retuse with two sharp points, calyx glabrous ..... *P. scutellarioides*
- 31\* Leaves with apex obtuse; calyx lower lip rounded and hirsute or with at least a few sparse hairs ..... 32
- 32 Leaves evenly covered with short straight hairs and margin shortly (often indistinctly) lobed to bluntly toothed; hairs suberect to spreading, not appressed; anther appendage absent ..... *P. stenophylla*
- 32\* Leaves with only a few hairs or glabrous and with margin entire; hairs appressed, antrorse, short; anther appendage present ..... *P. saxicola*
- 33 Leaves wrinkled with margin crenate ..... *P. rugosa*
- 33\* Leaves  $\pm$  smooth with margin entire ..... 34
- 34 Spines present, weakly erect or prostrate shrubs ..... *P. sejuncta*
- 34\* Spines absent, open erect shrubs ..... 35
- 35 Leaves  $\pm$  circular, usually appearing angular-ovate (rhombic) ..... *P. rhombea*
- 35\* Leaves narrowly ovate to ovate or obovate ..... 36
- 36 Leaves glabrous ..... 37
- 36\* Leaves hairy, at least with a few short tooth-like hairs near margin ..... 38
- 37 Leaves obovate, 4–6.5 mm long; prophylls not persistent, 3–3.5 mm long; strongly aromatic shrub; branches densely covered with short,  $\pm$  spreading hairs ..... *P. cuneata*
- 37\* Leaves narrowly ovate, 5–15 mm long; prophylls persistent, 2.5 mm long; slightly aromatic; branches sparsely covered with short, appressed hairs between ridges ..... *P. phyllicifolia*
- 38 Leaves often with upper surface almost glabrous, having a few tooth-like hairs ..... 39
- 38\* Leaves with upper surface moderately to densely hairy ..... 40
- 39 Leaves hairy, at least with a few short tooth-like hairs near margin; branches densely covered with short to long spreading to antrorse hairs; corolla without markings in throat..... *P. decussata*
- 39\* Leaves with upper surface almost glabrous, having a few tooth-like hairs; branches predominantly glandular, usually sparsely to moderately covered with short,  $\pm$  antrorse hairs; corolla throat with dark purple spots ..... *P. howelliae*
- 40 Anther appendage absent, dark mauve markings in corolla, leaves grey-green, never toothed (note: if corolla markings absent and leaves not grey-green, then = *P. rhombea*) ..... *P. granitica*
- 40\* Anther appendage about as long as locule, lower inside corolla throat white covered with orange markings; leaves green, sometimes toothed ..... 41
- 41 Branchlets, leaves and calyces scabrous hirsute; leaves narrowly ovate to narrowly elliptic, up to 8 mm long; prophylls up to 2.5 mm long ..... *P. marifolia*
- 41\* Branchlets, leaves and calyces densely and softly hairy; leaves broadly ovate, often cordate, 6–13 mm long; prophylls 2–5.5 mm long ..... *P. densa*
- 42 Branchlets, leaves and calyces with glandular hairs ..... 43
- 42\* Branchlets, leaves and calyces without glandular hairs ..... 44
- 43 Calyx and branches not appearing glandular because podiate glands <0.02 mm long; calyx with inner surface glabrous or with an occasional hair and gland (visible by 10 $\times$  magnification); adaxial calyx lobe with apex rounded to 3-lobed ..... *P. cryptandroides* subsp. *cryptandroides*

- 43\* Calyx and branches distinctly glandular, podiate glands (0.1–)0.2–0.6; mm long; calyx with inner surface glandular (visible by 10× magnification); adaxial calyx lobe rounded to slightly emarginate .....  
..... *P. cryptandroides* subsp. *euphrasioides*
- 44 Branchlets, leaves and calyces glabrous ..... *P. striatiflora*
- 44\* Branchlets, leaves or calyces hairy ..... 45
- 45 Leaves narrowly obovate (often appearing almost linear) or linear, conduplicate or incurved, usually appearing ± terete ..... 46
- 45\* Leaves ± flat or slightly channelled above; margin slightly incurved or slightly recurved ..... 47
- 46 Erect shrub 1–4 m high; adaxial calyx lobe 3–5 mm long; corolla 14–18 mm long; anther appendage c. 1.5 mm long; leaf lamina 10–50 mm long, 0.5–2 mm wide ..... *P. nivea*
- 46\* Low spreading, decumbent or sub-prostrate, or weakly erect subshrub, 0.1–0.3 m high; adaxial calyx lobe 1.5–1.8 mm long; corolla 8–12 mm long; anther appendage 0.5–0.7 mm long; leaf lamina 8–16 mm long, 1–4 mm wide (note: elliptic to narrowly elliptic leaves are also present on young plants or near the base of older plants) ..... *P. junonis*
- 47 Branchlets moderately to densely hairy, with hairs patent or slightly spreading ..... *P. makinsonii*
- 47\* Branchlets appearing sparsely hairy or with hairs restricted to opposite decussate bands ..... 48
- 48 Branchlets with opposite decussate bands of hairs (often superficially appearing glabrous) ..... 49
- 48\* Branchlets sparsely hairy with appressed hairs, or if almost glabrous then hairs restricted to nodes ..... 52
- 49 Leaves obovate to ± spatulate; calyx with inner surface glabrous and outer surface densely hairy .....  
..... *P. palustris*
- 49\* Leaves linear, ovate, elliptic, or narrowly obovate; calyx variously hairy or glabrous throughout ..... 50
- 50 Strongly aromatic shrub; leaves with margin dentate to deeply dissected ..... *P. incisa*
- 50\* Non-aromatic or faintly aromatic shrub; leaves with margin entire ..... 51
- 51 Erect shrub to 2 m high; calyx with outer surface glabrous or almost so; anther appendages absent .....  
..... *P. hindii*
- 51\* Low spreading, decumbent, weak subshrub, erect when young 0.1–0.3 m high; calyx with outer surface sparsely to densely hairy, especially on abaxial surface of tube and abaxial lobe (distinct anther appendages almost as long as the locule) ..... *P. junonis*
- 52 Leaves (5–)6–10 mm wide, fresh leaves aromatic when crushed ..... *P. gilesii*
- 52\* Leaves less than 5 mm wide, not aromatic when crushed ..... 53
- 53 Leaves up to 15 mm long, branches lacking ridges ..... *P. saxicola*
- 53\* Leaves 15 mm long, branches distinctly 4-ridged ..... *P. linearis*
- 54 Prophylls inserted at base or on lower half of pedicel ..... *P. ringens*
- 54\* Prophylls inserted at base of calyx or on upper half of pedicel ..... 55
- 55 Leaves with lamina ± terete ..... *P. aspalathoides*
- 55\* Leaves with lamina ovate to narrowly ovate, sometimes ± circular, never terete or linear-obovate ..... 56
- 56 Branches 4-angular and 4-ridged, ridges fused to base of petiole ..... *P. porcata*
- 56\* Branches ± terete, ridges absent ..... 57
- 57 Leaves with lamina less than 5 mm long; petiole absent or to 0.5 mm long; venation not visible .....  
..... *P. serpyllifolia*
- 57\* Leaves with lamina more than 10 mm long; petiole more than 1.5 mm long; venation visible, often faint ..... 58
- 58 Prophylls 10–18 mm long; inner surface of calyx lobes hairy; leaves non-aromatic ..... *P. monticola*
- 58\* Prophylls 4–6.5 mm long; inner surface of calyx lobes glabrous; leaves aromatic ..... *P. walteri*



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