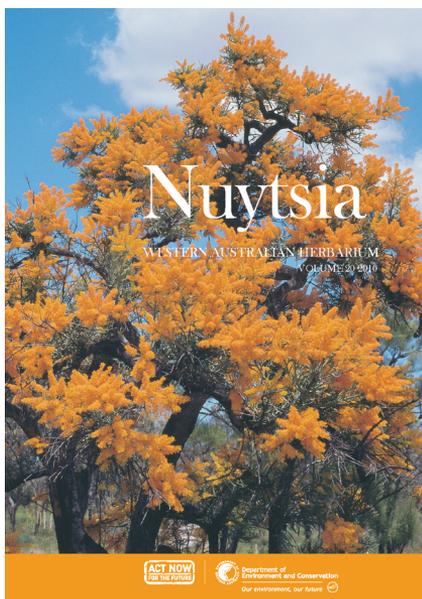


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## Two new taxa of *Verticordia* (Myrtaceae: Chamelaucieae) from south-western Australia

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### Abstract

George, A.S. and Barrett, M.D. Two new taxa of *Verticordia* (Myrtaceae: Chamelaucieae) from south-western Australia. *Nuytsia* 20: 309–318 (2010). *Verticordia mitchelliana* subsp. *implexior* A.S. George & M.D. Barrett and *Verticordia setacea* A.S. George are described and discussed. *Verticordia setacea* belongs with *V. gracilis* A.S. George in section *Platandra*, previously a monotypic section.

### Introduction

The genus *Verticordia* DC. (Myrtaceae: tribe Chamelaucieae) is a charismatic group of shrubs found mainly in south-western Australia, with several species in adjacent arid regions and three in tropical Australia (George 1991; George & Pieroni 2002). *Verticordia* is currently defined solely on the possession of divided calyx lobes, but the limits between *Verticordia* and the related genera *Homoranthus* A.Cunn. ex Schauer, *Chamelaucium* Desf. and *Darwinia* Rudge are difficult to define conclusively, and other characteristics such as anther morphology suggest conflicting relationships (Bentham 1867; Craven & Jones 1991; George 1991). A recent analysis using a single chloroplast gene, with limited sampling of *Verticordia* taxa (Ma *et al.* 2002), suggests that *Verticordia* may be polyphyletic. A thorough phylogenetic analysis of the group of genera around *Chamelaucium* is overdue.

During a molecular phylogenetic study of *Verticordia*, one of us (MB) noticed unusual levels of genetic divergence between samples of *Verticordia mitchelliana* C.A. Gardner. Multiple samples were taken to cover the geographic range of the species as defined by George (1991) and George and Pieroni (2002), particularly focusing on samples either side of the geographic disjunction in this species (see map in George & Pieroni 2002). The recovery of apparently fixed genetic differences prompted a morphological revision of *V. mitchelliana*, resulting in the discovery of several previously overlooked morphological characters correlating with both the genetic data and the geographic disjunction. A new subspecies is erected here to formally recognise that variation.

Concurrently, during finalisation of a treatment of *Verticordia* for *Flora of Australia* (George, in preparation), some variation was noted in inflorescence structure and floral morphology in different populations of *V. gracilis* A.S. George, initiating a review of the taxonomy of this species; a new species is described here to accommodate this variation.

As the publication of the account of *Verticordia* for *Flora of Australia*, and full publication of all molecular analyses (Barrett, in preparation) is some time off, the new taxa are described here to facilitate their conservation. The new species and *V. mitchelliana* subsp. *mitchelliana* are conservation-listed taxa for south-western Australia. The genus *Verticordia* (*sens. lat.*) now contains 102 species and (including autonyms) 26 subspecies and 47 varieties, of which 46 species and 27 infraspecific taxa have formal conservation status in Western Australia.

## Methods

This work is based on a morphological study of herbarium material. Methods, taxonomic concepts and terminology follow those outlined in George (1991). As in all genera, especially sizeable ones, assessment of useful characters and states comes from extensive study of the plants, as was done by George for his review of the genus (George 1991). *Verticordia* is especially rich in useful characters of vegetative and floral parts. An understanding of these underpins the assessment of ranking into subgenera, species, subspecies (which also includes a component of geographical disjunction) and variety. For dissection, flowers were softened in a mild detergent solution. Dimensions of flowers so treated are the same as in the fresh state.

***Verticordia mitchelliana***, C.A.Gardner, *J. Roy. Soc. Western Australia* 19: 89 (1933).

*Typus*: Avon district, near Bencubbin, [Western Australia], October 1929, James Mitchell *s.n.* (*holo*: PERTH 01623516; *iso*: K, PERTH 01623524).

A *shrub* to 1 m without lignotuber, widely branched. *Stem leaves* linear, semiterete, obtuse, 6–15 mm long; floral leaves similar. *Flowers* pendulous, in open raceme-like groups, not scented. *Peduncles* 4–16 mm long. *Bracteoles* not keeled, not cuspidate, caducous. *Hypanthium* turbinate, much expanded above, 3 mm long, not ribbed, smooth to slightly verrucose, glabrous except basal ring of hairs and sometimes a ring around the middle; a swelling below each sepal. *Sepals* 7–9 mm long, spreading, bright red; lobes 6 or 7, deeply and divaricately divided; auricles reflexed, divaricately divided. *Petals* 7–11 mm long, ovate-oblong, fimbriate across apex, erect, shortly pubescent outside, creamy-pink at first, turning bright red. *Stamens and staminodes* shortly united; stamens  $\pm$  uniform, erect with inflexed anthers, 2–3 mm long; filaments slightly compressed, smooth, glabrous; anthers globular, 0.7 mm long; appendage a small apical swelling. *Staminodes* inserted outside stamens, linear-subulate, 3–5 mm long,  $\pm$  glandular-verrucose. *Style* 24–29 mm long, straight, sparsely bearded with short simple hairs; stigma slightly enlarged. *Ovules* 2.

*Verticordia mitchelliana* has a disjunct distribution, one group of populations in the north-eastern wheatbelt, the other to the south-east. DNA sequences from the External Transcribed Spacer (ETS) of nrDNA (M. Barrett unpublished data) of three samples from each taxon show three apparently fixed substitutions and two apparently fixed insertions between sequences from the two areas, with no variation between sequences within each area. Study of herbarium material reveals morphological differences that are considered sufficient to warrant recognition at subspecific rank. Although the existence of two taxa was first suggested by molecular data, the taxonomic conclusions presented here are based on morphological data alone, and the genetic evidence will be presented elsewhere.

1. Petals 7–8 mm long; staminodes 3–4 mm long.....subsp. **mitchelliana**
- 1: Petals 8.5–11 mm long; staminodes 4.5–5 mm long..... subsp. **implexior**

**Verticordia mitchelliana** C.A.Gardner subsp. **mitchelliana**

*Leaves* 0.5–0.8 mm wide. *Petals* 7–8 mm long, pubescent outside, fringed almost to base. *Staminodes* 3–4 mm long. *Style* ‘neck’ (between beard and stigma) 1–1.5 mm long. (Figure 1)

*Selected specimens examined.* WESTERN AUSTRALIA: [precise localities withheld for conservation reasons] 12 Oct. 2008, *J.M. Collins* 373 (PERTH); Bencubbin, Sep. 1936, *C.A. Gardner s.n.* (PERTH); Cowcowing, 9 Oct. 1963, *C.A. Gardner s.n.* (PERTH); Wyalkatchem, 20 Oct. 1963, *R.D. Royce* 7993 (PERTH); SE of Kulja, 21 Oct. 1984, *B.H. Smith* 488 (AD, CANB, HO, MEL, PERTH); Wyalkatchem, 29 Dec. 1986, *B.H. Smith* 834 (CANB, CHR, HO, MEL, PERTH).

*Distribution and habitat.* Occurs sporadically from Kulja south to Wyalkatchem and east to Bencubbin. Grows in sand over laterite, in kwongan and shrubland (Figure 2).

*Phenology.* Flowers October to December.

*Conservation status.* Conservation Codes for Western Australian Flora: recently listed as Priority Three.

*Note.* Subsp. *mitchelliana* is typically of more spreading habit than subsp. *implexior*.

**Verticordia mitchelliana** subsp. **implexior** A.S.George & M.D.Barrett, *subsp. nov.*

Ab *Verticordia mitchelliana* C.A.Gardner subsp. *mitchelliana* foliis plerumque latioribus, sepalis copiosius divisis, petalibus et staminodiis longioribus, praecipue differt.

*Typus:* 25 km east of Rabbit Fence (No. 2), between Hyden and Pioneer, Western Australia, 24 Nov. 1964, *C.A. Gardner* 15010 (*holo:* PERTH 02359340; *iso:* CANB, K, MEL, PERTH 02386925)

*Leaves* 1–1.5 mm wide. *Petals* 8.5–11 mm long, ± glabrous or pubescent outside, fringed only across apex or on lateral margins. *Staminodes* 4.5–5 mm long. *Style* ‘neck’ (between beard and stigma) 0.5–1 mm long. (Figure 3)

*Selected specimens examined.* WESTERN AUSTRALIA: 61 km W of Coolgardie–Esperance Hwy on Lake King–Norseman road, 6 Oct. 2001, *B. Archer* 1987 (CANB, MEL, PERTH); 87 km E of Lake King on Lake King–Norseman Rd, 9 Oct. 1998, *S. Donaldson* 2026 & *G.T. Chandler* (CANB, PERTH); c. 150 km E of Hyden, Dec. 1956, *R.J. Donovan s.n.* (PERTH); c. 70 km E of Hyden, Dec. 1964, *A.R. Main s.n.* (PERTH); 26 km NW of Roberts Swamp, c. 50 km WNW of Grass Patch, 13 Nov. 1980, *K. Newbey* 8187 (PERTH); 54 km W of Kumarl [on Lake King–Norseman Rd], 10 Oct. 1966, *P.G. Wilson* 5699 (CANB, PERTH).

*Distribution and habitat.* Occurs from the Mt Holland area south-east to the Peak Charles area, including Frank Hann National Park. Grows in deep sand or sand over laterite, in kwongan, shrubland and mallee shrubland. A single plant recorded between Corrigin and Kulin was probably planted (Figure 2).

*Phenology.* Flowers October to December.

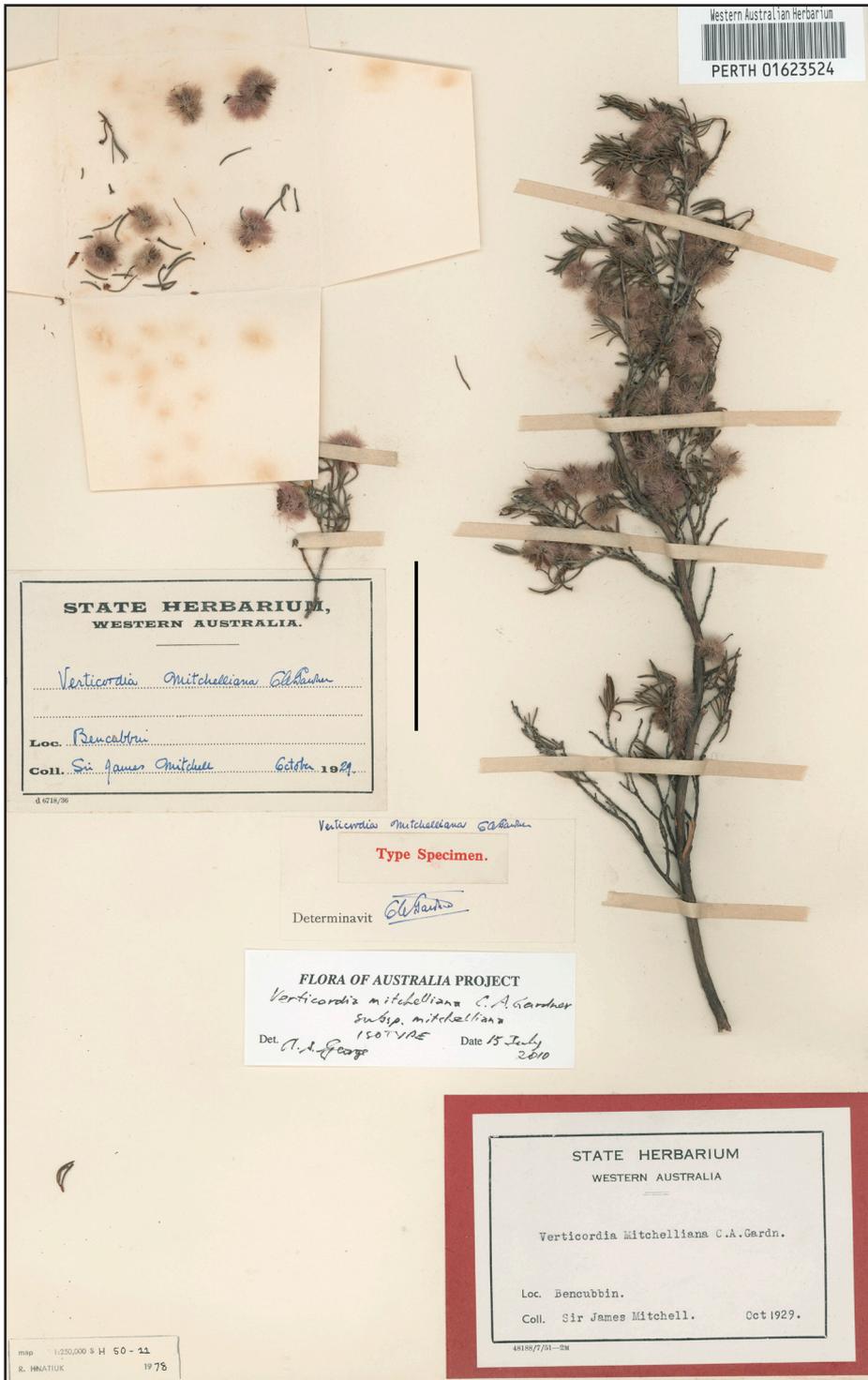


Figure 1. *Verticordia mitchelliana* subsp. *mitchelliana*. Isotype, near Bencubbin, October 1929, James Mitchell s.n. (PERTH 01623524). Scale bar = 5 cm.

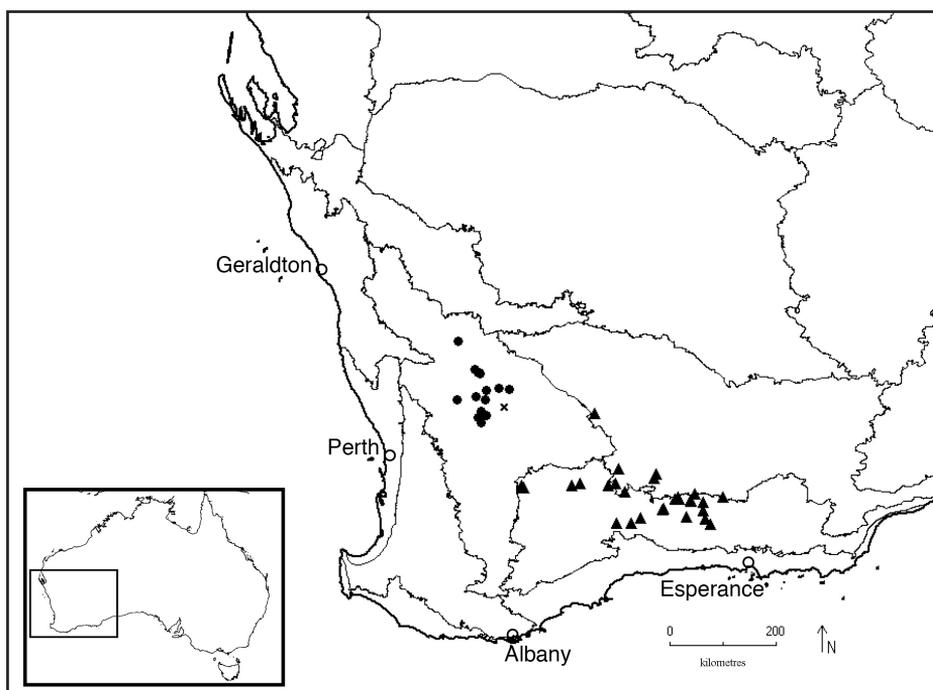


Figure 2. Distribution of *Verticordia mitchelliana* subsp. *mitchelliana* (●) and *V. mitchelliana* subsp. *implexior* (▲) in south-western Australia. The collection by W.Stevens, discussed below, is marked ×.

*Conservation status.* Well represented in conservation reserves and not considered threatened.

*Etymology.* The Latin *implexior* (more tangled) refers to the more copious divisions of the sepals compared to those of subsp. *mitchelliana*.

*Notes.* Compared with subsp. *mitchelliana*, the leaves are wider, the sepals and their auricles are more densely divided, the petals are longer and usually not or less fringed on the lateral margins, the staminodes are longer and slightly narrower, and the ‘neck’ of the style is usually shorter. In George and Pieroni (2002), the painting on page 295 represents subsp. *implexior*.

A collection labelled Trayning, Oct. 1961, *W. Stevens* [*C.A. Gardner* 13572], PERTH (from Herbarium Gardnerianum, New Norcia), lies on the south-eastern edge of the distribution of subsp. *mitchelliana* and is intermediate between the subspecies morphologically. It has leaves *c.* 1 mm wide, petals 8.5 mm long that are less pubescent outside and sparsely fringed along the lateral margins, and a style neck *c.* 1 mm long.

***Verticordia setacea*** A.S.George, *sp. nov.*

Ad *Verticordiam gracilem* A.S.George affinis, a qua turmis florum spiciformibus vel racemiformibus, pedunculis brevioribus (1–3 mm longis, raro ad 5 mm), petalis dentatis vel ciliatis, et stylo breviori (1–1.5 mm longo), praecipue differt.

*Typus:* private land, north-east of Lake Grace, Western Australia, 15 Dec. 2000, *M. & J. Stewart* 69 (*holo:* PERTH 06843956).



Figure 3. *Verticordia mitchelliana* subsp. *implexior*. Holotype, 25 km east of Rabbit Fence (No. 2), between Hyden and Pioneer, C.A. Gardner 15010 (PERTH 02359340). Scale bar = 5 cm.

A shrub to 60 cm, without? lignotuber. *Stem leaves*  $\pm$  oblong, semiterete to triquetrous, obtuse, 4–7 mm long; floral leaves similar. *Flowers* spreading, in open, raceme-like or spike-like groups; scent not recorded. *Peduncles* 1–3 mm long, rarely to 5 mm. *Bracteoles* not keeled, not cuspidate, caducous. *Hypanthium* broadly turbinate, swollen at apex, 1.5–2 mm long, 10-ribbed,  $\pm$  verrucose, openly hirsute on ribs, and openly long-hirsute towards base. *Sepals* 3–4 mm long, spreading, deep pink, deeply fimbriate without definite lobes, scabrid; lamina setose inside; auricles absent or a few reflexed cilia. *Petals* 2–2.5 mm long, orbicular, erect with incurved apex, irregularly ciliate to dentate, more deeply towards base, the cilia and teeth themselves scabrid to minutely ciliate, scabrid outside, deep pink. *Stamens and staminodes* very shortly united; stamens  $\pm$  uniform, inflexed, 0.5–0.8 mm long; filaments terete, smooth, glabrous; anthers globular but compressed, 0.3–0.4 mm long; appendage absent. *Staminodes* erect, narrowly triangular, almost acute, 0.5–0.7 mm long, glandular-verrucose. *Style* 1–1.5(c. 4) mm long, straight, towards apex comosely bearded all round with simple hairs; stigma not enlarged. *Ovules* 2. (Figure 4)

*Selected specimens examined.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] 21 Nov. 1980, D. Bell 17 (PERTH); 15 Nov. 1991, A.M. Coates 3487 (CANB, PERTH); 23 Dec. 2001, M. & J. Stewart 72 (PERTH).

*Distribution and habitat.* Occurs in a small area north-east of Lake Grace. Grows in lateritic soil or sand over laterite, in kwongan (Figure 5).

*Phenology.* Flowers November to December.

*Conservation status.* Conservation Codes for Western Australian Flora: recently listed as Priority Two. Known from several populations over a range of c. 40 km. Two are in a conservation reserve and one of these is reported to have c. 3000 plants. The record by D. Bell from ‘east of Hyden’ should be checked in the field – if confirmed, it would extend the range significantly.

*Etymology.* The Latin *setaceus* (setaceous) refers to the bristly aspect of the flowers due to the divisions of the sepals and petals and their setose to scabrid surface, especially the inner surface of the lamina of the sepals.

*Affinities.* Morphologically, *Verticordia setacea* is closely related to *V. gracilis* A.S. George (previously the only species in sect. *Platandra*) but differs in a more openly branched habit, the flowers arranged in raceme- or spike-like groups, the short peduncles, petals with dentate to ciliate margins and shorter style. The hairs on the hypanthium and at its base are less crowded. The species occurs to the south-west of *V. gracilis*. Recent collections of *V. gracilis* show that the hairs of the style are more commonly simple than divided. The specimen of D. Bell matches the others of *V. setacea* but has a style c. 4 mm long. The morphology of *V. setacea* necessitates amendments to the description of sect. *Platandra*: flowers in subcorymb-, raceme- or spike-like groups; style not or shortly exserted, bearded with forked or simple hairs. The setose inner face of the lamina of the sepals occurs in these two species and in *V. humilis* Benth.

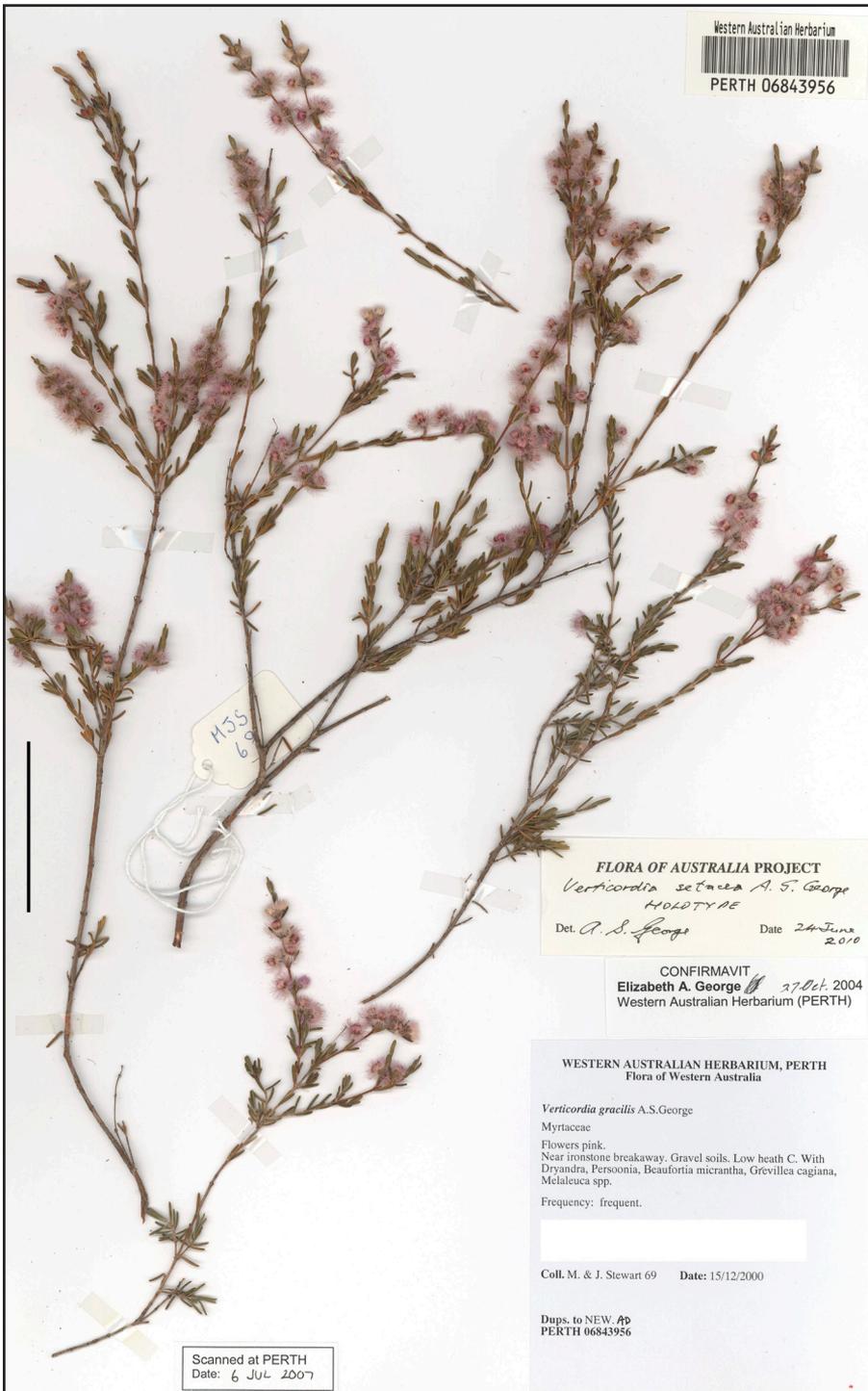


Figure 4. *Verticordia setacea*. Holotype, north-east of Lake Grace, M. & J. Stewart 69 (PERTH 06843956). Scale bar = 5 cm.

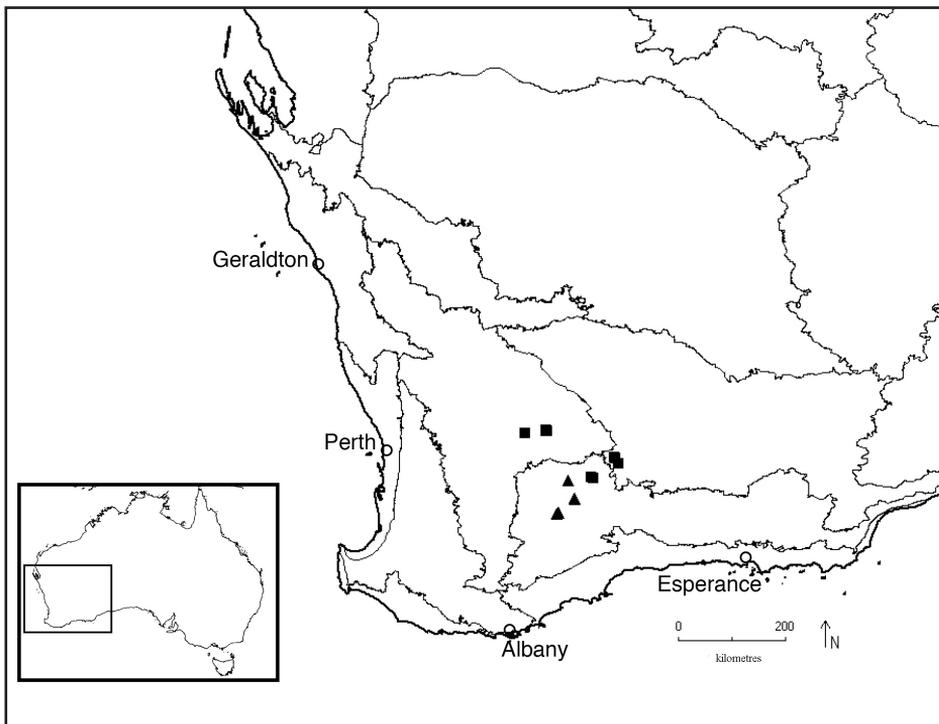


Figure 5. Distribution of *Verticordia setacea* (▲) and *V. gracilis* (■) in south-western Australia.

In the key to species in George and Pironi (2002), *V. setacea* keys out to lead 43, *V. gracilis*, and may then be distinguished thus:

- 43a. Flowers in corymb-like groups; peduncles 9–12 mm long; petals erose to dentate and shortly fimbriate on lower margins; style *c.* 4 mm long..... **V. gracilis**
- 43b. Flowers in raceme- or spike-like groups; peduncles 1–3 mm long, rarely to 5 mm; petals with dentate to ciliate margins; style 1–1.5(*c.* 4) mm long..... **V. setacea**

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