

## Two new species of *Prostanthera* (Lamiaceae) from south eastern Queensland

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### Abstract

Two new species of *Prostanthera* (Lamiaceae) are recognised from south eastern Queensland, Australia. Descriptions of the new species *Prostanthera oleoides* and *P. spathulata* are provided. The diagnostic features of both are illustrated, and notes on etymology, habitat preferences and conservation status are included.

### Introduction

The genus *Prostanthera* Labill. (Lamiaceae) has its highest diversity in the eastern states of mainland Australia, with approximately 30 species known as occurring in Queensland. Populations of species of *Prostanthera* are typically geographically discontinuous based on the scattered occurrence of the open and exposed habitats (such as rocky escarpments and outcrops) in which many of them grow (e.g. Conn and Wilson 2015). *Prostanthera oleoides* is restricted to sandstone escarpments of the central Queensland sandstone belt whereas *P. spathulata* is restricted to pavements on top of volcanic plugs west of Tewantin. Both species are known from relatively few botanical collections. The collection details are listed according to the Queensland botanical districts (Anonymous 1975). However, precise localities have not been cited because of the perceived vulnerability of these species.

### Taxonomy

General terminology follows previous publications on the systematics of *Prostanthera* by the authors. The shape of the leaf lamina is expressed by three simple quantitative metrics: (1) Systematics Association Committee for descriptive biological terminology (1962); (2) the ratio of length of the lamina compared to the lamina's maximum width; and (3) the position of the maximum width of the lamina as a ratio of the length (distance) of maximum width from base compared to the total lamina length. Inflorescence terminology follows Briggs and Johnson (1979), except as modified by Conn (1995).

***Prostanthera oleoides* T.C.Wilson & B.J.Conn, sp. nov. Figs 1, 2**

*Diagnosis:* *Prostanthera oleoides* is a medium-sized, open woody shrub that is morphologically similar to *P. ovalifolia* R.Br. *sensu lato*; however *P. oleoides* has glabrous branches (*P. ovalifolia* has curled hairs on branches), its leaves have a strongly recessed midvein with margin recurved (cf. midvein not visible and lamina margin flat, only sometimes weakly recurved, in *P. ovalifolia*); and corollas have dark purple markings inside throat (*P. ovalifolia* corolla markings absent).

**Holotype:** Queensland: Leichhardt: Blackdown Tableland National Park: T.C. Wilson 492, A.E. Orme & M.A. Bedoya-Perez, 27 Aug 2013 (NSW979123); isotypes: BRI, CANB.

**Informal phrase name:** *Prostanthera* sp. Blackdown Tableland (K.A.W. Williams 79071) (Bean and Forster 2014, as '*Prostanthera* sp. (Blackdown Tableland K.A.W. Williams 79071)').

Open, erect woody shrub to 2 m high, crown c. 1.5 m wide, with a single trunk. *Branchlets* quadrangular with ridges connecting to base of petiole, developing red and grey waxy bark on older branches, stem to 10 cm diam., glabrous, densely glandular [15–35 glands/mm<sup>2</sup>]; glands distinct, hemispherical, sessile. *Leaves* discolorous, with abaxial surface green, adaxial surface dark green, strongly aromatic; *petiole* 1–3 mm long; *lamina* narrowly elliptic, oblong, or narrowly obovate, (11–)18–30 mm long, (2–)4–6 mm wide [length to width ratio 4–7, length of maximum width from base to total lamina length ratio 0.3–0.4], glabrous, densely glandular [abaxial surface 25–55 glands/mm<sup>2</sup>]; base attenuate; margin entire, recurved (strongly when dried); apex obtuse; venation indistinct, midrib raised on abaxial surface and slightly depressed on adaxial surface. *Inflorescence* a frondose dibotryoid confluence (up to c. 36-flowered), uniflorescence botryoid (8–14-flowered). *Bracts* sessile, caducous; narrowly elliptic to ovate, 2–4 mm long, 0.5–2 mm wide [length to width ratio 2–3, length of maximum width from base to total lamina length ratio 0.3–0.4], glabrous; base cuneate; margin entire, ± hairy, with hairs to 0.1 mm long; apex acute to obtuse. *Podium* 1–3 mm long, glabrous and densely glandular. *Prophylls* ± persistent, inserted near base of calyx [a<sub>1</sub> axis to anthopodium ratio 3.5–5.5], opposite, narrowly ovate, 1–3 mm long, 0.3–0.5 mm wide [length to width ratio 4–8, length of maximum width from base to total lamina length ratio 0.1–0.3], glabrous, moderately glandular; base cuneate; margin entire with hairs (similar to those on inflorescence bracts); apex acute; venation not visible. *Calyx* greenish red, with several ribs (c. 8–12 ribs); outer surface glabrous, moderately to densely glandular; *tube* 2–3 mm long, with inner surface glabrous at base, densely hairy in a narrow band at mouth; *abaxial lobe* broadly to depressed ovate, 1–2.5 mm long, 2–3 mm wide at base [length to width ratio 0.5–1], apex rounded, inner surface glabrous; *adaxial lobe* depressed ovate, 0.5–1.5 mm long, 2–3(–3.5) mm wide at base [length to width ratio 0.2–0.5], apex obtuse, inner surface glabrous [adaxial lobe length to abaxial lobe length ratio c. 0.5]. *Corolla* (8–)10–12 mm long, mauve, with purple to dark mauve dots forming striations on inner abaxial surface of corolla throat; outer surface of tube sparsely hairy basally, densely hairy distally and on lobes [40–120 hairs/mm<sup>2</sup>], hairs 0.1–0.2 mm long, ± spreading or appressed; inner surface of tube and lobes glabrous or lobes sparsely hairy; *tube* 3–5 mm long; *abaxial median lobe* broadly spatulate, (3–)4–5 mm long, (2–)3–4(–6) mm wide [length to width ratio 1–1.5], apex rounded, ± bilobed (sinus to 1 mm long, c. 0.2 mm wide distally); *lateral lobes* broadly to depressed spatulate or ovate, (2–)3–4 mm long, (2–)4–5 mm wide [length to width ratio 0.5–1.5], apex acute to obtuse; *adaxial median lobe-pair* reflexed (in late anthesis), depressed ovate, (1.5–)3–4 mm long, 3–4 mm wide [length to width ratio 0.5–1], apex obtuse (sinus between lobes 0.2–1 mm long), median margin of lobes overlapping (when correct during early anthesis). *Stamens* inserted 1–2 mm above base of corolla; filaments mauve, 0.5–1.5 mm long; anthers dark purple, 1–1.5 mm long, c. 0.5 mm wide, 7–8 mm long; *ovary* cylindrical ovoid, c. 0.6 mm long, c. 0.4 mm diam. (at base), lobes c. 0.4 mm long; *style* 6–7 mm long; *stigma lobes* 0.1–0.2 mm long (± equal in length). *Fruiting calyx* slightly enlarged (adaxial lobe c. 1 mm long, 2.5–3.5 mm wide). *Mericarps* 1–2 mm long, extended distally 0.5–1 mm beyond base of style, distal diam. 0.5–1 mm; *seeds* ellipsoidal, c. 1 mm long, c. 0.5 mm diam.

**Distribution:** Known from the central Queensland sandstone belt, in Blackdown Tableland, Expedition, and Chesterton Range National Parks. **Fig. 3**

**Habitat:** This species is recorded as occurring in sandstone-derived soils between boulders of sandstone associated on top of escarpments or at the base of cliffs. Growing in sclerophyll woodland mixed with heath, consisting of species of *Eucalyptus*, with understorey of *Banksia*, *Petrophile*, *Xanthorrhoea*, *Leptospermum*, *Caustis*, *Hibbertia*, *Notelaea*, and *Boronia obovata* at an altitude of c. 700–800 m (Wilson 492) or in woodland with *Eucalyptus cloeziana* and *E. maculata* (Forster 17750).

**Etymology:** The specific epithet '*oleoides*' refers to the resemblance of the habit and leaves to European olive (*Olea europaea*).

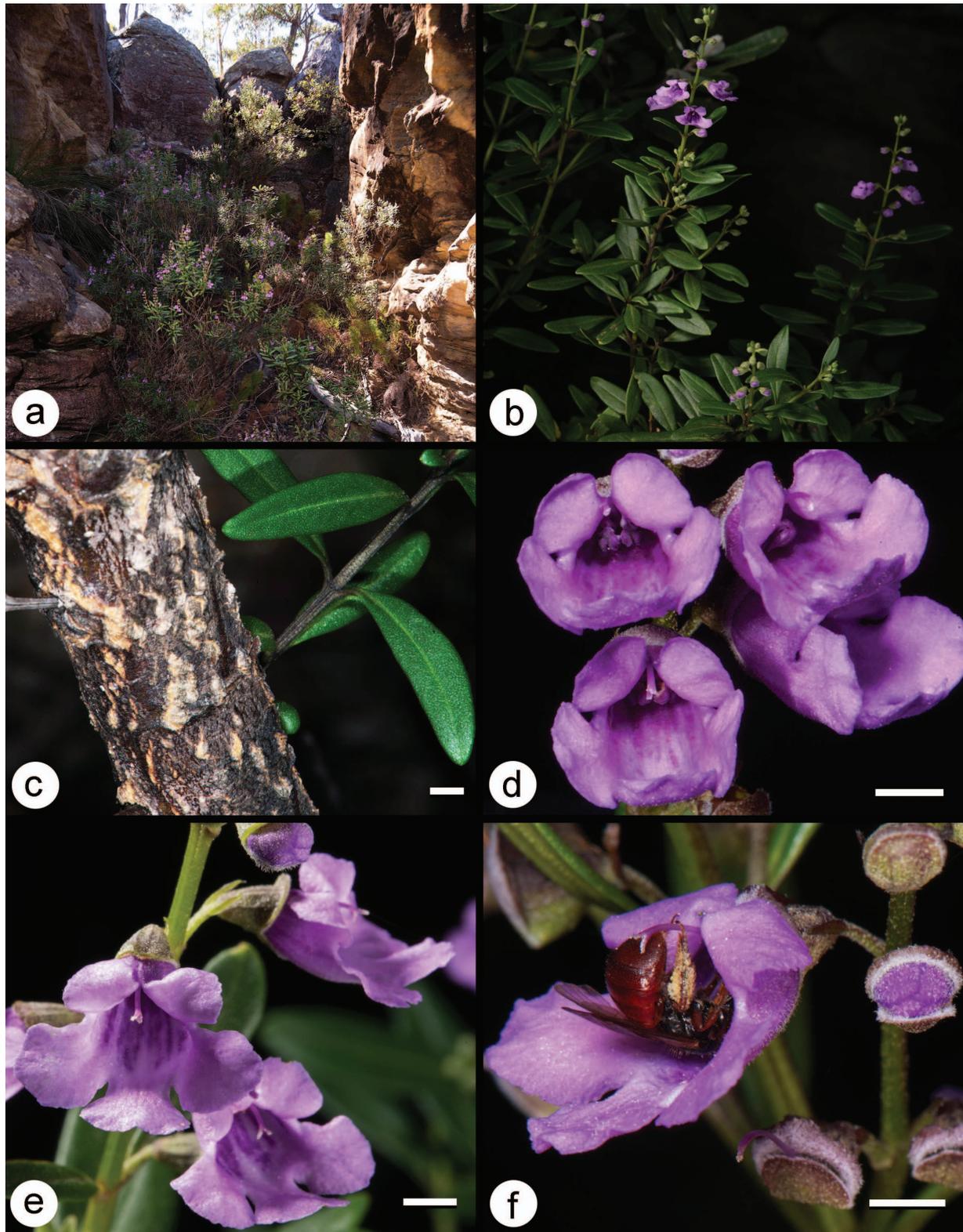
**Notes:** The flowers of *P. oleoides* are similar to *P. scutellarioides*, however this new species differs by having aromatic leaves that are oblong to narrowly ovate, 18–30 mm long, (2–)4–6 mm wide (whereas *P. scutellarioides* has linear, non-aromatic or faintly aromatic leaves 6–25 mm long, 0.5–2 mm wide), flowers arranged in a frondose and/or bracteose dibotryoid confluence (cf. frondose botryoidal in *P. scutellarioides*).

*Prostanthera oleoides* has been observed to have pollen successfully deposited on stigmas by numerous species of bees as well as flies (Wilson 492). The bees observed included species of *Trigona* and *Exoneura* (Fig. 2f).

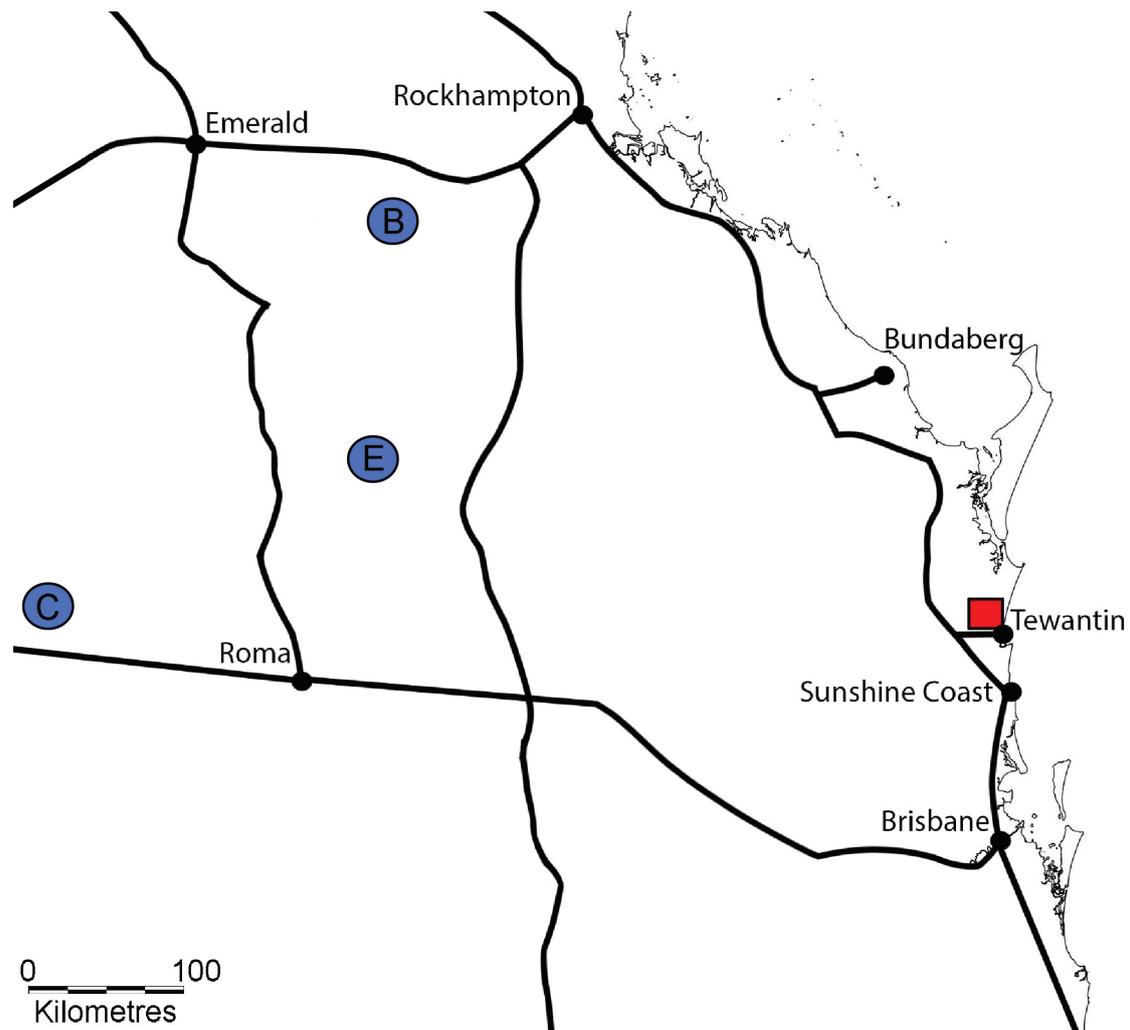
**Conservation status:** This species is afforded some protection by being within national park boundaries, although since populations are extremely localised the conservation status of this species should be considered as vulnerable until additional information is available.



**Fig. 1.** *Prostanthera oleoides*. **a**, habit, showing flowering branchlet; **b**, close-up of flowering branchlet, showing leaves and flowers; **c**, leaf, abaxial surface showing decurrent margin and raised midvein; **d**, leaf, adaxial surface, showing decurrent margin, branchlet node and portion of internode; **e**, detail of abaxial surface of leaf, showing hemispherical glands; **f**, stamen showing ventral view of anther locules, trichomes on connective, and distal portion of filament; **g**, stamen showing dorsal view of anther locules, connective and distal portion of filament; **h**, lateral view of flower showing prophylls, calyx, corolla and partial view of style and stigma; **i**, ventral view of flower showing inner surface of corolla tube and lobes, stamens, style and stigma; **j**, open corolla, showing inner surface of tube and lobes, and stamens. Scale bar: **a** = 50 mm; **b** = 40 mm; **c**, **d** = 20 mm; **e** = 3 mm; **f**, **g** = 2.5 mm; **h**, **i** = 8 mm; **j** = 10 mm. All from T.C. Wilson 492.



**Fig. 2.** *Prostanthera oleoides*. **a**, shrubs growing in white sandstone-derived soils between boulders of sandstone; **b**, habit, showing flowering branchlet with open and flowers and flower buds; **c**, older branchlet showing bark and young branchlet showing decussate leaves and adaxial leaf surface; **d**, young flowers showing partially open corolla, partial view of stamens, style and undeveloped stigmas; **e**, older flower, showing podium, prophylls, calyx, corolla with maroon markings in tube, and style with divergent receptive stigma lobes; **f**, mature flower being pollinated by an *Exoneura* species of bee, also showing unopened flower buds and developing fruits after the corolla has been lost. Scale bar = 2.5 mm. Photographs by A. Orme (a, b, e, f) and M. Bedoya-Perez (c, d).



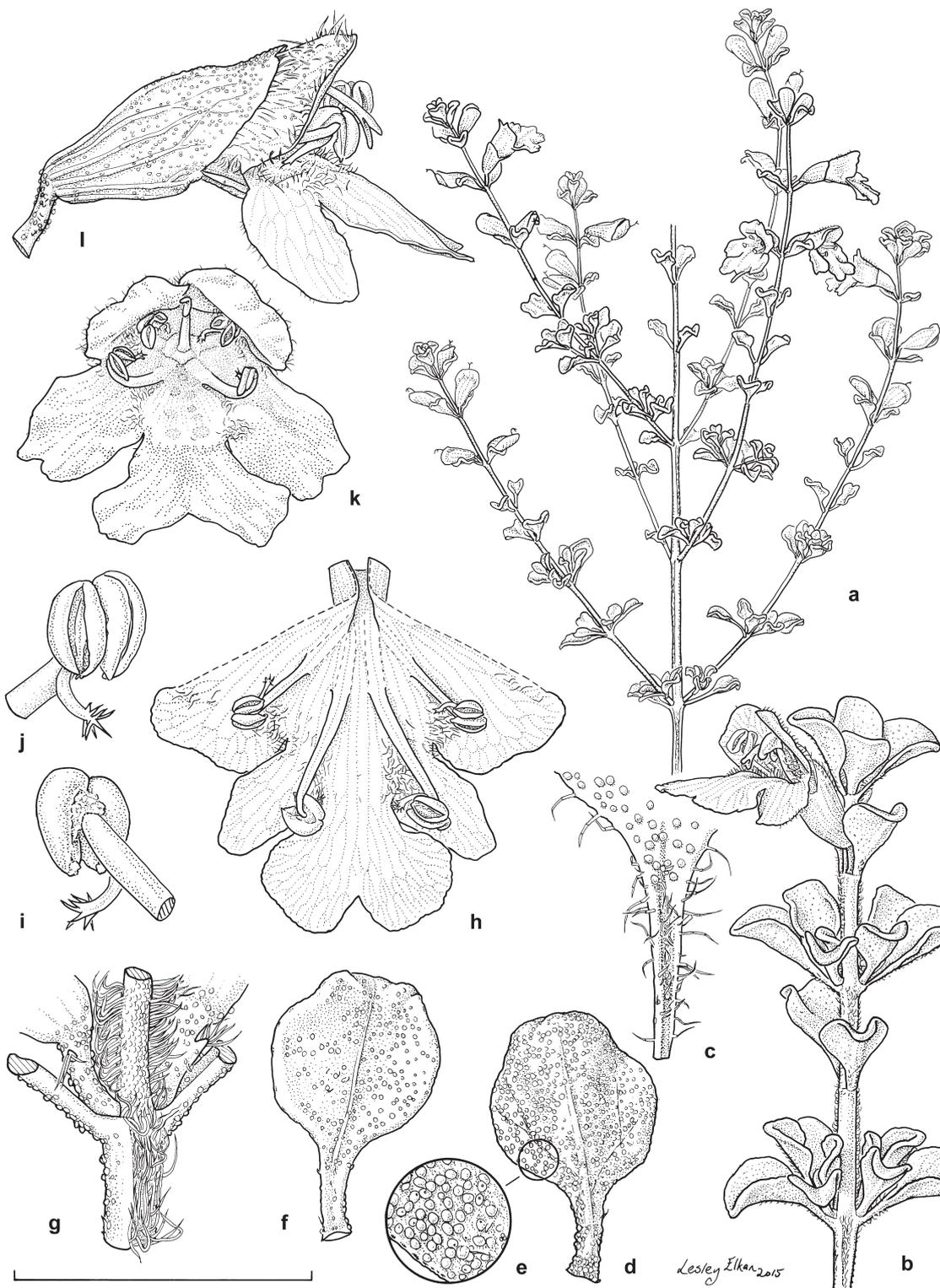
**Fig. 3.** Distribution map of *Prostanthera oleoides* and *P. spathulata* in south-eastern Queensland (Australia). The position of major cities, towns and roads, approximate position of the Blackdown Tableland National Park (B), Expedition National Park (E), and Chesterton Range National Park (C) and Mount Tinbeerwah National Park (marked with red square) are indicated.

**Other specimens examined:** QUEENSLAND: Leichhardt: Blackdown Tableland National Park: near Horseshoe Lookout: 5 Sep 1983, *H.I. Aston* 2481 (MEL); on Mimosa creek: 9 Sep 1971, *R.J. Henderson* 1106, *L. Durrington* & *P. Sharpe* (AD, BRI); 13 Oct 1984, *R.D. Spencer* 74 (MEL); 14 Oct 1984, *R.D. Spencer* 88 (MEL, NSW); Expedition National Park: Robinson gorge, downstream of Get Down, 17 Sep 1995, *P.I. Forster* 17750 & *S.J. Figg* (NSW, BRI); Brigalow Belt South: Chesterton Range National Park: SW boundary of national park, 29 Jul 1995, *C. Dollery* 85 (BRI).

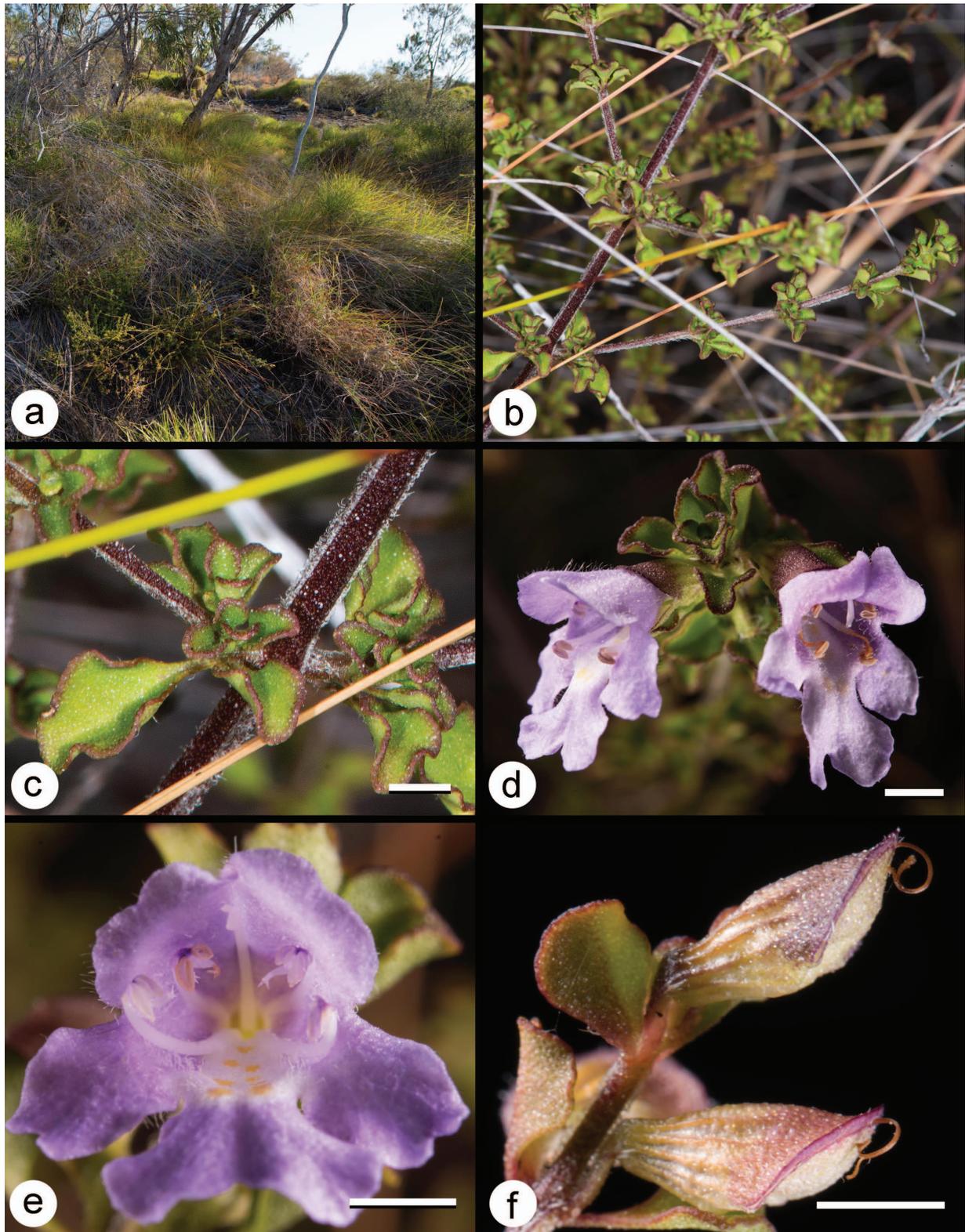
***Prostanthera spathulata*** T.C.Wilson & B.J.Conn, sp. nov. Figs 4, 5

**Diagnosis:** *Prostanthera spathulata* is a small open shrub distinguished by spathulate leaves with an undulating margin and flowers with long anther appendages. It is morphologically most similar to *P. palustris* B.J.Conn based on spathulate leaves. However, *P. spathulata* differs from *P. palustris* by its erect shrub-like habit (as opposed to a low weak subshrub), undulate leaves typically 2–3 mm wide (as opposed to 3.5–5 mm wide, not undulate), and growing in volcanic derived skeletal soils (as opposed to alluvial sandy soils in wet heath). Furthermore, the indumentum of *P. spathulata* on the branchlets consists of multi-celled hairs that are patent to variously spreading basally (not appressed) and with distal half curled (antrorsely or extrorsely) to more or less pointing back towards branchlet (indumentum of *P. palustris* has branchlets with hairs more or less antrorse and appressed).

**Holotype:** Queensland: Wide Bay: NNE slope of Mount Tinbeerwah, near summit, *T.C. Wilson* 497, *A.E. Orme*, *M.A. Bedoya-Perez* & *M.A.M. Renner*, 29 Aug 2013 (NSW845690); isotypes: AD, BRI, CANB, PERTH.



**Fig. 4.** *Prostanthera spathulata*. **a**, habit, showing flowering branchlet with flowers and developing fruits; **b**, close-up of flowering branchlet, showing leaves and one flower; **c**, detail of base of leaf, showing adaxial surface, glands and hairs; **d**, leaf, showing abaxial surface; **e**, close-up of hemispherical glands on abaxial surface of leaf; **f**, leaf, showing adaxial surface; **g**, detail of node and portion of internode, showing hairs, podium, reduced prophylls and base of calyx; **h**, Stamen, showing dorsal view of anther, connective appendage and distal portion of staminal filament; **i**, Stamen, showing ventral view of anther, connective appendage and distal portion of staminal filament; **j**, opened corolla, showing inner surface of corolla tube and lobes, and stamens; **k**, ventral view of older flower (female phase), showing inner surface of corolla tube and lobe, stamens, distal part of ovary, and style with receptive stigmas; **l**, lateral view of flower, showing podium, ridged calyx, lobes of corolla and extended anther locules and style with receptive stigma. Scale bar: **a** = 40 mm; **b** = 12 cm; **c**, **g** = 4 mm; **d**, **f**, **l** = 6 mm; **e** = 3 mm; **h**, **i** = 2.5 mm; **j**, **k** = 8 mm. All from T.C. Wilson 497, except **c** from G. Trapnell s.n. (BRI-AQ82480).



**Fig. 5.** *Prostanthera spathulata*. **a**, shrubs growing amongst volcanic pavements; **b**, open branching habit, showing hairy, maroon branchlets and leaves; **c**, detail of branchlet node and internode, showing a cluster of decussate leaves and hairs on branchlet; **d**, dichogamous flowers (female phase), after anthers have dehisced, showing leaves, calyx, corolla, with laterally displaced stamens, developing stigmas and distal end of style; **e**, ventral view of dichogamous flower (late male phase), showing inner surface and markings of corolla tube and lobes, staminal filaments, anther locules and appendages; **f**, fruiting calyx enclosing developing mericarps (not visible), with old style and stigma extended beyond calyx lobes. Scale bar = 2.5 mm. Photographs by M. Bedoya-Perez (a, b, c) and A. Orme (d, e, f).

*Informal phrase name:* *Prostanthera* sp. Mt Tinbeerwah (P.R. Sharpe 4781) (Bean and Forster 2014, as 'Prostanthera sp. (Mt Tinbeerwah P.R. Sharpe 4781)', Thomas and McDonald 1987)

Semi-erect woody shrub c. 0.3–1.5 m high, moderately densely branched. *Branchlets* terete, with surface yellowish or reddish green, developing reddish brown bark, densely hairy [60–100 hairs/mm<sup>2</sup>]; hairs antrorsely appressed, restricted to two narrow zones (each on opposite 'sides' of the branches) from the leaf axil region to the next more distal nodal region (between the opposite leaf bases), hairs 0.3–0.8 mm long; glands distinct, hemispherical, subsessile, moderate to dense [10–35 glands/mm<sup>2</sup>]. *Leaves* bright yellowish green with margin red or maroon, strongly aromatic, reminiscent of lemon and pine; *petiole* short, up to c. 1 mm long, distally expanding into lamina (lamina decurrent); *lamina* spatulate to broadly so, 4–9 mm long, 2–3(–5) mm wide [length to width ratio 1–3, length of maximum width from base to total lamina length ratio 0.5–0.8], mostly glabrous, but sometimes with a few hairs (up to 1 mm long) along abaxial surface of petiole, leaf margin, and/or in adaxial groove of midrib, densely glandular [25–48 glands/mm<sup>2</sup>]; base attenuate; margin entire and undulate (sometimes not obvious in pressed specimens); apex acute; venation indistinct, midrib visible from abaxial surface. *Inflorescence* a frondose racemiform conflorescence, uniflorescence monadic; 2–4(–10)-flowered [per conflorescence]. *Bracts* not seen. *Podium* 1–1.3 mm long, glabrous and densely glandular. *Prophylls* persistent, sometimes extremely reduced, inserted near base of calyx [ $a_1$  axis to anthopodium ratio 3–10], opposite, linear to elliptic, 0.1–0.2(–1.3) mm long, 0.1–0.2 mm wide [length to width ratio 1–4(–7), length of maximum width from base to total lamina length ratio up to 1], glabrous, moderately glandular; base cuneate; margin entire with hairs (similar to those of leaves); apex obtuse; venation not visible. *Calyx* yellowish green and maroon distally, with up to 12 ribs; outer surface glabrous or sometimes sparsely hairy at base [up to 16 hairs/mm<sup>2</sup>], moderately to densely glandular [20–30(–45) glands/mm<sup>2</sup>], margin ciliate; *tube* 2.5–4 mm long, with inner surface glabrous; *abaxial lobe* depressed ovate, 1.5–2.5 mm long, (2.5–)3–4 mm wide at base [length to width ratio 0.5–0.8], apex obtuse; *adaxial lobe* depressed ovate, 1.5–1.7(–2.5) mm long, 3–4 mm wide at base [length to width ratio 0.4–0.7], apex obtuse [adaxial lobe length to abaxial lobe length ratio 0.7–1]. *Corolla* 8.5–9.5 mm long, pale mauve, with inner abaxial surface of throat white and covered with yellow spots; outer surface of tube and lobes sparsely to densely hairy [up to 80 hairs/mm<sup>2</sup>], becoming less dense distally; hairs 0.2–0.5 mm long,  $\pm$  spreading to appressed; inner surface glabrous in tube and lobes, sparsely hairy in throat; *tube* 5–6.2 mm long; *abaxial median lobe* very broadly spatulate, 2–4 mm long, 1.9–4.5 mm wide [length to width ratio 0.8–1.1], bilobed (sinus to 0.2–0.5(–1.8) mm long, 0.2–1.7 mm wide distally); *lateral lobes* broadly spatulate or broadly ovate, 1.8–2.4 mm long, 1.8–2.1 mm wide [length to width ratio 0.9–1.3], apex obtuse or emarginate; *adaxial median lobe-pair lobes* depressed ovate, 1.8–2.3 mm long, 4.8–5.4 mm wide [length to width ratio 0.3–0.4], apex obtuse, (sinus between lobe-pair up to 0.6 mm long, median margin of lobes overlapping (mostly correct throughout anthesis)). *Stamens* inserted 3 mm above base of corolla; filaments white, 1.2–1.4 mm long; anthers mauve, 0.9–1.1 mm long, 0.4–0.6(–0.9) mm wide, base of locules glabrous; connective appendage white, 0.6–1 mm long, terminating in a sometimes thickened apex with a few narrowly triangular trichomes 0.1–0.2 mm long. Disc c. 0.4 mm long. *Pistil* 9–10 mm long; *ovary* cylindrical ovoid, 0.4–0.5 mm long, diam. at base 0.3–0.4 mm, lobes c. 0.3 mm long; *style* 3.5–4.5 mm long; *stigma lobes* abaxial lobe 0.6–0.7 mm long, adaxial lobe 0.5–0.6 mm long. *Fruiting calyx tube* slightly enlarged; *abaxial lobe* slightly enlarged, c. 3 mm long, 3–4 mm wide at base, *adaxial lobe* not or only slightly enlarged, 1.6–2.7 mm long, 3.3–4 mm wide at base. *Mericarps* 1–1.5 mm long, distally extended 0.5–0.9 mm beyond base of style, distal diam. 0.6–0.7 mm; *seeds* ellipsoidal, c. 1 mm long, c. 0.3 mm diam.

**Distribution:** Known from the Mount Tinbeerwah area, W of Tewantin, Wide Bay region of Queensland, Australia. Fig. 3.

**Habitat:** This species is recorded as growing amongst cracks and fissures in steep north-facing volcanic pavements, in loam or skeletal soils derived from trachyte (*Halford 3500*; *Sharpe 2566*; *Wilson 497*) and from tall eucalypt forest or open shrubland. Altitude 100–200 m.

**Etymology:** The specific epithet 'spathulata' refers to the spatulate leaves.

**Notes:** *Prostanthera spathulata* is morphologically similar to *P. rotundifolia* but it differs by its mauve corolla that has a white throat with yellow spots (*P. rotundifolia* has corolla purple to mauve, without markings), anthers pale mauve (as opposed to dark purple), and anther connectives forming appendages to 0.6–1 mm long (as opposed to anther connectives absent, or reduced to a tuft of basal hairs).

Conn (1997 onwards) mistakenly included *Prostanthera* sp. 'Mt Tinbeerwah' (P.R. Sharpe 4781) as a synonym of *P. palustris* (Conn 1997).

The pollinators of *P. spathulata* are unknown; however, it can be inferred from the morphological floral characters and markings that the likely pollinators are a variety of insects (Wilson *et al.* in press), presumably small bees. Like many other species of *Prostanthera* with long appendages, anther appendages partially obstruct

a passage through the corolla tube, thereby providing a mechanism with which pollinators can disrupt anthers, effecting pollen release. The flower is dichogamous, having two distinct stages: 1. a phase early in anthesis in which pollen-bearing anthers are positioned next to the inner adaxial surface of the corolla and the style is porrect (not illustrated); and 2. a phase later in anthesis where the stamens have senesced and the old anthers have moved laterally to the side of the inner surface of the corolla, the style becomes incurved, and the stigma lobes have parted, and presumably are receptive (Figs 4k, 5d, 5e).

**Conservation status:** Although this species is afforded some protection by its distribution within the Tewantin National Park, no estimate of the population has been conducted. The conservation status should be considered vulnerable until an adequate estimate is completed.

**Other specimens examined:** QUEENSLAND: Wide Bay: Mount Tinbeerwah, W of Tewantin: 7 Oct 1997, D. Halford Q3421 & P. Sharpe (BRI n.v., NSW); 27 Oct 1997, Halford Q3500, L. Hucks & G. Thomas (BRI n.v., CANB n.v., NSW); 24 Mar 1979, P.R. Sharpe 2566 (BRI); May 1969, L.S. Smith s.n. (BRI); 20 Apr 1984, I.R. Telford 9694 (BRI n.v., CBG n.v., NSW); Feb 1967, G. Trapnell s.n. (BRI).

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