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Taxonomic observations on the *Stylidium leptocalyx* complex (Stylidiaceae)

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Abstract

Wege, J.A. Taxonomic observations on the *Stylidium leptocalyx* complex (Stylidiaceae). *Nuytsia* 16(1): 221–231 (2006). The name *Stylidium leptocalyx* Sond. has been misapplied for many years. This trigger plant is now recognised to be of restricted distribution in the wandoo country south-west of York, and is characterised by pink flowers with linear calyx lobes, arranged in a loose, corymb-like raceme. *Stylidium stenosepalum* E.Pritz. is reinstated to account for the northern sandplain entity previously known as *S. leptocalyx*. This species differs from *S. leptocalyx* in possessing white flowers with a longer corolla tube and column. Amended descriptions and floral images are provided for both species, along with the morphologically-allied *S. scabridum* Lindl.

Introduction

Stylidium subgenus *Tolypangium* (Endl.) Mildbr. section *Squamosae* (Benth.) Mildbr. comprises those trigger plants with membranous scale-leaves located around or amongst a rosette of linear, grass-like leaves. Twenty-one scale-leaved species are currently recognised, all of which are endemic to the south-west of Western Australia. Whilst similar in habit, these species exhibit considerable variation in inflorescence structure and floral morphology. Furthermore, allied species often show differences in geographic distribution, habitat preference, chromosome number and karyotype (Carlquist 1969; James 1979; Coates 1982; Lowrie *et al.* 1998; Wege 2006). This paper reviews the subgroup of scale-leaved trigger plants that possess a loose corymb-like raceme, informally referred to here as the *Stylidium leptocalyx* Sond. complex.

Taxonomic history

Sonder (1845) named *Stylidium leptocalyx* from a collection James Drummond made as part of his first numbered series. According to Erickson (1969), specimens from this series were obtained the Swan, Avon, Helena and Toodyay Valleys and the Guangan (sandplain). In addition to long linear calyx lobes, this species is characterised by scabrid leaves, a densely glandular scape, flowers arranged in a loose corymb-like raceme and vertically-paired corolla lobes bearing prominent throat appendages. In his type description, Sonder notes that the flowers were rose-coloured in the dried state.

Stylidium scabridum Lindl., named by Lindley (1839) from an earlier Drummond collection from the same collecting region (Erickson 1969), has similar leaves to *S. leptocalyx* and the same inflorescence

structure, but differs in possessing smaller flowers with laterally-paired corolla lobes and less elaborate throat appendages. The similarity in habit between these two species, combined with the inherent difficulty in accurately documenting corolla morphology from herbarium specimens, may account for Bentham's (1869) decision to place *S. leptocalyx* in synonymy under *S. scabridum*.

In 1905, Pritzl described *S. stenosepalum* E.Pritz. to account for an entity from the Irwin District with the above mentioned features of *S. leptocalyx* but with large, white corolla lobes. Upon examining type material of *S. leptocalyx* and *S. stenosepalum*, as well as specimens of *S. scabridum* collected by Drummond, Mildbraed (1908) correctly reinstated *S. leptocalyx*; however, he synonymized *S. stenosepalum* under this taxon. In his ensuing description of *S. leptocalyx*, he notes that the flowers are white with unequal corolla lobes. In accordance with Mildbraed's description, this name has since been applied to specimens occurring from just north of Gingin to north-east of Eneabba (Erickson 1958; Carlquist 1969; James 1979; Coates 1982).

Recent botanical exploration of bushland south-west of York by Fred and Jean Hort uncovered populations of *S. leptocalyx* with pink corolla lobes of approximately equal size. These populations, which are morphologically distinct from those north of Gingin, show close resemblance to the type material of *S. leptocalyx* and appear to be the first collections from this region since Drummond.

In this paper, a revised species description is provided for *S. leptocalyx*. *Stylidium stenosepalum* is reinstated to account for the white-flowered populations north of Gingin, and a modified description supplied. An amended species description is also presented for the morphologically allied *S. scabridum*.

Materials and methods

This study is based on herbarium specimens housed at AD, BM, CANB, CGE, K, MEL, NSW, P, PERTH, RSA and W, and on the field observations of the author. Morphological characters were coded using a combination of fresh, spirit, photographic and herbarium material. Corolla lobe measurements were based solely on material preserved in 70% ethanol from the following collections: *S. leptocalyx* (Wege JAW 683); *S. stenosepalum* (Wege JAW 625, JAW 629, JAW 638, JAW 651, JAW 715, JAW 717, JAW 726, JAW 909, JAW 912, JAW 914); *S. scabridum* (Wege JAW 509, JAW 674).

Data were recorded as a DELTA dataset (Dallwitz *et al.* 1993), from which species descriptions were generated. Species distribution maps were generated using NatureMap, a departmental mapping application, and are based on PERTH specimen data.

Taxonomy

Stylidium leptocalyx Sond. *In*: C. Lehmann, Pl. Preiss. 1: 373, adnote (1845). *Type*: Swan River, J. Drummond 532 (*lecto*, here designated: MEL 2069478!; *isolecto*: BM!, K (2 sheets)!, MEL 2069477!, P!, W (2 sheets)!).

Perennial herb, 7–40 cm high. *Glandular trichomes* 0.2–4 mm long; heads red to red–black, ellipsoid; stalks translucent to yellow. *Multicellular eglandular (pilose) trichomes* 0.5–4 mm long. *Stems* somewhat condensed, internodes *c.* 0.5–1 cm long. *Stilt roots* glabrous. *Leaves* arranged in a rosette at the stem

apex, linear, 3.5–16 cm long, 1.1–2.2 mm wide, margin involute, apex acute; surface scabrous, papillae 0.15–0.3 mm long. Scale-leaves 0.35–4.8 cm long. *Scape* 4.5–35 cm high, 0.5–1.3 mm wide, glandular throughout, pilose hairs also present on lower portion. Inflorescence a loose corymbose raceme, 6–20-flowered. Bracts and bracteoles linear, glandular; bracts 6–23 mm long, 0.7–1.2 mm wide, scabrous at apex; bracteoles 6–18.5 mm long. Pedicels 8–60 mm long, glandular. *Hypanthium* ellipsoid, 2.5–5 mm long, 1.2–3.4 mm wide, glandular. Calyx lobes free or partly fused (2 fused and 3 free), 6.5–12.5 mm long, 0.6–1.1 mm wide, margin entire, apex subacute, surface and inner apex glandular. *Corolla* pale to bright pink with two set of dark pink throat markings and a creamy-white throat; abaxial surface pale with a darker central pink flush, glandular; tube 3–4 mm long; lobes vertically-paired, posterior lobes fused at base; anterior lobes 8–12.1 mm long, 5–6.7 mm wide, oblong to obovate, falcate and cymbiform, typically overlapping at apex; posterior lobes 8.5–12.5 mm long, 4.5–7.5 mm wide, oblong to obovate, often slightly pandurate. *Labellum* boss white, lenticular, 1–1.3 mm long, 0.5–0.7 mm wide; margin papillose, pink; lateral appendages 0.7–1.2 mm long, pink. *Throat appendages* 6 (1 on each anterior lobe, 2 on each posterior lobe); anterior appendages wing-like, pink, 1.5–2.5 mm long, 0.8–1.2 mm wide; posterior appendages subulate, white, 0.5–1.1 mm long, 0.2–0.3 mm wide. *Column* 8.5–10 mm long, white at base, pink above; connective glandular; anthers blue, subtending hairs absent; pollen white; stigma entire, shortly stalked, elliptic, cushion-like. *Capsule* ellipsoid 4.5–7.5 mm long. *Seeds* pale orange–brown to rust-coloured, obloid, 1.2–1.9 mm long, 0.3–0.4 mm wide. (Figure 1, Figure 2G,H)

Selected specimens. WESTERN AUSTRALIA: Gunapin Ridge Rd, Gunapin State Forest, 17 Nov. 1999, *F. Hort, J. Hort & A. Lowrie* 800 (PERTH); Qualen Road, Gunapin State Forest, 17 Nov. 1999, *F. Hort, J. Hort & A. Lowrie* 801 (PERTH); Little Darkin Swamp, Warrigal Road, Flynn State Forest, 29 Nov. 1999, *F. Hort* 851 (AD, CANB, MEL, NSW, PERTH, RSA); Track off Dale West Rd, West Dale National Park, 16 Oct. 2002, *J.A. Wege & F. Hort* JAW 683 (MEL, PERTH).

Distribution. Occupies a restricted range between Great Southern Highway and Brookton Highway, south-west of York. (Figure 3A)

Habitat. Favours upland habitats and lateritic soils. Grows in association with *Dryandra* in open wandoo woodland, jarrah/marri woodland, or eucalypt shrubland.

Phenology. Flowers have been recorded during October and November.

Conservation status. Conservation Codes for Western Australian Flora: Priority Four. *Stylidium leptocalyx* is known from a handful of populations of varying size found over a range of less than 40km. It is represented within both Westdale and Wandoo Conservation Parks and is not considered threatened.

Typification. The type material, collected by Drummond in 1839, closely resembles the collections from south-west of York made by the Horts in 1999–2000. This species does not appear to have been collected in the 160 year intervening period; quite remarkable given the relatively close proximity of these populations to Perth. The MEL sheet chosen here as a lectotype has been selected because it bears the annotations of Sonder. (Figure 1)

Chromosome number. Unknown. The counts of $n=8$ recorded under *S. leptocalyx* by both James (1979) and Coates (1982) correspond to *S. stenosepalum* (see notes under that species).



Figure 1. Lectotype of *Stylidium leptocalyx* (MEL 2069478). Scale bar at 1cm. Inset shows label details, with Sonder's annotation on the left.

Notes. In addition to differences in geographic distribution, *Stylidium leptocalyx* can be clearly separated from *S. stenosepalum* on account of its shorter corolla tube, shorter column, and corolla lobes that are pink and bear two sets of dark pink throat markings rather than creamy-white and with one set of throat markings. The relative size of the corolla lobes also typically differs between these species: in *S. leptocalyx* the posterior lobes are roughly equal in size to the anterior lobes, whilst in *S. stenosepalum* they tend to be slightly shorter. Sterile material can be identified with some confidence given the leaves of *S. leptocalyx* are usually broader than in *S. stenosepalum*, and bear slightly longer leaf papillae. Differences to *S. scabridum* are discussed under the notes for that species.

Stylidium stenosepalum E.Pritz. *In*: Diels, F.L.E. & Pritzel, E. *Fragm. Phyt. Austral.* 590 (1904–05). *Type*: Hab. in distr. Irwin pr. Mingenew in plagis apertis fruticosis flor. m., Sept. 1901, *L. Diels* 4225 (*holo*: B, *n.v.*, destroyed in WWII).

Illustrations. Mildbraed (1908) Figure 21C, p. 75; Carlquist (1969) Figure 88 (photograph), p. 53; Grieve & Blackall (1982) No. 20, p. 736.

Perennial herb, 12–38 cm high. *Glandular trichomes* 0.2–3.5 mm long; heads red to red–black, ellipsoid; stalks translucent to yellow. Multicellular eglandular (pilose) trichomes 1.5–4 mm long. *Stems* short, or somewhat condensed, internodes 0.4–2 cm long. Stilt roots glabrous. *Leaves* arranged in a rosette at the stem apex, linear, 5–25 cm long, 0.7–1.5 mm wide, margin involute, apex acute; surface scabrous (rarely glabrous), papillae to 0.15 mm long. Scale-leaves 0.5–7 cm long. *Scape* 7.5–32 cm high, 0.8–2.3 mm wide, glandular throughout, pilose hairs also present on lower portion. Inflorescence a loose corymbose raceme, 3–20-flowered. Bracts and bracteoles linear, glandular, often scabrous at apex; bracts 7–20 mm long, 0.7–2 mm wide; bracteoles 6.5–17 mm long. Pedicels 9–53 mm long, glandular. *Hypanthium* globular to ellipsoid, 3.2–7.5 mm long, 2–5.5 mm wide, glandular. Calyx lobes partly fused (2 fused and 3 free), 7.4–15 mm long, 0.8–1.7 mm wide, margin entire, apex subacute, surface and inner apex glandular. *Corolla* white (rarely pale pink) with one set of pink–red throat markings; abaxial surface flushed pinkish–red, glandular; tube 5–7.5 mm long; lobes vertically paired, posterior lobes fused at base; anterior lobes 10.5–18 mm long, 5.3–12 mm wide, ovate to oblong or obovate, falcate and cymbiform, sometimes overlapping at apex; posterior lobes 10–17 mm long, 4.3–10 mm wide, ovate to oblong or obovate. *Labellum* boss white, lenticular, 1.2–2 mm long, 0.7–0.9 mm wide; margin papillose, whitish–pink to bright pink; lateral appendages 0.6–1.5 mm long, pink or white with pink tips. *Throat appendages* 6 (1 on each anterior lobe, 2 on each posterior lobe), white to pinkish; anterior appendages wing-like, 2.4–4 mm long, 1.5–2.4 mm wide; posterior appendages subulate, entire or bilobed or trilobed, 1.2–3.2 mm long, 0.5–1.3 mm wide. *Column* 12.5–17 mm long, white, often with a pinkish hinge; connective glandular; anthers greenish to blue, subtending hairs absent; pollen yellow to greenish; stigma entire, shortly stalked, elliptic, cushion-like. *Capsule* subglobular, 5.5–10 mm long. *Seeds* brown to rust-coloured, obloid, 1–1.3 mm long, 0.3 mm wide. (Figure 2A–F)

Selected specimens. WESTERN AUSTRALIA: 11 miles S of Regans Ford, 15 Sept. 1967, *S. Carlquist* 3190 (MEL, NSW, PERTH, RSA); 2 km N of the Watheroo Rd junction along Coalara Rd, 30 Sept. 1987, *D. Coates* 4987 (PERTH); Moore River National Park, c. 15 km S of Moore River and near Brand Hwy, 6 Oct. 1996, *M.G. Corrick & B.A. Fuhrer* MGC 11278 (MEL, PERTH); Badgingarra National Park, just W of New Townsite, 6 Oct. 1981, *E.A. Griffin* 3182 (PERTH); E of Western Titanium Leases, SE of Eneabba, 13 Sept. 1977, *R. Hnatiuk* 770913 (PERTH); 32.4 km W of Arrino, Sept. 1974, *S. James* 74.9/10 (PERTH); 120 miles N of Perth on Gingin–Jurien Bay Rd, Sept. 1972, *G. Keighery & G. Stone* 72.9/9 (PERTH); 8 km E of Dandaragan West towards Dandaragan, 2 Oct. 1971, *S. Paust* 1135 (PERTH); 3.4 km S on Dewar Rd from the Marchagee Track, 21 Oct. 1998, *J.A. Wege* JAW 513 (K, MEL, PERTH); Junction of Bunney Rd and Neburu Rd, NE of Eneabba, 27 Sept. 2002, *J.A. Wege & C. Wilkins* JAW 625 (PERTH); N on Sundalara Rd from Robinson Rd, NE of Eneabba, 27 Sept. 2002, *J.A. Wege & C. Wilkins* JAW 629 (PERTH); c. 2.8 km W from Brand Hwy on Coorow–Green Head Rd, 27 Sept. 2002, *J.A. Wege & C. Wilkins* JAW 638 (PERTH); 4.2 km E of Brand Hwy on Wannamal West Rd, Boonanarring Nature Reserve, 29 Sept. 2002, *J.A. Wege & C. Wilkins* JAW 651 (MEL, NSW, PERTH); W on Barberton Rd from Capitela Rd, SW of Moora, 23 Oct. 2002, *J.A. Wege* JAW 715 (CANB, MEL, PERTH); N of Wandawallah Rd on Rowses Rd, SW of Moora, 23 Oct. 2002, *J.A. Wege* JAW 717 (PERTH); 15 km E of Carger Rd on Marchagee Track, Watheroo National Park, 24 Oct. 2002, *J.A. Wege* JAW 726 (PERTH); c. 3 km E on Boonanarring Rd from Brand Hwy, Boonanarring Nature Reserve, 7 Oct. 2003, *J.A. Wege* 909 (AD, CANB, PERTH); 900 m S of Red Gully Rd on Brand Hwy, Moore River National Park, 7 Oct. 2003, *J.A. Wege* 912 (PERTH); c. 3 km S of Gillingarra Rd on Brand Hwy, 7 Oct. 2003, *J.A. Wege* 914 (PERTH).

Distribution. Extends from Boonanarring Nature Reserve north to Badgingarra and the Moora District through to breakaway country north-east of Eneabba. (Figure 3B)

Habitat. Grows in sand or sandy loam within *Banksia* woodland/shrubland, heathland, or open *Eucalyptus* woodland with a shrubby Proteaceous understorey. Often associated with lateritic breakaways.

Phenology. Flowering specimens have been collected from the end of August through to the end of October.

Conservation status. Known from a number of populations in the northern sandplains, several of which are in conservation reserves. No conservation code is applicable.

Typification. Type material of *S. stenosepalum* housed at Berlin was destroyed during World War II (Botanical Museum Berlin-Dahlem 1999), but not before being viewed by Mildbraed (1908). Searches at BM, CANB, K, MEL, NSW, P, PERTH and W have failed to find duplicate material of this Diels collection. A neotype will be chosen if type material is not located during forthcoming searches of other botanical institutions.

Chromosome number. James (1979) refers to two populations of *S. leptocalyx* as having a chromosome number of $n=8$: 120 miles N of Perth on the Gingin–Jurien Bay Rd (PERTH 02859041) and 32.4 km west of Arrino (PERTH 02859033). Both populations are referable to *S. stenosepalum*. Coates (1982) also recorded a count of $n=8$ under *S. leptocalyx*. No voucher specimens have been located at PERTH or UWA; however, the three populations surveyed in his study were also from the northern sandplains (Coates pers. comm.) and are therefore interpreted here as corresponding to *S. stenosepalum*.

Notes. Differences to *S. leptocalyx* and *S. scabridum* are discussed under the notes for those species.

Subtle variation in throat appendage morphology is evident both within and between populations of *S. stenosepalum*. The southern-most populations (i.e. from Boonanarring Nature Reserve to Regans Ford) tend to possess more ornate appendages: the margin of the anterior appendage is irregularly lobed (to varying degrees), and the posterior teeth are bilobed or trilobed. In the remaining populations the margin of the anterior throat appendage varies from slightly irregular to more or less entire, and the posterior teeth are either entire or bilobed. This variation is in accordance with that often shown in species of *Stylidium* both within and between populations and is not considered here to be taxonomically significant.

Stylidium stenosepalum also exhibits considerable variation in corolla morphology both within and between populations, particularly with regards to the shape of the anterior (upper) corolla lobes. In all populations examined, the anterior lobes are falcate and cymbiform, although to varying degrees (Figure 2A–F). In the southern-most populations, the anterior lobes are obovate (rarely oblong) and overlap at the apex to form what Carlquist (1969) termed a “reverse hood” through which the column moves (Figure 2A–B). A comparable hood is present (to varying degrees) in several other scale-leaved species, including *S. leptocalyx*.

In contrast to the southern populations, the anterior lobes in the northern-most populations are typically ovate and less inwardly-curved (Figure 2E–F), and thus the hood tends to be absent (although flowers with hooded anterior lobes were occasionally observed). In the geographically intermediate

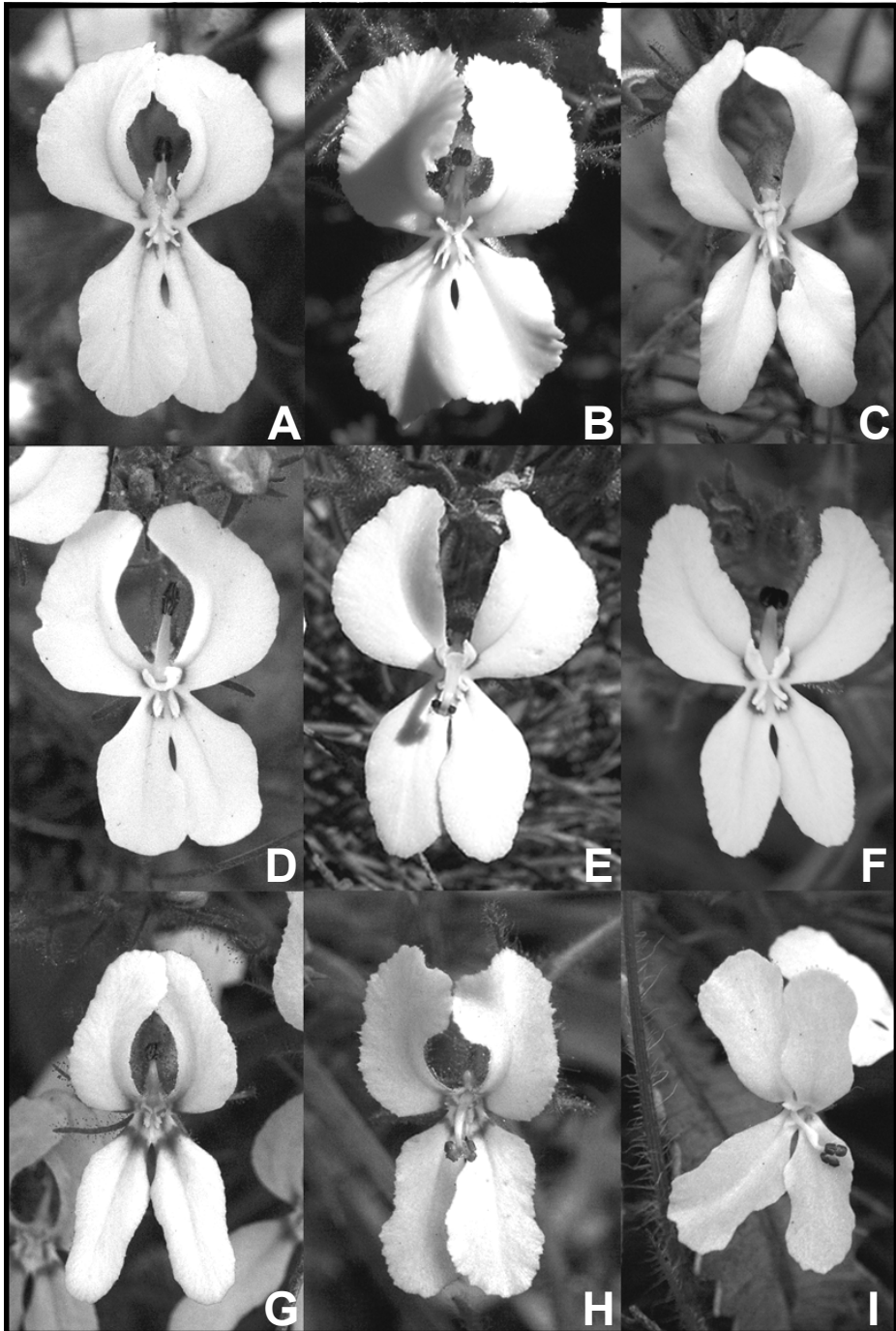


Figure 2. Variation in corolla lobe morphology in the *Stylidium leptocalyx* complex. A–F: *S. stenosepalum*; A – JAW 909, Boonanarring; B – JAW 651 Boonanarring; C – JAW 726, Watheroo National Park; D – JAW 715, SW Moora; E – JAW 625, NE Eneabba; F – JAW 629, NE Eneabba. G–H: *S. leptocalyx*, JAW 683. I – *S. scabridum*, JAW 674. Flowers A–H have vertically-paired flowers in which the column operates from above; flower I has laterally-paired flowers and a column that operates from the side. Flowers not to scale.

populations from south-west of Moora and Watheroo National Park (Figure 2C–D), the anterior lobes are narrowly obovate, ovate or narrowly oblong and the hood tends to be present. These populations appear to be morphological intermediates between the southern and northern populations. The shape of some flowers also seemed to superficially resemble those of *S. leptocalyx* (compare Figure 2C and G).

In all populations, the posterior lobes (which range in shape from obovate to oblong) tend to be slightly shorter than the anterior lobes. This difference in size is more apparent in the northern-most populations. Overall flower size was found to vary considerably within the majority of populations.

An erose corolla lobe margin was evident in some plants of *S. stenosepalum* from Boonanarring Reserve (Figure 2B), although this feature was not consistent within the reserve (Figure 2A). Similarly, *S. leptocalyx* was variable for this feature within the population examined at Westdale National Park (Figure 2G–H), suggesting that this feature is not taxonomically significant.

Corolla lobe shape is often highly diagnostic and as such it continues to be used (in part) to support species boundaries in *Stylidium*, particularly within section *Squamosae* (e.g. Carlquist 1969; Carlquist 1976; Wege 2006); however, whilst some species of *Stylidium* possess corolla lobes that are uniform in shape, others display subtle variation in corolla shape (e.g. *S. graminifolium*, Raulings & Ladiges 2001; *S. crosscephalum*, Wege 2006). The diversity in corolla morphology evident in *S. stenosepalum* is unprecedented within *Stylidium*. Whilst corolla shape in the northern-most populations appears to be distinct from that in the southern-most populations, intraspecific variation combined with the presence of geographically and morphologically intermediate populations suggests that this variation may be continuous in nature.

It is considered practical to broadly circumscribe this species at this point in time. Further field observations targeting geographically intermediate populations in the Shire of Dandaragan, combined with detailed phenetic studies, may help determine whether *S. stenosepalum* should be divided into infraspecific taxa, or is just a variable species.

Stylidium scabridum Lindl. Sketch Veg. Swan Riv. Col. xxviii (1839). Base name for *Candollea scabrida* (Lindl.) F. Muell. Syst. Census Austral. Pl. 85 (1882). *Type*: not cited [Swan River, *J. Drummond s.n.*] (*holo*: CGE!; *iso*: G–DC, *n.v.* (microfiche seen), K (2 sheets)!).

Stylidium laxiflorum DC., Prod. 7(2): 782 (1839). *Type*: In Novâ-Hollandiâ ad Swan-river, *J. Drummond s.n.* (*holo*: G–DC *n.v.*, microfiche seen; *iso*: CGE!, K (2 sheets)!).

Illustrations. Mildbraed (1908) Figure 21D–F, p. 75; Erickson (1958) Plate 46, No. 4. Plate 48, Nos. 11–18, p. 159; Grieve & Blackall (1982) No. 19, p. 736.

Perennial herb, 5–24 cm high. *Glandular trichomes* 0.2–3 mm long; heads red, ellipsoid; stalks translucent. Multicellular eglandular (pilose) trichomes 0.5–1.2 mm long. *Stems* short, often branched, internodes 0.2–3 cm long. Stilt roots glabrous. *Leaves* arranged in a rosette at the stem apex, linear, 2.5–9.5 cm long, 0.7–2 mm wide, margin involute, apex mucronate; surface scabrous, papillae *c.* 0.1 mm long. Scale-leaves 0.25–3 cm long. *Scape* 4–16.5 cm high, 0.5–1.2 mm wide, glandular throughout, pilose hairs also present on lower portion. Inflorescence a loose corymbose raceme, 5–18-flowered. Bracts and bracteoles linear, glandular, scabrous at apex; bracts 3.5–8.5 mm long, 0.5–1 mm wide; bracteoles 1.5–4 mm long. Pedicels 12–40 mm long, glandular. *Hypanthium* globular, 1.5–2.3 mm long, 0.9–2.2 mm wide, glandular. Calyx lobes partly fused (2 fused and 3 free), 3.1–5 mm long, 0.5–0.9 mm wide, margin entire,

apex subacute to acute, surface glandular, inner apex glabrous. *Corolla* pale pink to whitish with red–pink throat markings confined to the posterior lobes, throat white; abaxial surface with a central reddish stripe, glandular; tube 2–3 mm long; lobes laterally-paired, oblong to pandurate; anterior lobes 5.5–10.5 mm long, 2.8–5.6 mm wide; posterior lobes 5.5–10.2 mm long, 2.5–4.8 mm wide. *Labellum* boss white, ovate, 0.6–0.8 mm long, 0.4–0.5 mm wide, margin entire; terminal appendage red, 0.2–0.5 mm long; lateral appendages absent. *Throat appendages* 4 or 6 (1 on each anterior lobe, 1 or 2 on each posterior lobe), white; anterior appendages wing-like, 0.5–0.6 mm long, 0.6–1.2 mm wide; posterior teeth 0.2–0.3 mm long, 0.1–0.2 mm wide. *Column* 6.2–8 mm long, dilated at distal end, white; connective glabrous; anthers red to blue–black, subtending hairs absent; pollen white; stigma entire, shortly stalked, elliptic, cushion-like. *Capsule* globular, 3.5–5 mm long. *Seed* not viewed. (Figure 2I)

Selected specimens. WESTERN AUSTRALIA: Site 14, Deefor Rd, 3 km SSW Coolakin Spring, 11 Nov. 1996, *M.G. Allen* 467 (PERTH); Near Narembeen, 72 km S of Merredin, *W.E. Blackall* s.n. (PERTH); 8 miles from Wyening on secondary road between Wyening and the 68 mile peg S of New Norcia, 3 Oct. 1967, *S. Carlquist* 3605 (AD, CANB, PERTH, MEL, RSA); W of Wyening, N of Toodyay, 23 Sept. 1951, *R. Erickson* s.n. (PERTH, MEL); Warrigal Rd, 1.3 km E of Kent Rd, 23 Mar. 2000, *F. Hort* 974 (PERTH); 2 miles W Tammin on Great Eastern Hwy, Oct. 1968, *S. James* 68.10/2 (PERTH); New Norcia Monastery, 11 Oct. 1995, *D. Papenfus* DP 188 (PERTH); 620 m WSW down Deefor Rd from the junction of Kent Rd, 29 Nov. 1994, *J.L. Robson* s.n. (PERTH); Meckering, 20 Sept. 1914, *O.H. Sargent* s.n. (PERTH); 750 m N on Kent Rd from Qualen Rd, 21 Oct. 1998, *J.A. Wege* JAW 509 (K, PERTH, MEL); 800 m S from Deefor Rd on Kent Rd, 16 Oct. 2002, *J.A. Wege* JAW 674 (CANB, PERTH).

Distribution. Known only from conservation reserves south-west of York and a disjunct population from New Norcia. *Stylidium scabridum* was once more widespread, occurring in pockets of sandplain as far east as Tammin; however, these populations are now extinct (Coates pers. comm.). *Stylidium scabridum* overlaps in geographic range with *S. leptocalyx*; however, there are no records of any sympatric occurrences. (Figure 3C)

Habitat. *Stylidium scabridum* favours sandy habitats in open woodland or heathland.

Phenology. Flowering specimens have been collected from September to late November, with an isolated record for March following abnormally high levels of summer rain.

Conservation status. Conservation Codes for Western Australian Flora: Priority Four. Geographically restricted but represented within conservation reserves in the Shire of York. Not considered threatened.

Chromosome number. James (1979) recorded a count of $n=8$ from 2 miles W of Tammin; this population is now extinct (Coates pers. comm.). Coates (1982) also recorded counts of $n=8$ from two populations; however, no voucher specimens have been located at PERTH or UWA.

Notes. *Stylidium scabridum* is the only scale-leaved trigger plant to have laterally-paired corolla lobes (Figure 2I). This species typically has smaller flowers than *S. stenosepalum* and *S. leptocalyx*, including shorter calyx lobes (with no glandular hairs on the inner surface) and a shorter corolla tube and column. The labellum is less ornate, lacking lateral appendages and a papillose border.

The throat appendages in *S. scabridum* are less conspicuous than those found in either *S. stenosepalum* or *S. leptocalyx* and so it is not surprising that Mildbraed (1908), without the aid of field observations or wet collections, overlooked their presence altogether. Erickson (1958) amended Mildbraed's

description, reporting the presence of six small throat appendages. Examination of wet collections from JAW 674 indicates that throat appendage number can be variable within populations of *S. scabridum*. A broad, low, wing-like appendage is always present on each anterior corolla lobe; however, the posterior corolla lobes may each bear either one or two small, tooth-like appendages. The posterior tooth closest to the anterior corolla lobe was occasionally observed to fuse at the base with the anterior wing.

The degree to which throat appendage morphology varies within species of *Stylidium* remains to be fully explored. Several studies have now demonstrated intraspecific variation in both throat appendage number and morphology (Raulings & Ladiges 2001; Wege 2006). Whilst throat appendages can provide important diagnostic information, these recent observations illustrate that throat appendage characters must be used with caution when delineating species of *Stylidium*.

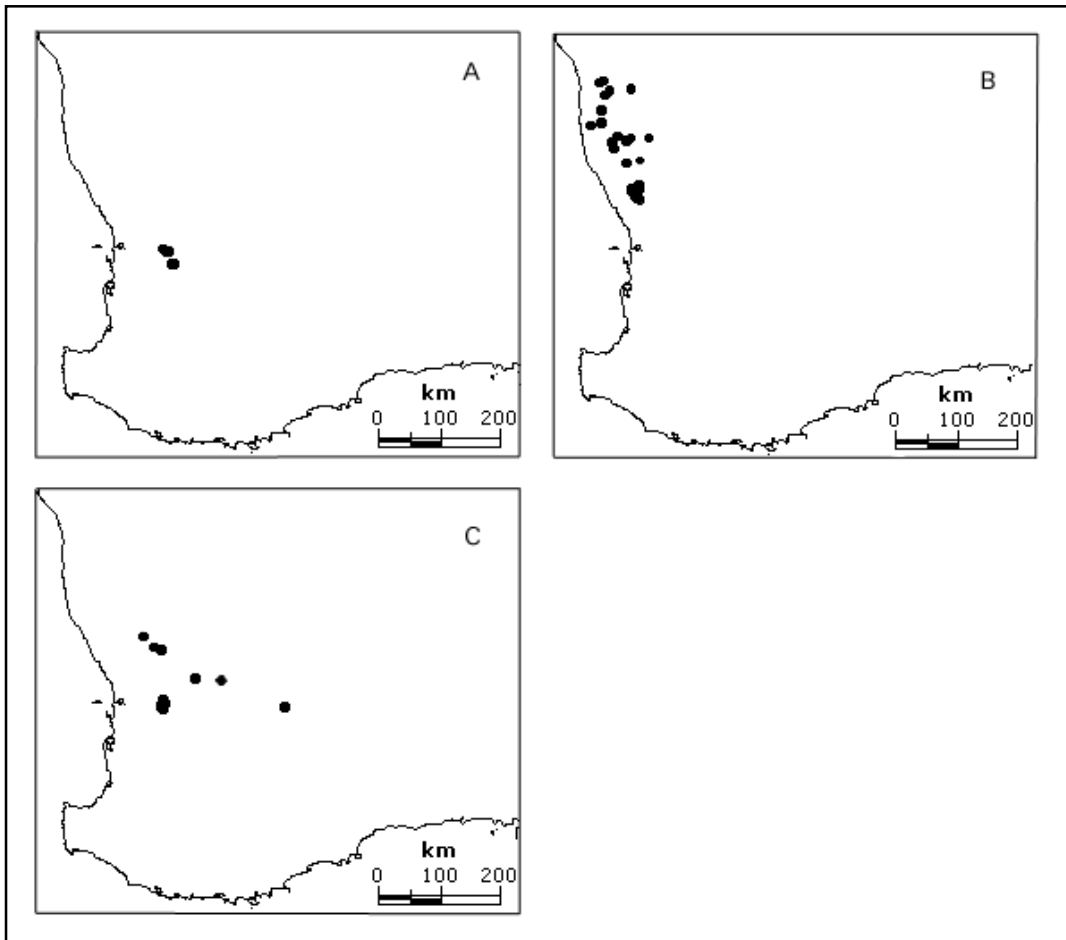


Figure 3. Geographic distribution of members of the *Stylidium leptocalyx* complex (●): A – *S. leptocalyx*; B – *S. stenosepalum*; C – *S. scabridum*.

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