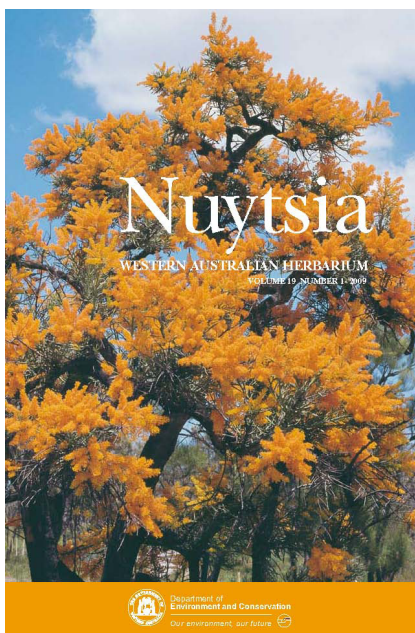


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***Tetratheca plumosa* (Elaeocarpaceae), a new species closely allied to *Tetratheca similis* from south-west Western Australia**

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Abstract

Butcher, R. *Tetratheca plumosa* (Elaeocarpaceae), a new species closely allied to *Tetratheca similis* from south-west Western Australia. *Nuytsia* 19(1): 9–16 (2009). *Tetratheca plumosa* R. Butcher *sp. nov.*, was collected from private property near New Norcia in 2007 and confirmed to be a new species in 2008. This species is closely allied to *T. similis* Joy Thomps., but differs significantly in having elongate, plumose, gland-tipped hairs on the ovary. *Tetratheca plumosa* is described herein and its affinities discussed. Illustrations and a distribution map are provided.

Introduction

The genus *Tetratheca* Sm. was described by Smith in 1793 from *T. juncea* Sm., a New South Wales endemic species. By 1957 53% (26 species) of the currently recognised species had been described by a variety of authors (Smith 1804; Labillardière 1805; Endlicher 1837; Cunningham 1825; Lindley 1838, 1839; Steetz 1845; Turczaninow 1852; Schuchardt 1853; Hooker 1855; Bentham 1863; Mueller 1865, 1876, 1882; Blakely 1925; Black 1929; Willis 1957). Taxonomic revision of the genus by Thompson in 1976 saw 13 new species described, eight of these endemic to Western Australia. One of these, *T. elliptica* Joy Thomps., is no longer current (T.D. Macfarlane *in sched.*; Western Australian Herbarium 1998–). Recent alpha taxonomic studies have increased the size of the genus to 49 species through the description of 11 new Western Australian endemics (Alford 1995; Butcher & Sage 2005; Bull 2007; Butcher 2007a, 2007b, 2007c, 2008), many with highly restricted distributions. The description of *T. plumosa* R. Butcher raises the number of species of *Tetratheca* to 50, 70% of which are endemic to Western Australia.

Tetratheca plumosa was discovered during a vegetation survey of private land near New Norcia by Moore Catchment Council (MCC) and Department of Environment and Conservation (DEC) personnel in 2007. The specimen, collected from private property, was originally referred to *T. similis* Joy Thomps. due to its superficial similarity to that species, but was identified as an undescribed species in 2008 when close examination revealed elongate, plumose, gland-tipped hairs on the ovary. Hairs such as these have not been recorded in the genus before and are so remarkable that recognition of this taxon at species rank is considered appropriate.

Methods

All *Tetratheca* specimens at AD, MEL and PERTH, and specimens of Western Australian species on loan from NSW, were examined. The description is based on herbarium specimens, reconstituted flowers, fresh samples and material preserved in 70% ethanol. Herbarium acronyms follow Holmgren and Holmgren (1998–). The distribution map was created using the freeware program DIVA-GIS freeware Version 5.0.2.0 (<http://www.diva-gis.org>), from PERTH specimen data, and shows *Interim Biogeographical Regionalisation for Australia (IBRA) Version 6.1* boundaries (Department of the Environment, Water, Heritage and the Arts 2008).

Taxonomy

Tetratheca plumosa R. Butcher, *sp. nov.*

Tetrathecae simili Joy Thomps. affinis sed ovario pilis glanduliferis longis plumosis et colore staminum omnino purpureo notabilis.

Typus: south-west of New Norcia [precise locality withheld for conservation reasons], 17 October 2008, R. Butcher & L. Kelly RB 1311 (*holo*: PERTH 07904924; *iso*: CANB, K, MEL, NSW).

Tetratheca sp. New Norcia (D. Rayner *et al.* RH 807-20), Western Australian Herbarium, in *FloraBase*, <http://florabase.dec.wa.gov.au> [accessed 13 October 2008].

Spreading *sub-shrub*, 0.07–0.2 m high, 0.3–0.4 m wide. *Stems* numerous from base; branches alternate or several arising from a node, slender, terete, straight, indeterminate, 0.5–0.7 mm wide in flowering region; younger stems light green, striate; older stems light green to olive green, rugulose to irregularly striate, developing a light grey-brown, thin bark; all stems densely pubescent with wavy, commonly decurved hairs, 0.3–0.5 mm long, and moderately dense, stiff, ±patent, tubercle-based setae, which are 1–2.5 mm long, red ageing to orange-brown, and fall away on older stems to leave tubercles and hair bases. *Leaves* 3-whorled, persistent, moderately spaced, ascending when young, spreading when mature; petiole indistinct, flattened with a prominent mid-vein, 0.2–0.5 mm long, yellowish green, with setae in the stipular position and on petiole base, not glaucous; blade narrowly ovate to ovate, occasionally elliptic, 2.1–10.5 mm long, 1.2–6 mm wide; apex obtuse to rounded, occasionally with a short point; base tapering into petiole; margins usually shortly lobed, flat to undulate, usually recurved in the area between the lobes which terminate in long (1.9–2.8 mm), stiff, tubercle-based setae, which are red ageing to orange-brown; adaxial surface mid- to dark green, hirtellous to hirsute, frequently slightly glaucous; abaxial surface dull, very pale green, usually pubescent, the hairs concentrated along mid-vein, glabrescent, not glaucous. *Flowers* solitary in upper leaf axils, often three at a node. *Bracts* apparently paired, linear to lanceolate to ovate, 0.4–1 mm long, 0.2–0.4 mm wide, pink-red to red; adaxial surface concave, glabrous or with scattered short simple hairs; abaxial surface subglabrous, with a few hairs at apex and near margins. *Pedicels* straight to gently curved, hooked at apex, lengthening as flowers develop, 17–34 mm long, 0.3–0.45 mm wide, pink-red to magenta-purple, pubescent, not glaucous, very finely striate, uniform in width along length then expanding abruptly at apex into a thickened, ±circular, pubescent receptacle 1.3–1.8 mm wide. *Calyx* segments commonly 5, less commonly 6, rarely 7, inserted inside receptacle rim, the base thickened and folded with the thickened portion on top of the rim, deciduous, ovate, 1.8–2.5 mm long, 0.9–1.3 mm wide, strongly concave in TS; apex acute to acuminate; margins flat; outer surface pink-red to magenta-purple,

glabrous; inner surface with a few, fine, short hairs inside margin and towards apex; mid-vein thickened. *Petals* commonly 5, less commonly 6, rarely 7, deciduous, obovate with an elongate base to broadly obovate, 7.5–11.5 mm long, 4.3–7.7 mm wide with the widest point at 5.8–7 mm (*c.* 1/3–1/4 from the apex), dark pink with purple-black patch at base, this ±trifid at apex with the central peak elongated, peaks following main veins for a short distance; apex broadly rounded with a small triangular fold from centre. *Stamens* commonly 10, less commonly 12, rarely 11, 13 or 14, 3–3.7 mm long, all free; filaments thick, compressed, obliquely angled, 0.2–0.5 mm long, purple, glabrous; anther body very gently curved from the filament on the inner edge then incurved into the tube, outer edge distended a little at base then broadly curved from filament and incurved into the tube, 1.6–2.2 mm long, purple, glabrous; anther tube very gently curved along its length, 1.2–1.8 mm long, orifice narrow to moderately broad, oblique to shortly two-lipped, lower lip slightly longer than upper lip, purple, glabrous. *Ovary* ovate to elliptic, tapering into style at apex, compressed, slightly thickened at base, 1.5–1.7 mm long, 1.2–1.4 mm wide, green, densely covered with short, simple hairs externally and with the faces of the ovary also densely covered with plumose, gland-tipped hairs, these tapering from base to apex, 0.6–1.7 mm long, colourless to very pale pink, with lateral hairs in lower half to two-thirds, glabrous inside loculi; *style* straight to kinked in mid-region, thick, tapering towards apex, 1.6–2.2 mm long, pink-red becoming pale towards apex, pubescent in lower half to two-thirds; *stigma* simple, sometimes shortly tufted; *ovules* 2, 1 in each locule, attached near the apex of the septum by a swollen, colourless placenta. *Fruit* not seen. *Seed* not seen. (Figure 1)

Specimens examined. WESTERNAUSTRALIA: [localities withheld for conservation reasons] 17 Oct. 2008, R. Butcher & L. Kelly RB 1312 (HO, PERTH 07904916); 23 Aug. 2007, D. Rayner, S. Clune & L. Kelly RH 807-20 (PERTH 07845685).

Distribution and habitat. To date, this species has only been collected from private property *c.* 10 km south-west of New Norcia, which is *c.* 135 km north-east of Perth (Figure 2). *Tetralthea plumosa* grows in an upland position at the base of low lateritic breakaways in and on the edge of *Eucalyptus wandoo*/*Corymbia calophylla* woodland. Associated vegetation is open, tall *Banksia* spp. shrubland over dwarf shrubs of *Calothamnus* sp. and *Hibbertia* sp. The majority of *T. plumosa* plants seen grew in an open situation amongst and under plants of *Hibbertia*.

Phenology. Collected in flower in late August and mid-October, with newly initiated fruits seen in October.

Etymology. From the Latin *plumosus* (feathery) in reference to the diagnostic plumose, gland-tipped hairs covering the ovary.

Conservation status. Recently listed as Priority One under DEC Conservation Codes for Western Australian Flora, as *Tetralthea* sp. New Norcia (D. Rayner *et al.* RH 807-20).

Affinities. *Tetralthea plumosa* is remarkably similar to *T. similis* and *T. pilifera* Lindl. in having stems covered with short, curved, simple hairs and long, stiff, dark-coloured setae, three-whorled, ovate leaves with shortly lobed, long-setose margins, long pedicels that are strongly curved at the apex below a distinct receptacle, and glabrous, thickened calyx segments which are inserted inside the receptacle rim. These latter species share the characters of having glabrous abaxial leaf surfaces, small, 4- or 5-merous flowers and the ovary covered with short, simple hairs only. Molecular cladistic analysis of nuclear ribosomal Internal Transcribed Spacer (ITS) sequences resolved *T. similis* and *T. pilifera* as moderately supported sister taxa (77% bootstrap; 0.98 Bayesian posterior probability)

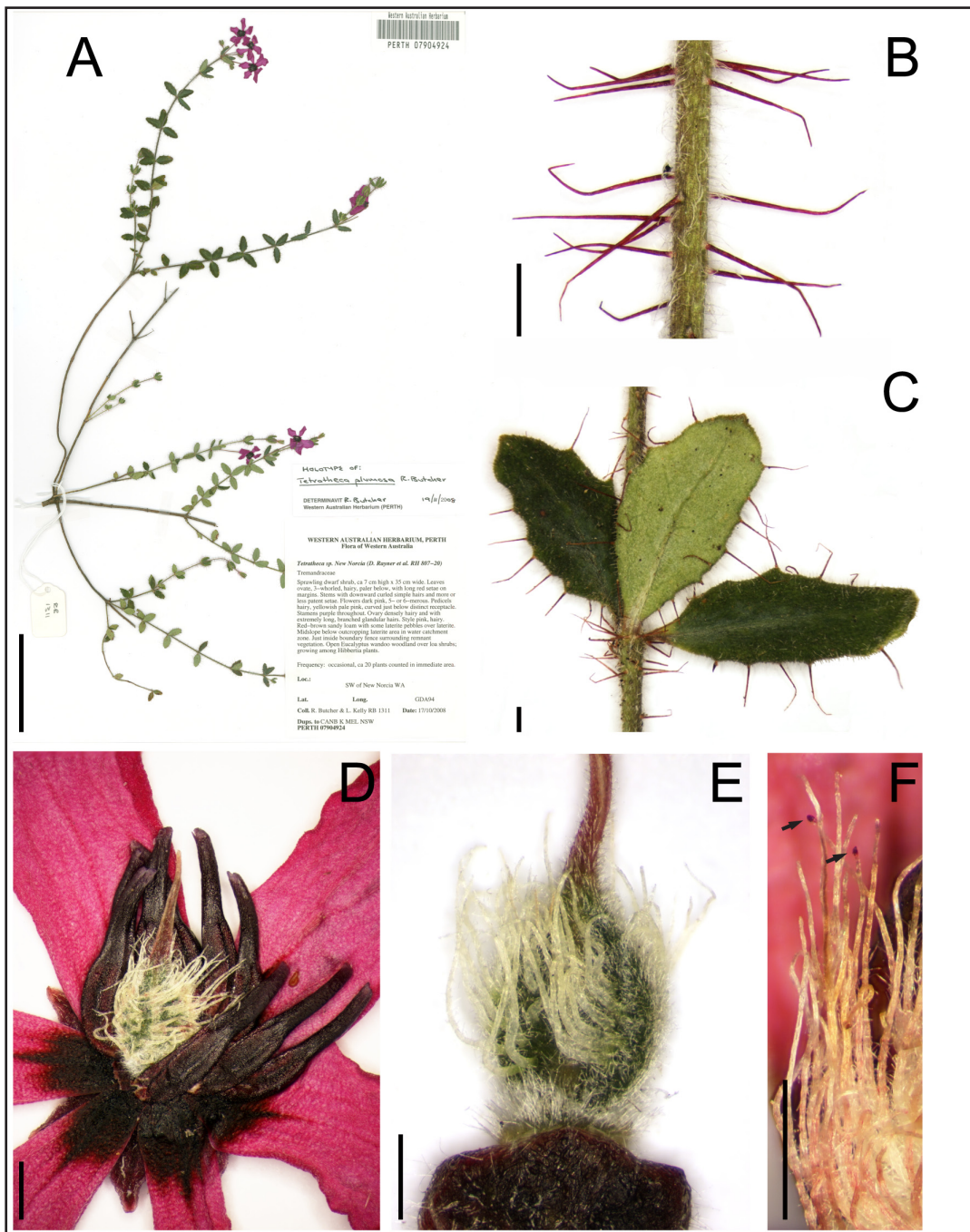


Figure 1. *Tetratheca plumosa*. A – holotype; B – stem detail showing short, curved simple hairs and long, stiff, patent, tubercle-based setae; C – leaves showing whorled phyllotaxis, discolorous surfaces, shortly lobed margin with stiff setae and setae on petiole; D – pressed flower detail showing stamen morphology and colour, the dark spot with a \pm trifid apex at the base of petals and the gynoecium; E – gynoecium showing green ovary, pink style and indumentum of both short, simple hairs and elongate, plumose, glandular hairs; F – detail of plumose hairs showing morphology and minute, apparently caducous, glandular tips (arrowed). A–E from R. Butcher & L. Kelly RB 1311; F from D. Rayner et al. RH 807-20. Scale = 5 cm (A); 1 mm (B–D); 0.5 mm (E–F).

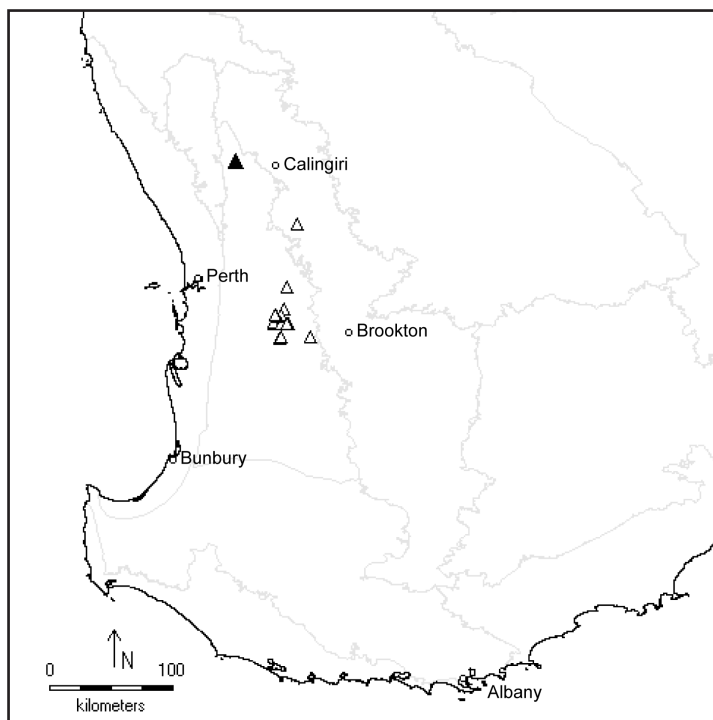


Figure 2. Distribution of *Tetralthea plumosa* in south-west Western Australia (▲). The relative distribution of *T. similis* is also shown (△).

within a polytomy of Western Australian species, but the relationships hypothesised through *trnL-trnF* chloroplast sequence analysis were incongruent: *T. pilifera* placed as weakly supported (54% bootstrap; 0.97 Bayesian posterior probability) sister to *T. parvifolia* Joy Thomps. and *T. similis* fell within an unsupported clade (52% bootstrap; 0.76 Bayesian posterior probability) containing *T. efoliata* F.Muell. and *T. paynterae* Alford, towards the base of the tree (McPherson 2008). Within this group of species, *T. pilifera* is distinctive in having purple flowers and stamens with long, slender filaments, yellow anther body and extremely short and broad anther tubes (see Thompson 1976: 150, Fig. 4), similar to those seen in *Tremandra* DC.

Tetralthea plumosa is most similar to *T. similis*, but can be distinguished by its ovary indumentum (pubescent with long, plumose, gland-tipped hairs, compared with a dense, silky, short pubescence only), stamen morphology (having a stronger curve between the anther body and tube on the outer surface and a narrower tube) and colour (all parts dark purple, compared with a red-purple anther body and yellow tube), and by having usually 5- or 6-merous flowers, compared with usually 4-merous flowers in *T. similis*. More subtle differences include *T. plumosa* having hairier adaxial and abaxial leaf surfaces (abaxial surface recorded as glabrous for *T. similis* in Thompson 1976), a distinctly pubescent pedicel and receptacle (both recorded as glabrous for *T. similis* in Thompson 1976) and obovate to broadly obovate, rather than ligulate to narrowly obovate, petals. Variations in these characters are discussed under *Notes*.

Dendritic hairs have also been recorded on the pedicels, receptacles and calyx segments of *T. nephelioides* R. Butcher and *T. paucifolia* Joy Thomps. (Butcher 2007a). When present, the hairs in these species are red, 0.3–1 mm long and 0.1–0.5 mm long, respectively, with a persistent glandular tip

and short, stiff, simple hairs along the shaft. *Tetralthea paucifolia* also has this hair type on the ovary (see Butcher 2007a: 142, Fig. 1F), but the shaft tends to be straight, robust and pale in colour and the glandular head more prominent. By contrast, the glandular hairs on the ovary of *T. nephelioides* are minute (<0.1 mm long) and unbranched. These species are easily distinguishable from *T. plumosa* and share with each other minute, acute tubercles on their stems and short (2.7–4.1 mm long and 1.75–4 mm long, respectively), hispid pedicels which expand gradually along their length to form the receptacle. *Tetralthea nephelioides* is further distinctive in this group in having small, scale-like, deciduous leaves and tuberculate stamens, while *T. paucifolia* has its leaves in sparse, cluster-like arrangements and stamens with the lower part of the anther flattened and contiguous with an elongate, flattened filament. *Tetralthea nephelioides* is restricted to the south of Eneabba. The range of *T. paucifolia* encompasses that of *T. plumosa*, extending from Mt Lesueur to Beverley, with three collections (*F. Hort* 1978 (PERTH); *F. Hort & J. Hort* 1983 (CANB, PERTH); *D. Rayner et al.* RG 807-15 (PERTH)) from the New Norcia–Toodyay area.

Notes. While the long, plumose ovary indumentum is highly distinctive for *T. plumosa*, the other characters distinguishing this species from *T. similis* display some variation within other species and must be used in conjunction with other characters for accurate diagnosis. For example, the stamens of *T. setigera* Endl. show considerable variation in the curvature between the anther body and tube, and those of *T. efoliata* can have either yellow or red anther tubes. Anther tube tip colour was used as a supporting feature for the recognition of subspecies in *T. paynterae* (Butcher 2007a), but has since been found to be inconsistent (P.A. Butcher pers. comm.). It must be noted, however, that all *T. similis* collections seen have yellow anther tubes.

Merosity has also been found to vary within some species with combinations of 4-, 5- and 6-merous flowers occurring on the same plant (e.g. *T. paynterae*: 4-, 5- & 6-merous flowers (Butcher 2007a); *T. exasperata* R. Butcher and *T. phoenix* R. Butcher: 5- & 6-merous flowers (Butcher 2007c); *T. pilifera*: 4- & 5-merous flowers (Thompson 1976); *T. virgata* Steetz: 4- & 5-merous flowers observed). Observation of 27 *T. plumosa* flowers from three plants found that 18 were 5-merous, seven were 6-merous and two were 7-merous, and the type material shows this variation. Some specimens of *T. similis* (e.g. *M. Hislop* 208 (PERTH); *F. Hort* 779 (PERTH), 1154 (BRI, PERTH); *F. & J. Hort* 599 (AD, CANB, NSW, PERTH 05440394)) have a small number of 5-merous flowers amongst the predominantly 4-merous ones. No 4-merous *T. plumosa* flowers have been seen, however.

Indumentum differences have been used to support the distinction of *T. plumosa* from *T. similis* (see *Affinities*); however, since Thompson's (1976) description of *T. similis* additional collections have revealed variation in the distribution and density of hairs on some parts. For example, specimens having more, and more robust, indumentum on the adaxial leaf surface than recorded by Thompson include *F. & J. Hort* 599, *F. Hort* 1153 (HO, PERTH) and *R. Davis* 4201 (PERTH). *B. Morgan* 92-1 (PERTH), *M. Hislop* 208, *M.J. Kealley* 1748 (PERTH), *F. Hort* 1153 (HO, PERTH) and *F. Hort & B. Hort* 2320 (MEL, PERTH) have simple hairs on the pedicels.

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