

## A taxonomic revision of the *Stylidium brunonianum* alliance (sect. *Saxifragoidea*: Stylidiaceae)

Juliet A. Wege

Western Australian Herbarium, Department of Parks and Wildlife,  
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983  
Email: Juliet.Wege@dpaw.wa.gov.au

### Abstract

Wege, J.A. A taxonomic revision of the *Stylidium brunonianum* alliance (sect. *Saxifragoidea*: Stylidiaceae). *Nuytsia* 25: 313–342 (2015). A morphological assessment of *Stylidium brunonianum* Benth. and its allies recognises eight taxa, all of which are endemic to the south-west of Western Australia. Following examination of type material and field work, a narrower circumscription of *S. brunonianum* is presented, *S. tenue* Sond. is reinstated and the following five taxa are newly described: *S. araeophyllum* Wege, *S. neurophyllum* Wege, *S. purpureum* Wege, *S. spiciforme* Wege and *S. tenue* subsp. *majusculum* Wege. A revised description is provided for *S. lowrieianum* Carlquist, a conservation-listed species from the Leeuwen-Naturaliste Ridge. Lectotypes are selected for *S. brunonianum*, *S. tenue* and *S. brunonianum* var. *minor* Benth., with the varietal name newly placed into synonymy under *S. tenue*. A lectotype is also designated for the name *S. striatum* Lindl. var. *glaucum* Benth. (based on collections of *S. lowrieianum*, *S. neurophyllum*, *S. bellum* Wege and *S. rosulatum* Wege) to fix its application as a synonym of *S. rosulatum*. A dichotomous key to the *S. brunonianum* alliance is provided along with photographs of key features and distribution maps.

### Introduction

The *Stylidium brunonianum* Benth. alliance forms a cohesive group within sect. *Saxifragoidea* Mildbr. (Stylidiaceae), a large and variable section of perennial triggerplants from the south-west of Western Australia characterised by non-fibrous leaves and glandular hairs with discoid (or more rarely turbinate or subglobular) heads. Members of this alliance are distinctive within this section on account of their flowers, which have pink, purple or white, vertically-paired corolla lobes that are orientated so that the anterior pair are in the upper position and the column operates dorsally. Other characteristics of this alliance (albeit ones that are shared with some other members of sect. *Saxifragoidea*) include scapes with whorls of sterile bracts, glaucous or glaucescent, racemose inflorescences with a sparse indumentum of glandular hairs, ellipsoid to obloid hypanthia and capsules, and flowers with six or eight throat appendages.

*Stylidium brunonianum* was described by Bentham (1837) some 31 years prior to his account of the genus for *Flora Australiensis* (Bentham 1868) and has since been broadly circumscribed to include a suite of morphologically variable populations extending from near Kalbarri to Albany (Bentham 1868; Mildbraed 1908; Erickson 1958; Wheeler 1987; Wheeler *et al.* 2002). A much narrower circumscription of *S. brunonianum* is presented herein, with the name applied to a distinctive, linear-leaved species

restricted to seasonally wet habitats mostly on the Swan Coastal Plain. The present study also includes taxonomic assessment of specimens previously misapplied against *S. striatum* Lindl. (e.g. Mildbraed 1908; Erickson 1958; Wheeler *et al.* 2002, *p.p.*); this name is now known to apply to a species from sect. *Saxifragoidea* with yellow, laterally-paired corolla lobes (see Wege 2007). Eight taxa are now recognised in the *S. brunonianum* alliance, of which five are newly described.

## Methods

This study is based primarily on examination of herbarium specimens and associated spirit collections housed at the Western Australian Herbarium (PERTH) and field observations, with supplementary data obtained from additional specimens housed at a range of institutions. Distribution statements and maps are based on taxonomically validated PERTH specimen data and refer to *Interim Biogeographic Regionalisation for Australia* Version 7 bioregions and subregions (Department of the Environment 2013).

The descriptions are not exhaustive but encompass the key diagnostic features for species in the genus. Leaf measurements are from mature leaves rather than the dense, inner cluster of smaller, bract-like leaves present at the base of the scape (and often scarcely visible on herbarium specimens). Spirit collections from the following populations were used to measure floral features (*J.A. Wege* numbers unless indicated): *S. araeophyllum* Wege – 1128, 1332, 1335, 1340, 1343, 1447, 1954; *S. brunonianum* – 1113, 1381, 1400, 1453, 1801; *S. lowrieianum* Carlquist – 438, 1484, 1972; *S. neurophyllum* Wege – 709, 779, 1134, 1363, 1393, 1395, 1401, 1468, 1473, 1537, 1942, 1944, 1970, 1971, *Wildflower Society of WA* KOJE 7/74; *S. purpureum* Wege – 203, 613, 735, 742, 923, 1355, 1356, 1384, 1793; *S. spiciforme* Wege – 1338, 1341, 1344, 1345, 1352; *S. tenue* Sond. subsp. *tenue* – 830, 1063, 1364, 1448, 1481, 1555; *S. tenue* subsp. *majusculum* Wege – 661, 1091, 1367, 1371, 1380, 1388, 1788, 1961.

### Key to taxa in the *Styloidium brunonianum* alliance

1. Hypanthium glandular-hairy throughout or at least near the apex
  2. Hypanthium glandular-hairy near the apex; leaf margin crispate; stems elongated and with internodes clearly visible between the swollen growth nodes; roots forming at the nodes when they are buried (i.e. stilt roots absent) [western Warren, Southern Jarrah Forest] ..... ***S. lowrieianum***
  2. Hypanthium sparsely glandular-hairy throughout; leaf margin entire; stems contracted or if shortly elongated then with internodes obscured by crowded leaf bases; stilt roots usually clearly evident
    3. Mature leaves linear; pedicels 3–25 mm long, decreasing in length from inflorescence base to apex; prophylls inserted well above the base of the pedicels; capsules ellipsoid to globose [Swan Coastal Plain, Jarrah Forest] ..... ***S. araeophyllum***
    3. Mature leaves narrowly oblanceolate to oblanceolate (rarely almost linear); pedicels 1.5–4 mm long, more or less equal in length; prophylls inserted at or near the base of the pedicels (adjacent to or just above the bract); capsules obloid [northern Swan Coastal Plain, southern Lesueur Sandplain] ..... ***S. spiciforme***
- 1: Hypanthium glabrous (rarely with hairs near the base)
  4. Corolla lobes purple [northern Swan Coastal Plain, Geraldton Sandplains, Avon Wheatbelt] ..... ***S. purpureum***
  4. Corolla lobes mauve-pink, pink or white

5. Mature leaves linear, without striations, usually rugose and crumpled in dried material [on or adjacent to winter-wet habitats; Swan Coastal Plain, Jarrah Forest] ..... **S. brunonianum**
- 5: Mature leaves narrowly oblanceolate to oblanceolate or spatulate (rarely somewhat linear), smooth or striate, never rugose or crumpled [sandplain or upland habitats]
6. Mature leaves distinctly striate, the apex subacute to shortly acuminate (but not strongly tapered); corolla often white to pale pink, sometimes mauve-pink to medium pink [sandy habitats; Swan Coastal Plain, western margin of Jarrah Forest, western Warren] ..... **S. neurophyllum**
- 6: Mature leaves without striations (rarely scarcely striate), the apex acute to long-acuminate (usually strongly tapered); corolla mauve-pink to medium pink
7. Mature leaves in a compact rosette, 0.5–2 cm long; stems usually contracted, occasionally shortly elongated; scapes with sterile bracts in 1 or 2(3) whorls [Jarrah Forest, southern Avon Wheatbelt, Fitzgerald] ..... **S. tenue** subsp. **tenue**
- 7: Mature leaves in a spreading basal rosette, (1.2–)2–5 cm long; stems usually elongated and with distinct nodes, occasionally contracted; scapes with sterile bracts in (1)2–5 whorls [Northern Jarrah Forest and adjacent eastern Swan Coastal Plain, Avon Wheatbelt and Southern Jarrah Forest] ..... **S. tenue** subsp. **majusculum**

### Taxonomy

#### ***Stylidium araeophyllum* Wege, sp. nov.**

*Type:* 2.6 km south of Brookton Highway on Metro Road, south-east of Perth, Western Australia, 14 October 2014, J.A. Wege 1954 (*holotype*: PERTH 08542147; *isotypes*: CANB, K, MEL).

*Illustrations.* B.J. Grieve & W.E. Blackall, *How Know W. Austral. Wildfl.* 4: 732, ?No. 8 (1982), as *S. brunonianum*.

[*Stylidium brunonianum* auct. non Benth.: G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* 548 (2000), p.p.]

*Perennial herb* (12–)20–75 cm high; *stems* contracted or shortly elongated to 5 cm long and elevated above the soil surface, unbranched or branching, glabrous, clothed with persistent leaf bases; stilt roots present. *Glandular trichomes* 0.1–0.2 mm long, with a translucent to yellowish stalk and black, discoid head. *Leaves* in an erect basal tuft, linear, 1–6 cm long, 0.4–2.5 mm wide, acute and bearing a small blunt apical callus, entire, sometimes scarcely rugose and crumpled, without striations, glaucous (especially the undersurface), glabrous. *Scapes* (10–)18–70 cm long, 1–3(–5) mm wide, sparsely glandular-hairy above the lowest flower and sometimes in the axils of the sterile bracts; sterile bracts in 1 or 2 whorls and also scattered below the inflorescence, subulate to linear, 5–18 mm long, often crumpled like the leaves, glabrous. *Inflorescence* racemose, 12–c. 100-flowered, glaucescent; bracts subulate to linear, 2–7 mm long, subacute to acute, entire, glabrous; prophylls inserted well above the pedicel base, similar to the bracts but smaller; pedicels 3–25 mm long, glabrous or sparsely glandular-hairy. *Hypanthium* elliptic to ovate in outline, subglobose in TS, 1.7–2.5 mm long, 1–1.8 mm wide, faintly longitudinally

ridged, sparsely glandular-hairy. *Calyx lobes* free, with 2 a little longer and broader than the remaining 3, 1.8–3.2 mm long, 0.5–0.8 mm wide, subacute to acute, entire, glabrous or sparsely glandular-hairy. *Corolla* mauve-pink to medium pink with a white throat, glabrous, with the lobes paired vertically and rotated through 180°; tube 1.5–2.5 mm long; anterior (upper) lobes oblong to narrowly obovate, slightly narrower than the posterior (lower) pair, 3.5–5 mm long, 1.5–2.2 mm wide; posterior lobes oblong to obovate, 3.7–5 mm long, 2.3–3 mm wide. *Labellum* reflexed and angled across the calyx, ovate to elliptic, 0.7–1 mm long, 0.4–0.6 mm wide, with a terminal appendage 0.2–0.9 mm long, glabrous; lateral appendages to 0.4 mm long or absent. *Throat appendages* 8 (2 on each corolla lobe), with each lower pair partially fused, white at base with a mauve-pink or reddish pink centre and creamy white or yellowish tip, oblong and somewhat capitate, 0.8–1.2 mm long, glabrous. *Column* sigmoid when poised, straight when extended, 9–13.5 mm long, glabrous; anthers reddish black, subtending hairs absent; stigma sessile, entire. *Capsules* ellipsoid to globose, 2–3.5 mm long excluding calyx lobes. *Seeds* brown, obloid, *c.* 0.5–0.6 mm long, 0.2–0.25 mm wide, surface wrinkled. (Figure 1)

*Diagnostic features.* The following features distinguish *S. araeophyllum* from all other species in the genus: a stilted, perennial habit; a basal tuft of linear, glaucous and glabrous leaves; scapes with 1 or 2 whorls of sterile bracts below the inflorescence; prophylls that are inserted well above the pedicel base; a glandular-hairy hypanthium; mauve-pink or pink, vertically-paired corolla lobes; ellipsoid to globose capsules.

*Selected specimens.* WESTERN AUSTRALIA: 7.5 km NNE of Muchea, 3 km N along Reserve Rd from junction of Great Northern Hwy, 19 Oct. 2006, *R. Davis* 11130 (PERTH); Lot 505, Hungerford Ave, Halls Head, Nov. 2001, *P. Foreman* 342 (PERTH); Tea Tree Rd, Bindoon, *c.* 7.7 km W from Great Northern Hwy, 23 Oct. 2006, *F. Hort* 2909 (CANB, PERTH); 0.6 km E of Great Northern Hwy Reserve 27583/7867, Morrissey Rd, Bullsbrook, 21 Oct. 2006, *F. & B. Hort* 2916 (PERTH); 1 km S of Deefor Rd, Wandoo National Park, Kent Rd, 14 Oct. 2006, *F. & J. Hort* 2923 (CANB, PERTH); Kinsella Rd, Armadale, 2.2 km S of Brookton Hwy, 8 Nov. 2006, *F. Hort J. Hort & L.E. Boyle* 2935 (PERTH); W of Brand Hwy *c.* 5 km N Red Gully Rd, 12 Oct. 1988, *B.J. Keighery* 290 B (PERTH); Lowlands, Serpentine River, 30 Oct. 1999, *G.J. Keighery* 15703 (PERTH); Modong Nature Reserve, 16 Oct. 1994, *G.J. Keighery* 13212 (PERTH); Harvey River Reserve 13987, 4 km E of Lake Clifton townsite, 4 Nov. 2005, *G.J. Keighery* 16851 (PERTH); ?reserve at corner of South West Hwy and Dardanup West Rd, *J.A. Wege* 1128, 14 Nov. 2003 (MEL, PERTH); 6.3 km from Brand Hwy along Airfield Rd then Duffy Rd, Yeal Swamp Nature Reserve, 10 Oct. 2006, *J.A. Wege* 1332 (CANB, MEL, PERTH); S along Sandringham Rd from Gingin Brook Rd, Yeal Swamp Nature Reserve, 10 Oct. 2006, *J.A. Wege* 1335 (AD, CANB, MEL, PERTH); Brand Hwy, 600 m N of Red Gully Rd, Moore River National Park, 10 Oct. 2006, *J.A. Wege* 1337 (PERTH); 9.6 km W along Orange Springs Rd from Brand Hwy, Moore River National Park, 10 Oct. 2006, *J.A. Wege* 1340 (MEL, PERTH); Wongonderrah Rd, 9.4 km W of Brand Hwy, Wongonderrah Nature Reserve, 10 Oct. 2006, *J.A. Wege* 1343 b (PERTH); *c.* 500 m S on Munbinea Rd from Hill River Bridge, Hill River Nature Reserve, 11 Oct. 2006, *J.A. Wege* 1354 (PERTH); W boundary of Buller Road Nature Reserve, W of Waroona, 6 Nov. 2007, *J.A. Wege & R. Butcher* JAW 1461 (MEL, PERTH); Crawler Rd, SW of Kent Rd, SE of Chidlow, 1 Nov. 2007, *J.A. Wege & K. Hufford* JAW 1447 (PERTH); 2.35 km W of Christmas Tree Well turnoff on Brookton Hwy, Shire of Beverley, 28 Oct. 2004, *J.A. Wege & D. Wege* JAW 1239 (CANB, MEL, PERTH).

*Distribution and habitat.* *Stylidium araeophyllum* is widespread in the Swan Coastal Plain and Jarrah Forest bioregions, from east of Jurien Bay to near Boyanup and from south of Toodyay to near Collie, with an outlying record in the Avon Wheatbelt near Highbury (Figure 2A). It grows on plains, gentle hillslopes, dune slopes and flat hill crests in deep sand over limestone and in sand or sandy loam over



Figure 1. *Stylidium araeophyllum*. A – stilted habit with narrow, tufted basal leaves; B – mauve-pink, vertically-paired corolla lobes bearing eight throat appendages; C – side view of flower showing the sparsely glandular-hairy hypanthium, one of the prophylls on the pedicel, and throat appendages with a dark pinkish band of colour below the creamy yellow tip. Photographs © J.A. Wege from J.A. Wege & K. Hufford JAW 1447 (A) and J.A. Wege 1954 (B, C).

laterite. It is commonly found in *Banksia menziesii* and *B. attenuata* low woodland, sometimes with scattered *B. ilicifolia* or *Nuytsia floribunda* or with emergent *Eucalyptus marginata* or *E. todtiana*, and in *E. marginata* and *Corymbia calophylla* woodland. There is a single record from ‘salt marsh vegetation with fringing estuarine forest’ (PERTH 06085393) which is a mixed collection with *S. brunonianum* (PERTH 06796885). Field observations are required to confirm whether the two species actually grow intermixed or in close proximity but in different habitats (the latter is most likely; see affinities section below).

*Phenology*. Flowering from October to mid-November.

*Conservation status*. A common and widespread species that does not require a conservation listing.

*Chromosome number*. James (1979) recorded a count of  $n = 9$  from a population east of Jurien Bay (PERTH 02915995), under *S. brunonianum* subsp. *brunonianum*. A second, unpublished voucher specimen from near North Bannister (PERTH 08542058) that is annotated with  $n = 9$  was uncovered several years ago amongst Sid James’ personal effects at the University of Western Australia (UWA) and transferred to PERTH.

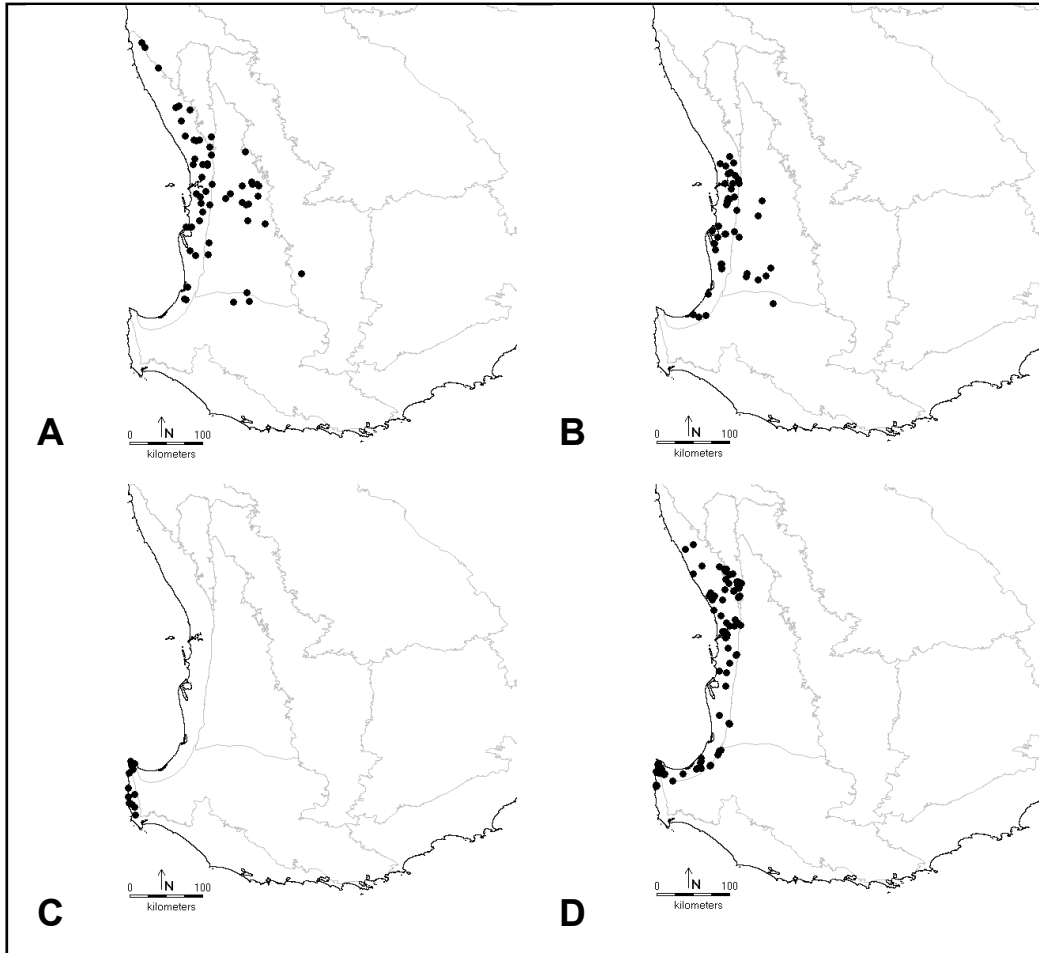


Figure 2. The distribution of four members of the *Styliidium brunonianum* alliance in the south-west of Western Australia based on PERTH specimen data, with IBRA regions (Department of the Environment 2013) in pale grey. A – *S. araeophyllum*; B – *S. brunonianum*; C – *S. lowrieianum*; D – *S. neurophyllum*.

*Etymology.* From the Greek *araios* (thin, narrow) and *-phyllus* (-leaved).

*Common name.* Stilt Walker (here designated).

*Affinities.* *Styliidium araeophyllum* is morphologically similar to *S. spiciforme*, a species which also occurs on the sandplains north of Perth. Both taxa have glandular-hairy hypanthia, eight throat appendages (usually with a distinctive dark colouration below the tip; e.g. Figure 1C), and a similar habit, although the stems of *S. araeophyllum* tend to be more conspicuously propped above the soil, with those of *S. spiciforme* becoming partially buried as the plant ages. A key difference between the two species can be found in the inflorescence morphology: *S. spiciforme* has a spike-like raceme in which the pedicels are fairly short (to 4 mm) and relatively uniform in length, and the prophylls are inserted at the pedicel base (just above the floral bract); *S. araeophyllum* tends to have longer pedicels (3–25 mm) which decrease in length from base to apex, and the prophylls are inserted well above the pedicel base. *Styliidium spiciforme* usually has narrowly oblanceolate to oblanceolate rather than linear leaves like *S. araeophyllum*, although some more or less linear leaves are occasionally evident.

The shape of the capsules (ellipsoid to globular in *S. araeophyllum*; obloid in *S. spiciforme*) and seed (obloid in *S. araeophyllum*; ovoid to ellipsoid in *S. spiciforme*) appear taxonomically informative, although I have seen relatively few mature capsules and seed. The distributions of the two species slightly overlap although they are not known to co-occur.

*Stylidium araeophyllum* grows with *S. neurophyllum* at a number of sites on the Swan Coastal Plain (e.g. PERTH 05478774 and 05478782, PERTH 02915499 and 02915421, PERTH 07855567 and PERTH 08542325). *Stylidium neurophyllum* can be most readily distinguished by its narrowly oblanceolate to oblanceolate, striate and more spreading basal leaves, glabrous hypanthia and throat appendage morphology (usually six rather than eight appendages and lacking the bands of colour found in *S. araeophyllum*). *Stylidium purpureum* also grows in close proximity to *S. araeophyllum* (e.g. PERTH 07855621 and 07855230) but differs in having more spreading basal leaves, glabrous hypanthia, and purple corolla lobes. A comparison between *S. araeophyllum* and *S. brunonianum* is provided below.

**Stylidium brunonianum** Benth., in Endl., Fenzl, Benth. & Schott, *Enum. Pl.* 72 (1837). *Candollea brunoniana* (Benth.) F.Muell., *Syst. Census Austral. Pl.*: 86 (1882). *Stylidium brunonianum* var. *typicum* Domin, *Věstn. Král. České Společn. Nauk. Tř. Mat.-Přir.* 2 (2): 115 (1923), *nom. illeg. nom. superfl.* *Type*: Swan River [Western Australia, 27 November 1833–11 January 1834], K. Hügel s.n. (*lectotype*, here designated W!; *isolectotypes*: BM 00894109!, MEL 2295758!).

*Stylidium compressum* Lindl., *Sketch Veg. Swan R.*: xxix (1839). *Type*: not cited [Swan River, Western Australia, 1839 [1835–1838], *J. Drummond s.n.*] (*holotype*: CGE!; *isotypes*: BR 0000013333232 image seen, BR 0000013332631 image seen, FI 006812!, G 00358752!, ?G 00358751!, K 000355046!, ?K 000355044!, MEL 2254115!, TCD!).

*Stylidium brunonianum* β [var.] *depauperatum* Sond., in Lehm., *Pl. Preiss.* 1(3): 380 (1845). *Type citation*: ‘In arenosis silvae prope oppidulum Perth, d. 4. Febr. 1839. Herb. Preiss. No. 2280 et in asperis montium continuorum Darling’s-range, Perth d. 5. Dec. 1839. (Drummond!).’ *Type specimens*: In arenosis silvae prope oppidulum Perth [Western Australia], 4 February 1839, *L. Preiss* 2280 (*lectotype*, here designated: MEL 2258643 [fruiting specimen and capsule fragments in packet]; *isolectotypes*: ?G(2 sheets)!, LD 1097796!. *Paralectotypes (syntypes)*: ‘In asperis montium continuorum Darling’s-range, Perth’ [Western Australia], 5 December 1839, *L. Preiss* [?]2280 (MEL 2258643 [flowering material in packet]!, MEL 2258644!, MEL 2258646!); Swan River [Western Australia], 1839 [1835–1838], *J. Drummond s.n.* (BR 0000013332631 image seen, BR 0000013333232 image seen, CGE!, FI 006812!, G 00358752!, ?G 00358751!, K 000355046!, ?K 000355044!, MEL 2254115!, TCD!).

*Perennial herb* (7–)20–70 cm high; *stems* contracted (rarely shortly elongated to 2 cm), shallowly buried or positioned just above ground level, unbranched or branching, glabrous, clothed with persistent leaf bases; stilt roots absent or inconspicuous. *Glandular trichomes* 0.1–0.2 mm long, with a translucent or yellowish stalk and black, discoid head. *Leaves* in a spreading, basal rosette or tuft, linear, (1–)2–8 cm long, 0.5–2 mm wide, acute and bearing an inconspicuous blunt apical callus, entire, usually rugose and crumpled in pressed material, without striations, glaucous, glabrous. *Scapes* (7–)20–70 cm long, (0.5–)1–3 mm wide, sparsely glandular-hairy above the lowest flower and sometimes near the sterile bracts; sterile bracts in 2–4 whorls and sometimes also scattered below the inflorescence, linear, 5–40 mm long, often crumpled like the leaves, glabrous. *Inflorescence* racemose, 8–c. 65-flowered, glaucescent; bracts subulate to linear, 2–9 mm long, acute, entire, glabrous; prophylls inserted well above the pedicel base, similar to the bracts but smaller; pedicels 2–20(–30) mm long, sparsely glandular-hairy. *Hypanthium* elliptic in outline, subglobose in TS, 1.5–2.3 mm long, 1–1.5 mm wide, faintly longitudinally ridged, glabrous. *Calyx lobes* free (rarely with 2 basally fused), with 2 a little

longer and broader than the remaining 3, 2–3.2 mm long, 0.6–0.9 mm wide, subacute to acute, entire, glabrous. *Corolla* mauve-pink to pink with a white throat, glabrous, with the lobes paired vertically and rotated through 180°; tube 1–2 mm long; anterior (upper) lobes slightly shorter and narrower than the posterior pair, elliptic to narrowly obovate, 4–5.5 mm long, 2–2.5 mm wide; posterior (lower) lobes elliptic to obovate, 4.5–6 mm long, 2.5–3 mm wide. *Labelium* reflexed and angled across the calyx, elliptic, 0.8–1.2 mm long, 0.4–0.7 mm wide, with a terminal appendage 0.6–1.8 mm long, glabrous; lateral appendages 0.1–0.7 mm long. *Throat appendages* 6 (1 on each upper corolla lobe, 2 on each lower lobe), with each lower pair partially fused, pink to purplish at base with a creamy white (rarely pinkish) tip, oblong, capitate, 0.8–1.8 mm long, glabrous. *Column* sigmoid when poised, straight when extended, 10–14 mm long, glabrous; anthers reddish black, subtending hairs absent; stigma sessile, entire. *Capsules* broadly ellipsoid to subglobular, 2.5–3 mm long excluding calyx lobes. Mature *seeds* not viewed. (Figure 3)

*Diagnostic features.* The following features distinguish *S. brunonianum* from all other species in the genus: a perennial habit with the stems shallowly buried or positioned just above ground level (not or scarcely stilted); a spreading, rosette of linear leaves that are usually rugose and crumpled in pressed material; scapes with whorls of sterile bracts below the inflorescence; an elliptic, glabrous hypanthium; bright to medium pink, vertically-paired corolla lobes bearing 6 throat appendages.

*Selected specimens.* WESTERN AUSTRALIA: 100 m S of Cloister Ave, Canning River foreshore, 16 Oct. 1974, *M.L. Clark* 151 (PERTH); Hardy Rd, Forrestfield, 20 Oct. 1977, *R.J. Cranfield* 76/77 (PERTH); Yourdamung Lake, location 935 adjacent to Reserve 39821, N of Collie, 20 Nov. 2002, *R.J. Cranfield & B.G. Ward* 18637 (PERTH); 4.3 km SW along Bowelling McAlinden Rd from Trigwell Bridge Rd, SW of Bowelling, 22 Nov. 1998, *V. Crowley* 932 (PERTH); 2 km SE Ruabon on Wonnerup Rd, 9 Nov. 1987, *G.J. Keighery* 9276 (PERTH); Simmonds Block, Tuart Forest, 30 Nov. 1995, *G.J. Keighery* 14006 (PERTH); Forrestdale, c. 15 miles SSE of Perth, 7 Nov. 1969, *V. Mann & A.S. George* 7 (K, PERTH); Orchid Park Reserve, Beechboro, 31 Oct. 2010, *K.R. Thiele* 4082 (CANB, PERTH); 1.18 km SSE on Tallanalla Rd from Harvey–Quindanning Rd, N of Collie, 13 Nov. 2003, *J.A. Wege* 1113 (PERTH); Lightning Swamp, track off Maxwell Rd, Malaga, 24 Oct. 2006, *J.A. Wege* 1381 (MEL, PERTH); 12.5 km E of Kinsella Rd on Brookton Hwy, 1 Nov. 2010, *J.A. Wege* 1801 (CANB, MEL, PERTH); reserve at corner of Moores Rd and Phillips Rd, Pinjarra, 6 Nov. 2007, *J.A. Wege & R. Butcher* JAW 1453 (CANB, MEL, PERTH); Riverdale Road Nature Reserve, 2 Nov. 2006, *J.A. Wege & B.P. Miller* JAW 1400 (MEL, PERTH).

*Distribution and habitat.* *Stylidium brunonianum* is mostly found on the Swan Coastal Plain, from Perth's northern suburbs to near Busselton, with occurrences in the Jarrah Forest bioregion at sites south-east of Armadale and in the greater Collie region (Figure 2B). It is usually associated with seasonal wetlands and depressions, or estuarine and lake-side habitats, growing in clay-based soils or sand. The associated vegetation is varied and includes open *Melaleuca preissiana* or *M. raphiophylla* woodland, *Corymbia calophylla* or *Eucalyptus rudis* (more rarely *E. marginata*) woodland, *Banksia squarrosa* heath, and herb-rich shrublands.

*Phenology.* Flowering from October to early December.

*Conservation status.* *Stylidium brunonianum* has a reasonably wide distribution, with many populations occurring within nature reserves. As such a conservation listing does not appear to be warranted; however, many of the populations appear small, occurring in small bushland fragments in a region heavily impacted by land clearing and weed invasion.



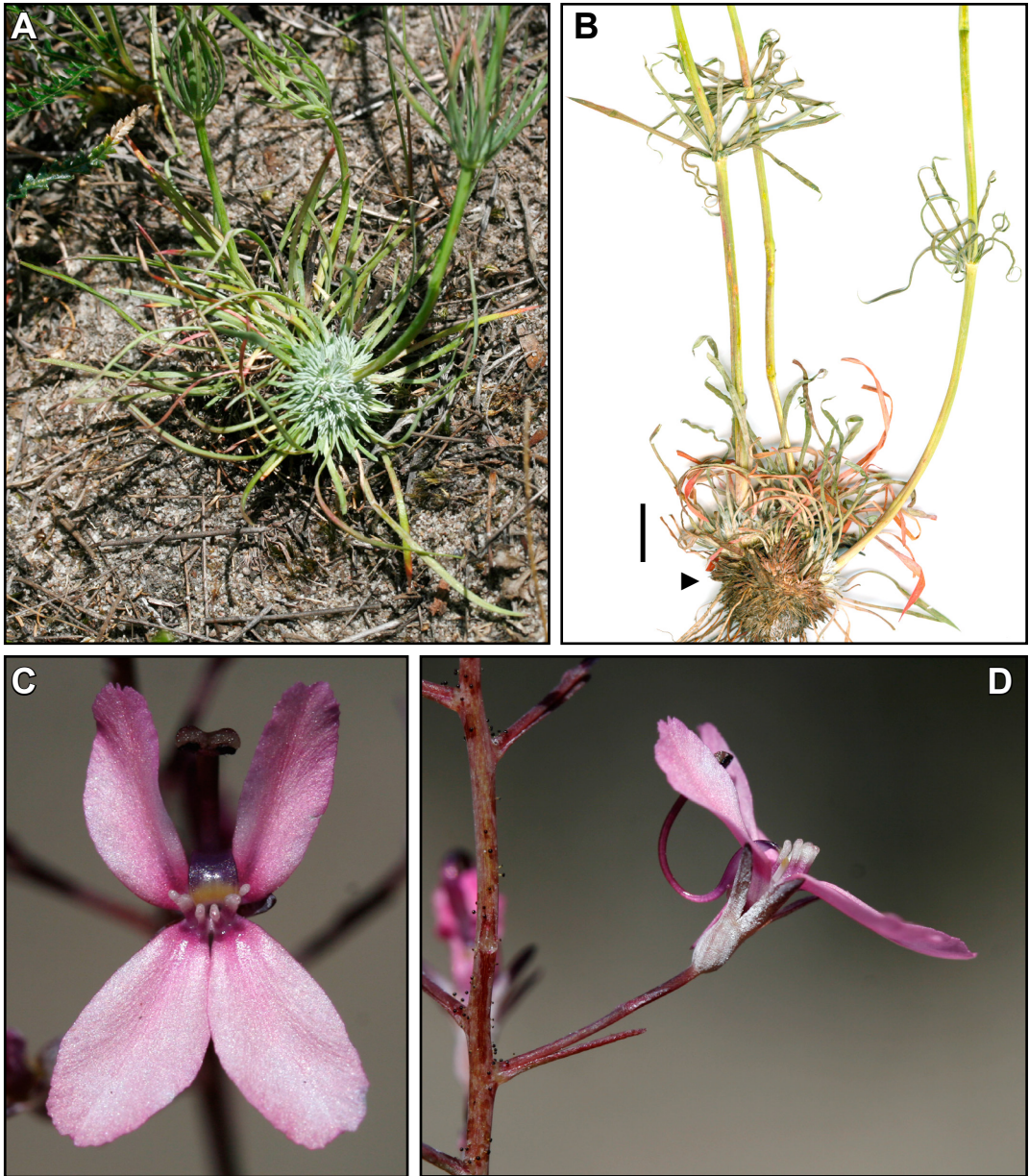


Figure 3. *Stylidium brunonianum*. A – spreading, external basal leaves contrasting with the conspicuous inner cluster of small bract-like leaves; B – fragment of a pressed specimen, showing the compact, partially buried stem (the arrow indicates the approximate level of the soil), and the crumpled external basal leaves and sterile scape bracts, scale bar = 1 cm; C – mauve-pink, vertically-paired corolla lobes with six throat appendages; D – side view of a flower showing the glabrous hypanthium and white-tipped throat appendages. Photographs © J.A. Wege from J.A. Wege & R. Butcher JAW 1453.

*Chromosome number.* A voucher specimen from Pinjarra (PERTH 08542066) annotated with an unpublished chromosome count of  $n = 9$  was found amongst Sid James' personal effects at UWA. The populations from east of Jurien Bay and south of Lancelin referred to *S. brunonianum* subsp. *brunonianum* by James (1979) correspond to *S. araeophyllum* and *S. neurophyllum* respectively.

*Common name.* Pink Fountain Triggerplant (Erickson 1958). This imaginative common name, in which the whorls of scape bracts are likened to a fountain, is retained for this species despite the fact that Erickson is not known to have seen it. She did collect both subspecies of *S. tenue* as well as *S. purpureum* and so this common name is referenced in the proposed common names for these taxa.

*Typification.* Bentham's description is based on a gathering by Baron Karl von Hügel, duplicates of which have been located at BM, MEL and W. All specimens have been annotated by Bentham, with the MEL and BM sheets indicated as ex Herbario Vindobonnensis (Vienna). The MEL specimen is fragmentary and the BM material poor quality (some flowers are missing from the sheet). The sheet at W is the best quality material and is selected herein as an appropriate lectotype. Note I have previously (and inexplicably) annotated the BM sheet as the holotype, the MEL sheet as an isotype and the W sheet as an isolectotype. *Stylidium compressum* Lindl. is clearly comparable to *S. brunonianum*.

Sonder (1845) based *S. brunonianum* var. *depauperatum* on three gatherings: two by Preiss (a flowering collection from December and a fruiting collection from February) and one by Drummond. Sonder viewed and annotated the Preiss material at MEL and LD, and the Drummond specimen at MEL. All of these specimens conform to the brief protologue ('foliis angustioribus, racemo abbreviato'). The designated lectotype is a fruiting collection from Sonder's personal herbarium and includes the mounted individual and the capsule fragments in the attached packet. The packet also contains dissected flower fragments, which have presumably been taken from Preiss' December collection since this species is not known to flower in January or February.

*Affinities.* *Stylidium brunonianum* and *S. araeophyllum* are narrow-leaved taxa that have broadly overlapping distributions, although the former is associated with winter-wet habitats and the latter upland habitats. *Stylidium brunonianum* can be distinguished from *S. araeophyllum* by the absence of glandular hairs on the hypanthia and the presence of six (rather than eight) throat appendages. *Stylidium brunonianum* has a distinctive basal leaf rosette in which the external, mature leaves are spreading, usually rugose and crumpled (particularly in dried material), and in marked contrast to the smaller, bract-like leaves clustered at the base of the scape (Figure 3A). These bract-like leaves are common in perennial triggerplants (although often much less conspicuous) and remain green in summer while the external leaves senesce, presumably functioning to protect the meristem. In *S. araeophyllum* the basal leaves are conspicuously stilted and arranged in a dense, erect to suberect tuft (Figure 1A) and while they also surround a cluster of bract-like leaves, their upright stature obscures this dimorphism. *Stylidium brunonianum* has stems that are usually shallowly or partially buried (Figure 3B), although they are sometimes positioned just above the soil level; this appears to be related to the age of the individuals and the microhabitat (individuals in wetter habitats tend to have buried stems whereas those in sandier, ecotonal habitats are often inconspicuously stilted).

The name *S. brunonianum* has been widely misapplied against material of *S. tenue* subsp. *majusculum*, including by Lindley (1839) who was the first to recognise the difference between these two taxa. The stems of *S. brunonianum* are usually contracted (rarely shortly elongated) and shallowly or partially buried (occasionally positioned just above the soil level and inconspicuously stilted), and its leaves basal, linear and usually rugose and crumpled. In contrast, the stems of *S. tenue* subsp. *majusculum* are usually elongated (occasionally contracted) and prominently stilted, with the leaves in a rosette as well as scattered on the stem and narrowly oblanceolate to oblanceolate (occasionally somewhat linear), and smooth or scarcely striate. Their distribution overlaps in the Northern Jarrah Forest and abuts on the eastern Swan Coastal Plain, with *S. brunonianum* occurring in or adjacent to winter-wet habitats and *S. tenue* subsp. *majusculum* favouring upland habitats.

**Stylidium lowrieianum** Carlquist, in Carlquist & Lowrie, *Phytologia* 67(5): 370 (1989). *Type*: west of Caves Rd, Western Australia [precise locality withheld for conservation reasons], 4 November 1988, A. Lowrie s.n. (*holotype*: RSA!).

*Illustrations*. S. Carlquist & A. Lowrie, *op. cit.* 374, Figure 4; J. Wheeler, N. Marchant & M. Lewington, *Fl. South West* 2: 918 (2002).

*Perennial herb* 15–65 cm high; *stems* trailing to 11 cm long, shallowly buried or positioned near the soil surface, unbranched or branching at swollen nodes, glabrous, nodes usually clothed with persistent leaf bases; stilt roots absent, but nodes rooting when shallowly buried. *Glandular trichomes* 0.1–0.2 mm long, with a translucent or yellowish stalk and black, discoid head. *Leaves* in a loose, spreading rosette, sometimes scattered on stem below, oblanceolate to spatulate, (1–)2–5 cm long, (2–)3–12 mm wide, subacute to acuminate and bearing a small blunt apical callus, finely hyaline and crispate, without striations, glaucous (especially the undersurface), glabrous. *Scapes* 15–65 cm long, 0.8–3 mm wide, glabrous below the inflorescence, sparsely glandular-hairy above the lowest flower; sterile bracts in 1–3(4) whorls and ± scattered below the inflorescence, narrowly oblanceolate to subulate, 4–11 mm long, glabrous. *Inflorescence* racemose, (6–)10–70-flowered, glaucescent; bracts subulate, 1.5–5 mm long, acute, entire, glabrous; prophylls inserted at or near the pedicel base, similar to the bracts but smaller; pedicels 2–4 mm long, sparsely glandular-hairy. *Hypanthium* elliptic to oblong in outline, ellipsoid in TS, 1.5–2.5 mm long, 0.8–1.3 mm wide, faintly longitudinally ridged, sparsely glandular-hairy near the apex. *Calyx lobes* free, with 2 a little longer and broader than the remaining 3, 1.5–2.8 mm long, 0.5–1 mm wide, subacute, entire, glabrous or with a few hairs near the base. *Corolla* pale pink with a creamy white throat, darker on the reverse, glabrous, with the lobes paired vertically and rotated through 180°; tube 1.5–3 mm long; anterior (upper) lobes elliptic to obovate, c. equal in length to but narrower than the posterior (lower) pair, 4–6 mm long, 2.7–3.5 mm wide; posterior lobes obovate, 4.5–6.5 mm long, 3.5–5 mm wide. *Labellum* reflexed and angled across the calyx, ovate to elliptic, 0.6–0.8 mm long, 0.4–0.5 mm wide, with a terminal appendage 1–1.5 mm long, glabrous; lateral appendages 0.4–0.8 mm long. *Throat appendages* 6 or 8 (1 or 2 on each upper corolla lobe, 2 on each lower lobe), with each lower pair partially fused, pinkish maroon with a pale yellow or cream tip, oblong or linear to subulate, ± faintly capitate, 0.1–1.5 mm long, glabrous. *Column* sigmoid when poised, straight when extended, 10–12.5 mm long, glabrous; anthers reddish black, subtending hairs absent; stigma sessile, entire. *Capsules* ellipsoid to obloid, c. 2.5–4 mm long excluding calyx lobes. Mature *seeds* not viewed. (Figure 4)

*Diagnostic features*. The following features distinguish *S. lowrieianum* from all other species in the genus: a perennial, rosetted habit with a thin, trailing stem bearing distinct swollen growth nodes which root when shallowly buried; oblanceolate to spatulate, glaucous leaves with crispate margins; hypanthia with glandular hairs near the apex only. Other useful spotting features include scapes with whorls of sterile bracts below the inflorescence, prophylls inserted at or near the base of the pedicels, pale pink, vertically-paired corolla lobes, and a column 10–12.5 mm long.

*Selected specimens*. WESTERNAUSTRALIA: [localities withheld for conservation reasons] 12 Nov. 1996, N. Casson & C. McChesney SC 7.7 (PERTH); 13 Nov. 1993, K.H. Coate 351 (PERTH); 5 Oct. 1999, H. Cole 222 A (PERTH); 25 Nov. 1989, N. Gibson & M. Lyons 754 (PERTH); 9 Oct. 1987, G.J. Keighery 9215 (PERTH); 5 Nov. 1989, A. Lowrie s.n. (PERTH 03122174); 29 Oct. 1997, J.A. Wege 438 (K, PERTH); 4 Nov. 2014, J.A. Wege 1972 (MEL, PERTH); 9 Nov. 2007, J.A. Wege & R. Butcher JAW 1484 (CANB, MEL, PERTH).



Figure 4. *Styliidium lowrieianum*. A – leaf rosette, showing the trailing stem with distinct growth nodes (indicated by the white arrows); B – pale pink, vertically-paired corolla lobes; C – side view of a flower showing the hypanthium with glandular hairs restricted to near the apex, and the long column. Photographs © J.A. Wege from J.A. Wege 1972.

**Distribution and habitat.** *Styliidium lowrieianum* is endemic to the Leeuwin-Naturaliste Ridge in the western-most portion of the Warren and Jarrah Forest bioregions, extending from near Eagle Bay to west of Margaret River (Figure 2C). It grows in sand or loamy sand over limestone, on hillslopes or low rises, in *Corymbia calophylla* and *Eucalyptus marginata* woodland with *Agonis flexuosa*, *Banksia attenuata* or *Allocasuarina fraseriana*, and *Agonis flexuosa* woodland or scrub, sometimes in association with *E. megacarpa*. There is a single record from *E. diversicolor* forest, and another from low scrub with *Stirlingia latifolia* and *Phlebocarya ciliata*. It co-occurs with *S. neurophyllum* within Leeuwin-Naturaliste National Park.

**Phenology.** Flowering in October and November.

**Conservation status.** This species has recently been listed as Priority Three under Department of Parks and Wildlife Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). *Styliidium lowrieianum* is geographically restricted and occurs in an area subject to ongoing development pressures. While there are occurrences in Leeuwin-Naturaliste National Park, detailed population data are lacking. Further survey is recommended and should proceed with the knowledge that the morphologically similar taxon *S. neurophyllum* is common in sandy habitats in the region and may grow in sympatry with *S. lowrieianum* (see affinities below).

*Chromosome number.* A voucher specimen collected west of Margaret River in 1991, and uncovered several years ago among Sid James' personal effects at UWA, is annotated with a chromosome count of  $n = 10$  (PERTH 08542082). The same chromosome number was published by James (1979) under *S. striatum* from a population south of Yallingup from work done by Grant Stone as part of an honours dissertation at UWA (Stone 1972). *Stylidium striatum* is now known to be restricted to the Darling Range east of Perth (Wege 2007), although the name has previously been misapplied to specimens of both *S. neurophyllum* and *S. lowrieianum*. While a voucher specimen for the 1979 study cannot be located, it most likely corresponds to *S. lowrieianum*. This species may be the only member of the *S. brunonianum* alliance to have ten rather than nine chromosomes.

*Common name.* Lowrie's Triggerplant (here designated).

*Affinities.* Although *S. lowrieianum* is distinctive it is likely to be confused with *S. neurophyllum*, a species which is common on the Leeuwin-Naturaliste ridge and has been observed growing with *S. lowrieianum* at a site south of Yallingup (PERTH 08542104 and 08542112). *Stylidium lowrieianum* can be differentiated by its trailing and nodose stems (Figure 4A), crisped leaf margins, and the presence of glandular hairs on the upper portion of the hypanthium (Figure 4C). *Stylidium lowrieianum* can be further distinguished from nearby populations of *S. neurophyllum* by its longer column (10–12.5 mm versus 5–7.5 mm), and its broader anterior (upper) corolla lobes (2.7–3.5 mm wide versus 1.2–2.5 mm wide).

*Notes.* Augustus Oldfield first collected *S. lowrieianum* from the Vasse region in the mid-1800s (MEL 2259120A, K 000355085). This gathering is amongst several collections used by Bentham (1868) to describe *S. striatum* var. *glaucum* Benth. (refer to the typification notes at the end of the present paper). Additional historical collections were made during the early 1900s by both Arthur Dorrien Smith (K 000060887) and Cecil Andrews (PERTH 02955792).

### ***Stylidium neurophyllum* Wege, sp. nov.**

*Type:* Ashworth Road, c. 200 m from Cullalla Road, Mooliabeenee, east of Gingin, Western Australia, 7 October 2014, J.A. Wege 1945 (*holotype:* PERTH 08542155; *isotypes:* CANB, K, MEL).

*Stylidium* sp. Chattering (J.A. Wege 709), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 10 January 2015].

[*Stylidium striatum* auct. non Lindl.: O. Sonder, in C. Lehmann, *Pl. Preiss.* 1(3): 379 (1845), *p.p.*; L. Diels. & E. Pritzel, *Bot. Jahrb. Syst.* 35: 593 (1905); J. Mildbraed, in A. Engler, *Planzenr.* IV. 278 (Heft 35): 64 (1908); R. Erickson, *Triggerplants* p. 109 (1958); S. Carlquist & A. Lowrie, *Phytologia* 67(5): 373 (1989); G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* 556 (2000), *p.p.*; J. Wheeler, N. Marchant & M. Lewington, *Fl. South West* 2: 918 (2002), *p.p.*]

*Illustrations.* B.J. Grieve & W.E. Blackall, *How Know W. Austral. Wildfl.* 4: 731, No. 5 (1982), as *S. striatum*; R. Barrett & E.P. Tay, *Perth Plants* p. 168 (2005), as *S. striatum*.

*Perennial herb* (10–)15–65 cm high; *stems* contracted or shortly elongated to c. 2 cm, usually partially buried or sometimes positioned just above the soil surface, unbranched or branching, glabrous, clothed with persistent leaf bases; *stilt roots* present (sometimes becoming buried in older plants). *Glandular trichomes* 0.1–0.2 mm long, with a translucent or yellowish stalk and black, discoid head. *Leaves* in a somewhat spreading basal rosette, narrowly oblanceolate to oblanceolate or spatulate, (0.7–)1–5 cm

long, (1.5–)2–9 mm wide, subacute to acute or acuminate and with a small blunt apical callus, entire or with a very fine hyaline and scarcely minutely erose border, striate (especially in the upper third near the margins), glaucous (especially on the lower surface), glabrous. *Scapes* (10–)15–60 cm long, (0.5–)1–3 mm wide, very sparsely glandular-hairy above the lowest flower and often in the axils of the sterile bracts; sterile bracts in (1)2 or 3 whorls and  $\pm$  scattered below the inflorescence, subulate to oblanceolate, 3–15(–20) mm long, glabrous. *Inflorescence* racemose, (6–)15–c. 95-flowered, glaucescent; bracts linear or subulate, 2–6 mm long, subacute to acute, entire, glabrous; prophylls inserted well above the pedicel base, similar to the bracts but smaller; pedicels (3–)4–12 mm long, sparsely glandular-hairy. *Hypanthium* elliptic in outline, subglobose in TS, 1.5–2.8 mm long, 1–1.8 mm wide, faintly longitudinally ridged, glabrous. *Calyx lobes* free, with 2 a little longer and broader than the remaining 3, 1.5–3.5 mm long, 0.5–1.2 mm wide, subacute or obtuse, entire, glabrous. *Corolla* pale to medium pink, mauve-pink or white with a whitish throat, often with darker pink or reddish pink markings at the base of the throat appendages, glabrous, with the lobes paired vertically and rotated through 180°; tube 1–2.5 mm long; anterior (upper) lobes elliptic to oblong or very narrowly obovate, often somewhat falcate, narrower than the posterior pair, 3.2–6.2 mm long, 1.2–2.5 mm wide; posterior lobes obovate or elliptic, 3.5–7 mm long, 2–4.7 mm wide. *Labellum* reflexed and angled across the calyx, elliptic, 0.6–1 mm long, 0.4–0.7 mm wide, with a terminal appendage 0.5–1.2 mm long, glabrous; lateral appendages absent or to 0.4 mm long. *Throat appendages* 6 or rarely 8 (1 or 2 on each upper corolla lobe, 2 on each lower lobe), with each lower pair partially fused, creamy white or yellowish throughout, sometimes pinkish near the base, oblong and somewhat capitate (rarely rudimentary), (0.1–)0.5–1.5 mm long. *Column* sigmoid when poised, straight when extended, 5–15 mm long, glabrous; anthers reddish black, subtending hairs absent; stigma sessile, entire. *Capsules* ellipsoid to somewhat obovoid, (1.5–)2.5–4 mm long excluding calyx lobes. *Seeds* brown, ellipsoid to ovoid, c. 0.4–0.5 mm long, 0.25–0.3 mm wide, surface wrinkled. (Figure 5)

*Diagnostic features.* The following features distinguish *S. neurophyllum* from all other species in the genus: a perennial, rosetted habit; narrowly oblanceolate to oblanceolate or spatulate leaves that are glaucous (especially on the lower surface) and striate (especially in the upper 1/3 near the margins); scapes with whorls of sterile bracts; an elliptic and glabrous hypanthium; pink, mauve-pink or white, vertically-paired corolla lobes.

*Selected specimens.* WESTERN AUSTRALIA: across from Department of Agriculture, Baron Hay Court, Kensington, 6 Oct. 2005, *R. Davis* 10932 (PERTH); King's Park, Perth, 4 Oct. 1954, *R. Erickson s.n.* (PERTH); Capel Nature Reserve, near Busselton, 8 Nov. 1992, *B.J. Keighery & N. Gibson* 1080 (PERTH); 2 km NE Gracetown, 9 Nov. 1987, *G.J. Keighery* 9472 (PERTH); 5 km S Carbanup River, Busselton to Margaret River, 9 Nov. 1987, *G.J. Keighery* 9475 (PERTH); Yelverton Forest, Blythe Rd, 24 km NW Margaret River, 9 Nov. 1989, *G.J. Keighery* 11123 (PERTH); Cardup Nature Reserve, Serpentine Shire, 20 Oct. 1992, *G.J. Keighery* 13284 (PERTH); Smokebush Rd, at the intersection with Tringa Rd, Two Rocks, 17 Sep. 2002, *K.C. Richardson* 94 (PERTH); 6.3 km from Brand Hwy on Airfield Rd then Duffy Rd, Yeal Swamp Nature Reserve, 10 Oct. 2006, *J.A. Wege* 1333 (MEL, PERTH); NW of gate at E end of O'Connor Rd, Talbot Road Nature Reserve, Stratton, 24 Oct. 2006, *J.A. Wege* 1363 (PERTH); 4.7 km E of Brand Hwy on Wannamal West Rd, Boonanning Nature Reserve, 14 Oct. 2008, *J.A. Wege* 1537 (AD, CANB, PERTH); N boundary of Barracca Nature Reserve, NE of Muechea, 7 Oct. 2014, *J.A. Wege* 1942 (AD, CANB, MEL, PERTH); 100 m on Hemsley Dr from Caves Rd, Leeuwin-Naturaliste National Park, 5 Nov. 2014, *J.A. Wege* 1970 (AD, CANB, MEL, PERTH); 1.3 km along Camp Gully Rd from North Goodwood Rd, SE of Capel, 7 Nov. 2007, *J.A. Wege & R. Butcher* JAW 1473 (MEL, PERTH); Paganoni Swamp, Paganoni Rd, Karnup, 16 Oct. 2005, *Wildflower Society of WA* PAGS 6/38 (PERTH); adjacent to Plot KOJE07 in Korijekup Conservation Park, 6 Nov. 2005, *Wildflower Society of WA* KOJE 7/74 (PERTH).

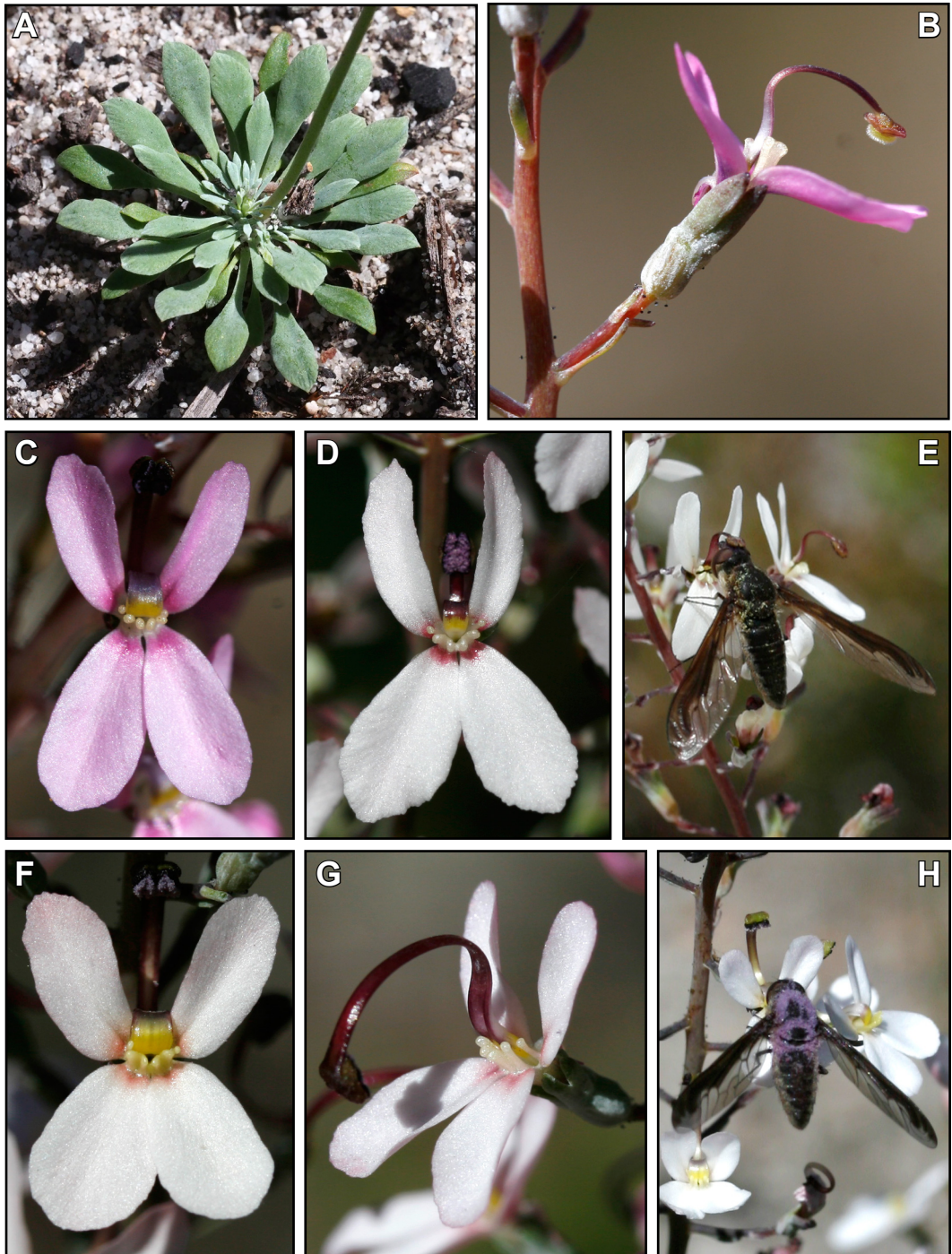


Figure 5. *Stylidium neurophyllum*. A – basal leaf rosette of broad, glaucous and striate leaves; B – side view of flower from the type population showing the glabrous hypanthium and the two prophylls positioned on the pedicels; C – flower from the type population with eight throat appendages and an intermediate column length; D, E – flowers from a southern population with very short columns, striking the beefly on the top of the head; F–H – flowers with long columns, with a beefly covered in pollen on the back of the thorax. Photographs © J.A. Wege from *J.A. Wege* 1942 (A, F, H), *J.A. Wege* 1945 (B, C), *J.A. Wege* 1971 (D), *J.A. Wege & R. Butcher* JAW 1473 (E), and at *Wildflower Society of WA* PAGES 6/38 (G).

*Distribution and habitat.* *Stylidium neurophyllum* is widely distributed in sandy habitats on the Swan Coastal Plain and adjacent western Jarrah Forest bioregion from north of Gingin to Yallingup, extending into the Warren region north-west of Margaret River (Figure 2D). The associated vegetation is usually woodland with *Banksia attenuata*, *B. menziesii*, *Eucalyptus marginata*, *Corymbia calophylla* or *Agonis flexuosa*, more rarely *E. gomphocephala*. There is the occasional record from low heath or shrubland.

*Phenology.* Flowering from late August to mid-November, with peak flowering from late September to mid-October in the northern part of its range and mid-October to mid-November in the south.

*Conservation status.* A common and widespread species that is well represented in conservation reserves across its range.

*Chromosome number.* James (1979) recorded a count of  $n = 9$  from a population south of Lancelin (PERTH 02915995), under *S. brunonianum* subsp. *brunonianum*. A second voucher specimen from a population near Muchea (PERTH 08542074) that is annotated with  $n = 9$  was found amongst Sid James' personal effects at UWA.

*Etymology.* From the Greek *neuro-* (nerve-) and *-phyllum* (-leaved).

*Common name.* Coastal Plain Triggerplant (here designated).

*Affinities.* In the north of its distribution, *S. neurophyllum* is most likely to be confused with *S. spiciforme*, a species with a morphologically similar leaf rosette that also occurs on the Swan Coastal Plain. While *S. neurophyllum* can often be differentiated from this species by its leaf striations, these are sometimes evident in *S. spiciforme* (e.g. PERTH 08587302). The two species are therefore more reliably differentiated by the absence (in *S. neurophyllum*) or presence (in *S. spiciforme*) of glandular hairs on the hypanthia. *Stylidium neurophyllum* also tends to have longer pedicels that are (3–)4–12 mm long (versus 1.5–4 mm in *S. spiciforme*) and with two prophylls inserted well above the pedicel base (rather than at the base just above the floral bract). The two species also tend to differ in throat appendage number (usually six in *S. neurophyllum* versus eight in *S. spiciforme*); in the rare instances where *S. neurophyllum* has eight throat appendages (e.g. PERTH 08021813, *p.p.*), the two in the anterior-most position are noticeably reduced in size. The distributions of the two species abut in the Regan's Ford to Moore River National Park area although they are not known to overlap. *Stylidium neurophyllum* can, however, co-occur with *S. araeophyllum* on the Swan Coastal Plain and also with *S. lowrianum* in the south of its range (refer to the affinities section under these species for comparative comments).

*Notes.* *Stylidium neurophyllum* is a common species that has been overlooked for naming at the species level due to its widespread misapplication against the name *S. striatum* (Wege 2007). It was one of four species cited by Bentham (1868) under *S. striatum* var. *glaucum* (refer to the typification notes at the end of the present treatment).

*Stylidium neurophyllum* exhibits variation both within and between populations in corolla shape and size, throat appendage morphology (e.g. the length of the appendages and the degree to which the posterior pair are fused), and the presence and length of lateral appendages on the labellum. Of special note is the extraordinary variation in column length (5–15 mm) for which there is some geographic patterning: the southern-most populations (Cape Naturaliste to Capel) tend have the shortest columns (5–7.5 mm long; e.g. *J.A. Wege* numbers 779, 1134, 1401, 1468, 1473, 1970 and 1971; Figure 5D, E), populations on the Dandaragan Plateau north of Muchea, which are informally recognised on Western



Australia's plant census as *S.* sp. Chittering (J.A. Wege 709), have the longest (mostly 12–15 mm long; e.g. *J.A. Wege* numbers 709, 1331B and 1942, *F. & J. Hort* 2380, *F. Hort* 2908 and 2912, and *S.J. Pedrick* 216; Figure 5F, H), while populations that otherwise occur in the northern half of the species' range often have columns that are intermediate length (8–10.5 mm long; e.g. *J.A. Wege* numbers 13, 1393 and 1537; Figure 5B, C). However, there are populations scattered across the northern half of the range with columns that are 6–8 mm long (e.g. *J.A. Wege* numbers 289, 1333 and 1363 and 1395), and a southern population near Harvey with columns that are *c.* 11–12.5 mm long (*Wildflower Society of WA KOJE* 7/74; Figure 5G). Furthermore, measurements of samples recently acquired from populations north of Muchea indicate that column length can be as low as 10.5 mm in this region. It is difficult to partition this variation into a meaningful taxonomy, and thus a broad species concept is adopted herein.

Variation in column length within species of *Stylidium* Sw. is usually minimal (up to 2 or 3 mm, more rarely to 5 mm) enabling precise pollen placement on, and retrieval from, pollinators. Casual pollination observations have indicated that populations of *S. neurophyllum* at the extreme ends of the column length continuum place pollen on different parts of visiting insects; flowers with the shortest columns deposit pollen on the top of the head of visiting bee flies (e.g. Figure 5E), whereas flowers with the longest columns place a large pollen load over the upper thorax (e.g. Figure 5H). Further research that incorporates molecular analyses and detailed pollinator observations (including observations of any sympatric species) is needed to ascertain whether column length variation in *S. neurophyllum* is taxonomically significant or whether character displacement is occurring (see Armbruster *et al.* 1994).

### ***Stylidium purpureum* Wege, *sp. nov.***

*Type:* Yerramullah Road, 4.2 km north of Bibby Road, Badgingarra National Park, Western Australia, 18 October 2010, *J.A. Wege* 1793 (*holotype:* PERTH 08542120; *isotypes:* CANB, MEL)

*Stylidium purpureum* subsp. nonstilted (J.A. Wege & F. Hort JAW 1384), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 12 January 2015].

[*Stylidium brunonianum* *auct. non* Benth.: G. Bentham, *Fl. Austral.* 4: 19 (1868), *p.p.*; R. Erickson, *Triggerplants* p. 109 (1958), *p.p.*; J.R. Wheeler in N.G. Marchant *et al.*, *Fl. Perth Region* 2: 612 (1987), *p.p.*; G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 548 (2000), *p.p.*]

*Perennial herb* (12–)20–55 cm high; *stems* contracted or shortly elongated to 3 cm long and elevated above the soil surface (rarely shallowly buried), unbranched or branching, glabrous, clothed with persistent leaf bases; stilt roots present (rarely absent). *Glandular trichomes* 0.1–0.25 mm long, with a translucent or yellowish stalk and black, discoid head. *Leaves* in an erect to spreading basal tuft and occasionally also scattered below on the stem, linear to narrowly oblanceolate, 1.5–9 cm long, 0.8–4 mm wide, acute and bearing a small blunt apical callus, entire, without striations, glaucous, glabrous. *Scapes* 11–50 cm long, 0.7–3 mm wide, sparsely glandular-hairy above the lowest flower and sometimes in the axils of the sterile bracts; sterile bracts in (1)2 or 3 whorls and sometimes also scattered below the inflorescence, subulate to linear or narrowly oblanceolate, 5–32 mm long, glabrous. *Inflorescence* racemose, 5–60-flowered, glaucous; bracts subulate to linear, 2.5–8 mm long, subacute to acute, entire, glabrous; prophylls inserted well above the pedicel base, similar to bracts but smaller; pedicels 2–12 mm long, sparsely glandular-hairy. *Hypanthium* elliptic in outline, subglobose in TS, 1.7–2.5 mm long, 1.3–1.8 mm wide, faintly longitudinally ridged, glabrous. *Calyx lobes* free, with 2 a little longer and broader than the remaining 3, 1.8–3.5 mm long, 0.6–1.3 mm wide, subacute, entire,

glabrous. *Corolla* purple with a white throat, glabrous, with the lobes paired vertically and rotated through 180°; tube 1–1.7 mm long; anterior (upper) lobes elliptic to oblong or narrowly obovate, *c.* equal to or a little narrower than the posterior (lower) pair, 4–5.5 mm long, 2–3 mm wide; posterior lobes elliptic to obovate, 4–6 mm long, 2.3–3.5 mm wide. *Labellum* reflexed and slightly angled across calyx, ovate to elliptic, 0.8–1.2 mm long, 0.5–0.8 mm wide, with a terminal appendage 1–1.5 mm long, glabrous; lateral appendages 0.2–0.7 mm long (rarely rudimentary). *Throat appendages* 6 or more rarely 8 (1 or 2 on each upper corolla lobe, 2 on each lower lobe), with each lower pair partially fused, white, sometimes with pinkish maroon markings near the base, oblong, often somewhat capitate, 0.9–1.3 mm long, glabrous. *Column* sigmoid when poised, straight when extended, 9.5–15.5 mm long, glabrous; anthers reddish black, subtending hairs absent; stigma sessile, entire. *Capsules* ellipsoid to ovoid, 3–4.5 mm long excluding calyx lobes. *Seeds* brown, narrowly ovoid to ellipsoid, *c.* 0.5 mm long, *c.* 0.3 mm wide, surface wrinkled. (Figure 6)

*Diagnostic features.* *Stylidium purpureum* is the only triggerplant in the south-west region with purple, vertically-paired corolla lobes. Other useful spotting features include: a perennial, stilted habit (rarely with stems buried in the south of its range); a rosette of linear to narrowly oblanceolate leaves; scapes with whorls of sterile bracts below the inflorescence; a glabrous hypanthium.

*Selected specimens.* WESTERNAUSTRALIA: 2 miles N of Dandaragan W on the road to Badgingarra, 5 Oct. 1974, *S. Carlquist* 5943 (PERTH, RSA); off Loop road 9.6 km E of Kalbarri; Kalbarri National Park, 26 Sep. 1976, *R.J. Chinnock* 3175 (AD, PERTH); Hi Vallee property (D. & J. Williams) Warradarge, 23 Oct. 1999, *M. Hislop* 1732 (PERTH); Boonanarring Nature Reserve, 1.95 km S from Wannamal West Rd along the W boundary, 17 Oct. 2001, *F. Hort* 1642 (PERTH); Waddi Rd, 450 m E of Brand Hwy, Badgingarra, 9 Oct. 2002, *F. & J. Hort* 1851 (PERTH); 15.1 km from Brand Hwy on Tootbardie Rd, 24 Oct. 2002, *J.A. Wege* JAW 735 (PERTH); Brand Hwy, 12 km N of Coorow branch of Coorow-Green Head Rd, South Eneabba Nature Reserve, 25 Oct. 2002, *J.A. Wege* 742 (PERTH); 4.5 km W of Cockleshell Gully Rd on Coorow-Green Head Rd, Lesueur National Park, 8 Oct. 2003, *J.A. Wege* 923 (PERTH); 1.08 km from Jurien East Rd on Banovich Rd, Coomallo Nature Reserve, 11 Oct. 2006, *J.A. Wege* 1356 (PERTH); just N of Mullering Brook on Brand Hwy, 20 Oct. 2010, *J.A. Wege* 1799 (PERTH); 0.9 km S on Fynes Rd from Mogumber West Rd, 20 Oct. 2011, *J.A. Wege* 1868 (MEL, PERTH); just S of Hill River Bridge on Munbinea Rd, E of Jurien Bay, 20 Oct. 2009, *J.A. Wege & W.S. Armbruster* JAW 1692 (CANB, MEL, PERTH); 5.4 km N on road to The Loop from the Kalbarri-Ajana road, Kalbarri National Park, 26 Sep. 2002, *J.A. Wege & C. Wilkins* JAW 613 (CANB, MEL, PERTH).

*Distribution and habitat.* *Stylidium purpureum* occurs in the Geraldton Sandplains and Swan Coastal Plain bioregions, extending from the Kalbarri region south to near Bullsbrook, with outlying populations in the Avon Wheatbelt near New Norcia and Wongan Hills (Figure 7A). It grows on hillslopes and plains, or adjacent to swamps, rivers or drainage lines, in sand over limestone or laterite, or more rarely in sandy clay. The associated vegetation is varied and includes heath, mallee heath, *Banksia* woodland or shrubland and *Acacia* or *Melaleuca* shrubland/scrub.

*Phenology.* Flowering from late August (in the north of its range) to late November (in the south).

*Conservation status.* *Stylidium purpureum* is a widespread and common species that is well represented in conservation reserves across its range.

*Chromosome number.* A voucher specimen from near Bullsbrook (PERTH 08542090) annotated with an unpublished chromosome count of  $n = 9$  was found amongst Sid James' personal effects at UWA.

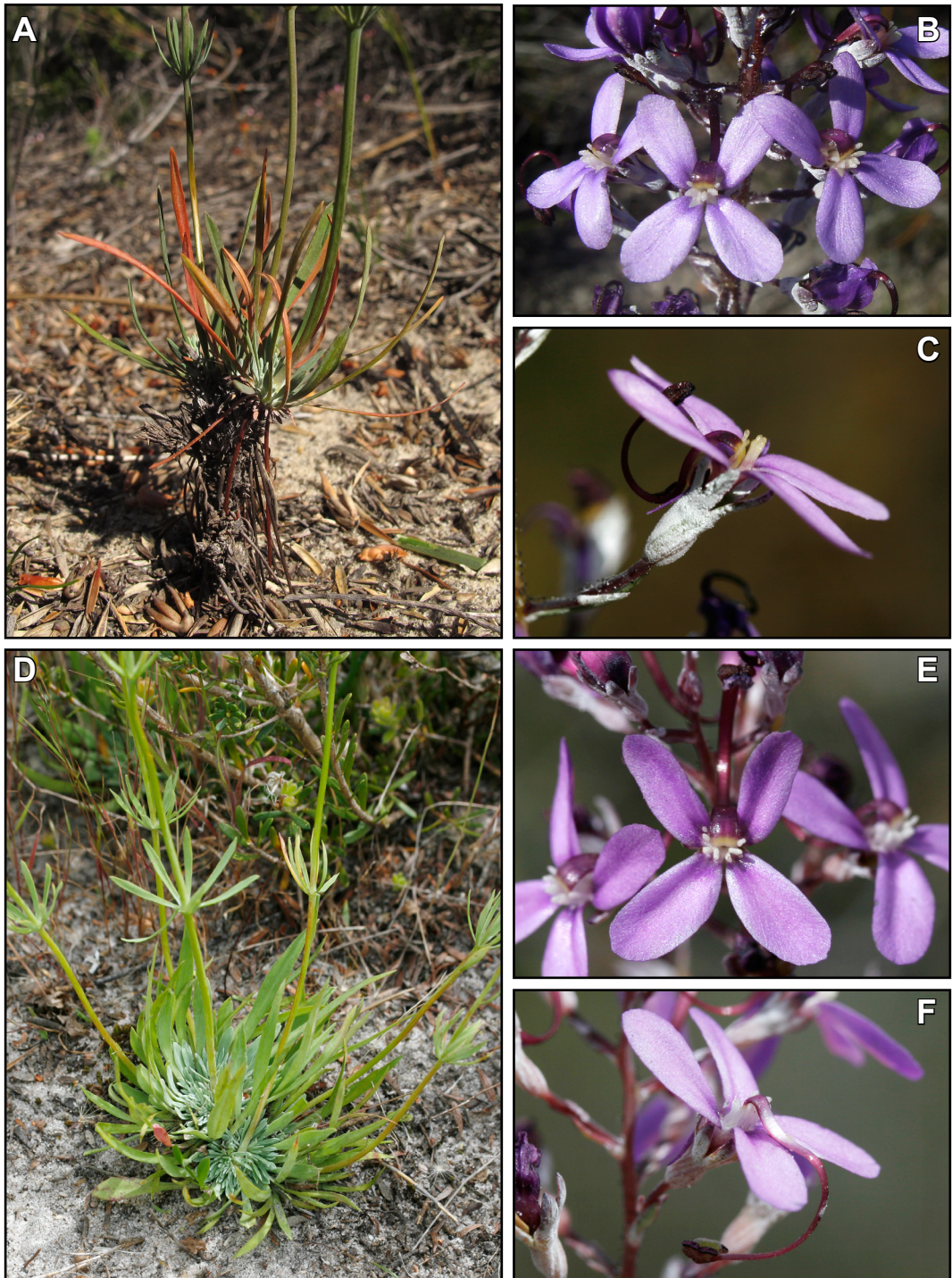


Figure 6. *Stylidium purpureum*. A – typical stilted habit and basal leaves; B – the characteristic purple, vertically-paired corolla lobes; C – side view of a flower showing the glaucous, glabrous hypanthium; D–F – the southern, atypical form with a non-stilted habit, broader leaves and flowers with a comparatively long column. Photographs © J.A. Wege from *J.A. Wege* 1868 (A), *J.A. Wege* 1355 (B), *J.A. Wege* 1793 (C) and *J.A. Wege & F. Hort* JAW 1384 (D–F).

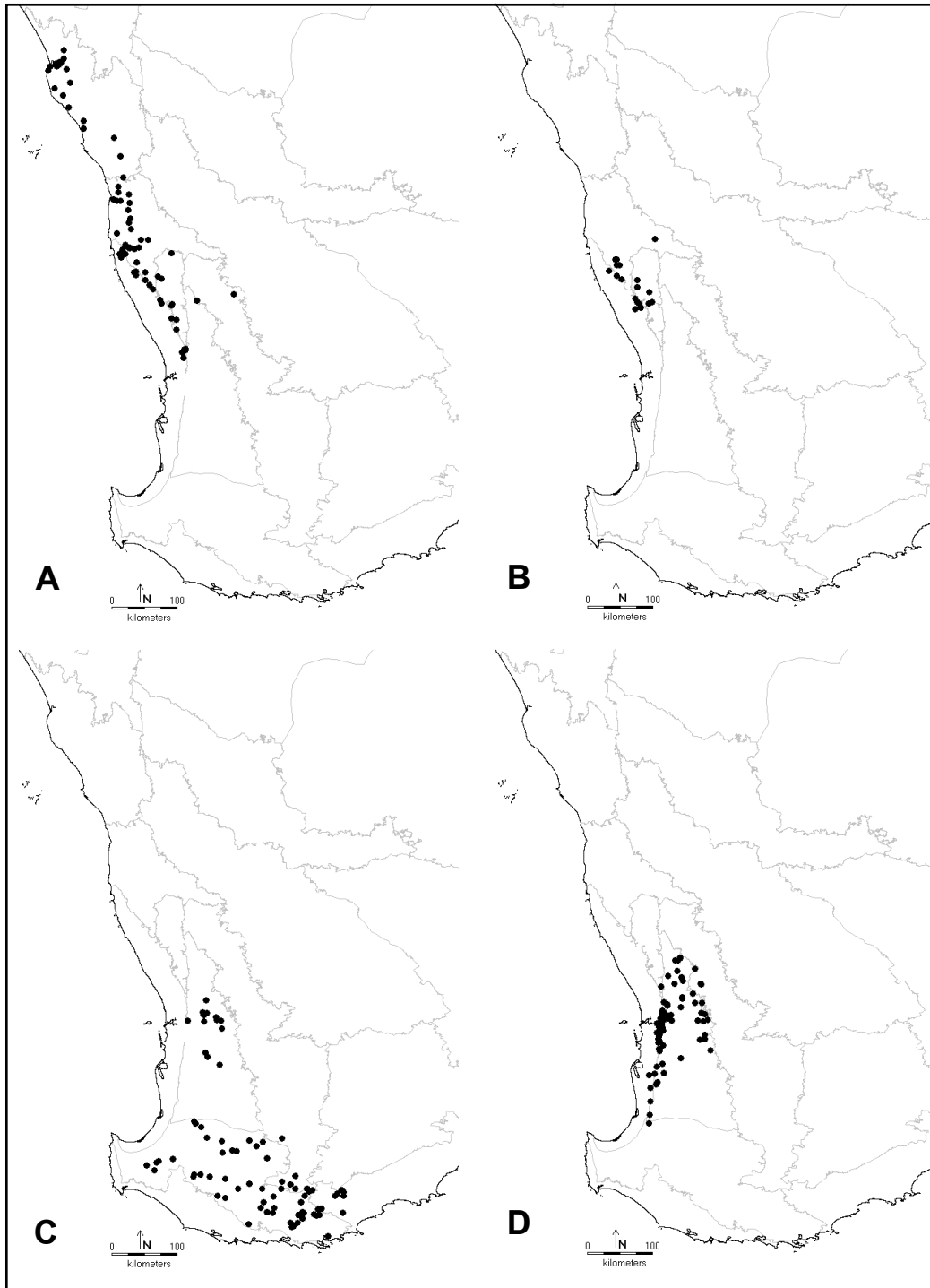


Figure 7. The distribution of four members of the *Stylidium brunonianum* alliance in the south-west of Western Australia based on PERTH specimen data, with IBRA regions (Department of the Environment 2013) in pale grey. A – *S. purpureum*; B – *S. spiciforme*; C – *S. tenue* subsp. *tenue*; D – *S. tenue* subsp. *majusculum*.

*Etymology.* From the Latin *purpureus* (purple), in reference to the corolla lobes.

*Common name.* Purple Fountain Triggerplant.

*Affinities.* This species is distinctive within this alliance on account of its corolla colour. It is most likely to be confused with *S. araeophyllum* and *S. brunonianum* (refer to the notes under these species for comparative comments).

*Notes.* In the southern-most population of *S. purpureum* (PERTH 07420161, the voucher for the informal name *S. purpureum* subsp. nonstilted (J.A. Wege & F. Hort JAW 1384)), the stems are partially buried (i.e. the plants are not stilted; Figure 6D) and flowers tend to have longer columns (mostly 14.5–17 mm versus 9.5–13 mm; Figure 6E, F). Recent examination of a nearby population (PERTH 08542139) has revealed variation in the position of the stem, apparently in relation to the microhabitat, with non-stilted plants occurring on sandy rises in a winter-wet depression and stilted plants in the adjacent open woodland. In the absence of detailed pollinator observations, the significance of the variation in column length is unclear (particularly in light of the variation documented for *S. neurophyllum* above). A broad species concept is therefore adopted until such time as a combined morphological, molecular and pollination study can be conducted.

***Stylidium spiciforme* Wege, sp. nov.**

*Type:* Brand Highway, 2.8 km north of Red Gully Road, Moore River National Park, Western Australia, 10 October 2006, J.A. Wege 1338 (*holotype:* PERTH 08021821; *isotypes:* CANB, K, MEL).

*Perennial herb* 20–65 cm high; stems contracted or shortly elongated to 4 cm, elevated above the soil surface becoming partially buried in older plants, unbranched or branching, glabrous, clothed with persistent leaf bases; stilt roots present. *Glandular trichomes* 0.1–0.2 mm long, with a translucent or yellowish stalk and black, discoid head. *Leaves* in a somewhat spreading or tufted basal rosette, narrowly oblanceolate to oblanceolate (rarely somewhat linear), 1–6 cm long, 1.2–6 mm wide, subacute to acuminate and bearing a small blunt apical callus, entire, occasionally faintly striate near the margins, glaucous (especially on lower surface), glabrous. *Scapes* 20–60 cm long, 0.8–3 mm wide, sparsely glandular-hairy above the lowest flower; sterile bracts in 1 or 2(3) whorls and ± scattered below the inflorescence (rarely with whorls absent), linear to narrowly oblanceolate, 4.5–15 mm long, glabrous. *Inflorescence* racemose, 15–70(–130)-flowered, glaucescent; bracts subulate, 2–7 mm long, subacute to acute, entire, glabrous; prophylls inserted at or near the pedicel base, similar to the bracts but smaller; pedicels 1.5–4 mm long, sparsely glandular-hairy. *Hypanthium* elliptic to oblong in outline, ellipsoid in TS, 1.5–3.5 mm long, 0.8–1.7 mm wide, faintly longitudinally ridged, sparsely glandular-hairy. *Calyx lobes* free, with 2 a little longer and broader than the remaining 3, 1.5–3 mm long, 0.6–1 mm wide, subacute to acute, entire, glabrous or sparingly glandular-hairy near the base. *Corolla* medium pink or mauve-pink, often darker near the base and with a white throat, glabrous, with the lobes paired vertically and rotated through 180°; tube 1.5–2 mm long; anterior (upper) lobes oblong to narrowly obovate, narrower and a little shorter than the posterior (lower) pair, 4–4.5 mm long, 1.5–2 mm wide; posterior lobes obovate, 4.5–5.3 mm long, 2–3.5 mm wide. *Labellum* reflexed and angled across the calyx, narrowly ovate, 0.8–1 mm long, 0.4–0.6 mm wide, with a terminal appendage 0.5–0.8 mm long, glabrous; lateral appendages 0.2–0.4 mm long. *Throat appendages* 8 (2 on each corolla lobe), with each lower pair partially fused, white at base with a dark reddish pink or mauve-pink centre and creamy yellow tip, oblong and somewhat capitate, 0.8–1.2 mm long, glabrous. *Column* sigmoid when poised, straight when extended, 8.5–10 mm long, glabrous; anthers reddish black, subtending

hairs absent; stigma sessile, entire. *Capsules* obloid, *c.* 3–4 mm long excluding calyx lobes. *Seeds* dark brown, ovoid to ellipsoid and truncate at one end, 0.4–0.5 mm long, 0.25–0.3 mm wide, surface wrinkled. (Figure 8)

*Diagnostic features.* The following features distinguish *S. spiciforme* from all other species in the genus: a perennial, rosetted habit; glabrous, glaucous leaves that are narrowly oblanceolate to oblanceolate (rarely more or less linear) and with entire margins; scapes with whorls of sterile bracts below the inflorescence; a spike-like raceme with the pedicels quite short (1.5–4 mm long) and more or less even in length, and with the prophylls inserted at or near the base of the pedicels alongside the floral bract; a glandular-hairy hypanthium; pink or mauve-pink, vertically-paired corolla lobes.

*Selected specimens.* WESTERN AUSTRALIA: SE of Dandaragan, 9 Sep. 1988, *E.A. Griffin* 4941 (PERTH); Brand Hwy, N of Minyulo Brook crossing, 9 Oct. 2002, *F. & J. Hort* 1856 (PERTH); S of Regans Ford along Brand Hwy, 26 Sep. 1989, *B. Nordenstam & A. Anderberg* 42 (PERTH, S); Brand Hwy, 4.85 km N of Dandaragan Rd, 10 Oct. 2006, *J.A. Wege* 1341 (CANB, MEL, PERTH); Bibby Rd, 6.39 km W of Brand Hwy, Badgingarra National Park, 10 Oct. 2006, *J.A. Wege* 1344 (CANB, MEL, PERTH); *c.* 10.05 km W along Cadda Rd from Brand Hwy, Badgingarra National Park, 11 Oct. 2006, *J.A. Wege* 1352 (PERTH).

*Distribution and habitat.* *Stylidium spiciforme* occurs on the northern Swan Coastal Plain and southern Lesueur Sandplain from Moore River National Park to Badgingarra National Park, and east to Watheroo National Park (Figure 7B). It grows in yellow or white sand over laterite on hillslopes and in upland habitats in *Banksia* woodland, shrubland or heath, sometimes in association with *Eucalyptus todtiana*. There is a single record from open woodland/tall shrubland of *Corymbia calophylla* and *Banksia hewardiana*, and another from proteaceous and myrtaceous shrubland.

*Phenology.* Flowering during September and October.

*Conservation status.* Although rather poorly collected, *S. spiciforme* is known from several populations occurring on lands managed for conservation and does not appear to warrant conservation listing.

*Chromosome number.* Unknown.

*Etymology.* From the Latin *spica* (spike) and *-formis* (formed) in reference to the spike-like raceme, in which the pedicels are quite short and fairly uniform in length.

*Common name.* Spiciform Triggerplant (here designated).

*Affinities.* *Stylidium spiciforme* is most likely to be confused with *S. araeophyllum* and *S. neurophyllum*, both of which also occur on sandplains north of Perth (refer to the notes under each of these species for comparative comments).

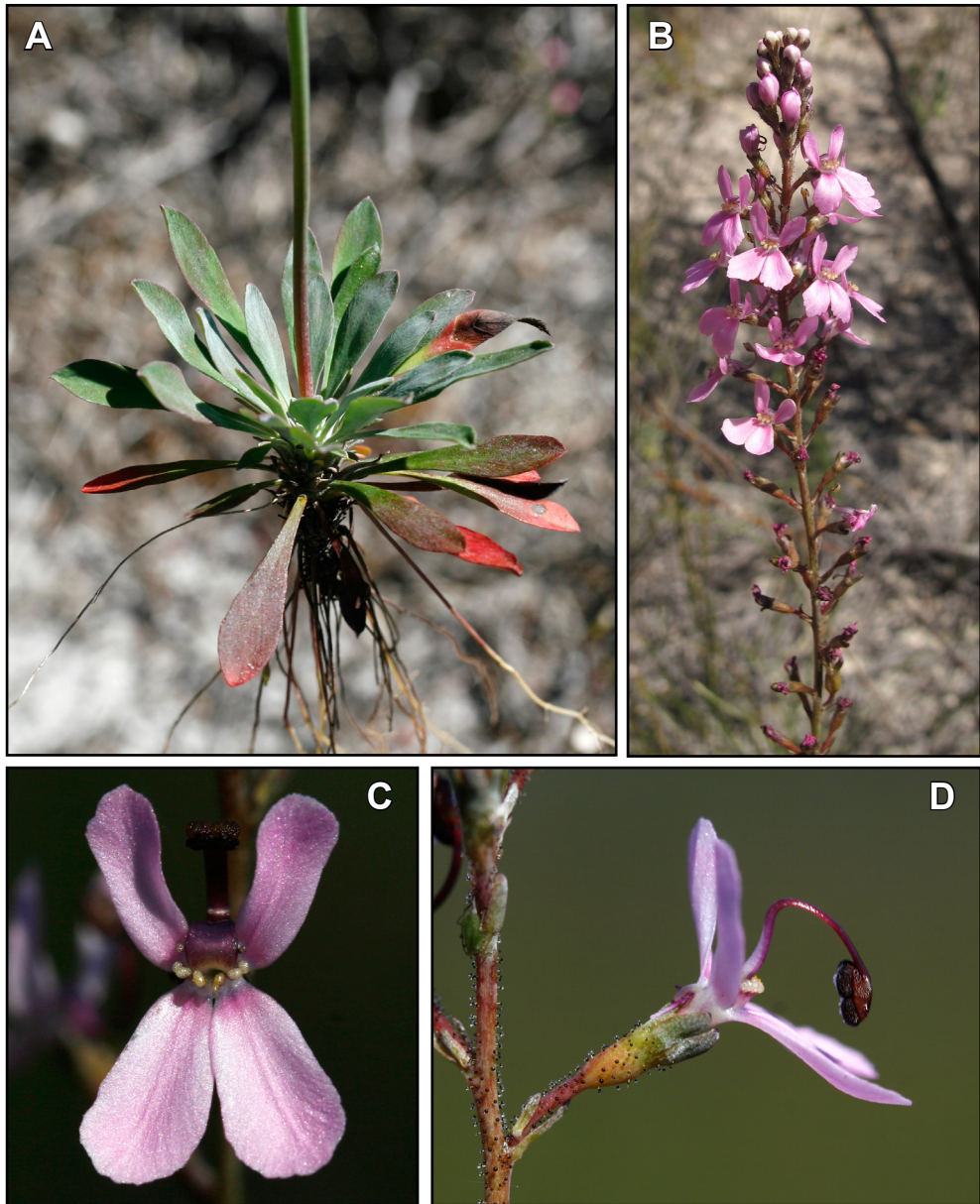


Figure 8. *Stylidium spiciforme*. A – spreading, basal leaf rosette; B – spiciform inflorescence, with short pedicels that are more or less equal in length; C – mauve-pink, vertically-paired corolla lobes bearing eight throat appendages; D – side view of a flower showing a short pedicel and one of two prophylls inserted just above the floral bract, the glandular-hairy hypanthium, and throat appendages with a dark pinkish band of colour below the creamy yellow tip. Photographs © J.A. Wege from *J.A. Wege* 1352 (A, C, D) and *J.A. Wege* 1345 (B).

**Stylidium tenue** Sond., in Lehm., *Pl. Preiss.* 1(3): 380 (1845). *Stylidium brunonianum* var. *tenue* (Sond.) Domin, *Věstn. Král. České Společn. Nauk. Tř. Mat.-Přír.* 2 (2): 115 (1923), *nom. illeg. nom. superfl.* Type: 'In glareosis sterilibus districtus Hay' [Western Australia], 7 November 1840, *L. Preiss* 2263 (*lectotype*, here designated: MEL 2258647!; *isolectotypes*: G 00358891!, LD!).

*Perennial herb* (6–)10–50 cm high; stems contracted and sometimes becoming partially buried, or elongated to *c.* 12 cm above the soil surface, unbranched or branching, glabrous, clothed with persistent, browned-off leaves or leaf bases (especially on the nodes); stilt roots usually present. *Glandular trichomes* 0.1–0.25 mm long, with a translucent or yellowish stalk and black, discoid head. *Leaves* in a compact or spreading basal rosette, scattered on the elongated stem (where present), narrowly oblanceolate to oblanceolate or occasionally somewhat linear and usually strongly tapering to the apex, 0.5–5 cm long, 0.5–5 mm wide, acute to acuminate and with a small blunt apical callus, entire or extremely finely irregularly hyaline, without striations or scarcely striate, glaucous, glabrous. *Scapes* (5–)12–45 cm long, 0.4–4 mm wide, subglabrous or sparsely glandular-hairy above the lowest flower and sometimes near the sterile bracts; sterile bracts in 1–5 whorls, sometimes also scattered below the inflorescence, linear to narrowly oblanceolate, 4–15 mm long, glabrous. *Inflorescence* racemose, 5–*c.* 150-flowered, glaucescent; bracts subulate to linear, 2–6 mm long, acute, entire, glabrous; prophylls inserted well above the pedicel base, similar to bracts but smaller; pedicels 4–18 mm long, sparsely glandular-hairy (rarely glabrous). *Hypanthium* elliptic to suborbicular in outline, subglobose in TS, 0.8–2.2 mm long, 0.5–2 mm wide, faintly longitudinally ridged, glabrous or with a few hairs at the base. *Calyx lobes* free, with 2 a little longer and broader than the remaining 3, 1.5–3 mm long, 0.5–0.8 mm wide, subacute, entire, glabrous. *Corolla* mauve-pink to medium pink, often darker near the base and with a white throat, glabrous, with the lobes paired vertically and rotated through 180°; tube 1–1.7 mm long; anterior (upper) lobes elliptic to oblong or narrowly obovate, often a little shorter and narrower than the posterior pair, 3–5 mm long, 1.2–2.5 mm wide; posterior lobes obovate, 3.5–5.5 mm long, 2–3.2 mm wide. *Labellum* reflexed and usually slightly angled across the calyx, elliptic, 0.6–1.1 mm long, 0.4–0.6 mm wide, with a terminal appendage 0.3–1.1 mm long, glabrous; lateral appendages absent or *c.* 0.1 mm long. *Throat appendages* 6 (1 on each upper corolla lobe, 2 on each lower lobe), with each lower pair fused near the base (rarely free), white, often purplish pink at the base, oblong and somewhat capitate, 0.7–1.3 mm long, glabrous. *Column* sigmoid when poised, straight when extended, 7–11 mm long, glabrous; anthers reddish black, subtending hairs absent; stigma sessile, entire. *Capsules* subglobose, ellipsoid or ovoid, 1.5–3 mm long excluding calyx lobes. *Seeds* dark brown, ellipsoid to ovoid, *c.* 0.3–0.5 mm long, 0.2–0.3 mm wide, surface wrinkled. (Figures 9, 10)

*Diagnostic features.* The following features distinguish *S. tenue* from all other species in the genus: a perennial, stilted habit (the stems sometimes becoming partially buried); narrowly oblanceolate to oblanceolate (more rarely almost linear) mature leaves, strongly tapering to an acute or acuminate tip; scapes with whorls of sterile bracts; mauve-pink, vertically-paired corolla lobes; a glabrous or mostly glabrous hypanthium (a few glandular hairs are sometimes present at the base).

*Distribution.* *Stylidium tenue* is common in forested habitats in the Jarrah Forest bioregion, but is also known from the Swan Coastal Plain and southern Avon Wheatbelt bioregions, and western Fitzgerald subregion (Figures 7C, D). Refer to the detailed information under each subspecies below.

*Typification.* Sonder's description was based on a gathering by Preiss and I have located three sheets, of which those at MEL and LD were viewed by Sonder. The designated lectotype is from Sonder's Herbarium, which was purchased by MEL in 1883 (Short & Sinkora 1988), and unlike the LD specimen bears a short descriptive annotation by Sonder.



*Notes.* Two subspecies are recognised herein. The typical subspecies, which is most common in the Southern Jarrah Forest, tends to have compact stems and leaf rosettes (Figure 9A), with leaves up to 2 cm long and scapes with only one or two (rarely three) whorls of sterile bracts. Subspecies *majusculum* occurs in the northern part of the species' range and differs in having stems that usually elongate as the plant ages (and therefore a much more prominently stilted habit), longer mature leaves (and hence a more spreading leaf rosette; Figure 10A) and (often) more numerous whorls of scape bracts. The subspecies have overlapping distributions in the Northern Jarrah Forest. A few specimens from this region are somewhat intermediate and difficult to place (e.g. PERTH 08021848, PERTH 08021856).

### ***Stylidium tenue* subsp. *tenue***

*Stylidium brunonianum* var. *minor* Benth., *Fl. Austral.* 4: 19 (1868). *Stylidium brunonianum* subsp. *minor* (Benth.) Carlquist, *Aliso* 7(1): 40 (1969). *Type citation:* 'Kalgan and Harvey river, Oldfield; foot of Stirling Ranges, F. Mueller, also Drummond (4th Coll.?) n. 170.' *Type specimens:* Kalgan River, Western Australia, [1859–1860], A.F. Oldfield s.n. (*lectotype*, here designated: K 000060664!); *isolectotype:* BR 0000013333225 image seen). *Paralectotypes* [*syntypes*]: Kalgan River, Western Australia, [1859–1860], A.F. Oldfield 267 (MEL 2258649); Kalgan River, Western Australia, [1859–1860], A.F. Oldfield 267b (MEL 2258653); Swan River, [Western Australia, 1844–1847,] J. Drummond 4: 170 (BM 001041330!, CGE!, FI 113111!, G!, K 000060666!, K 000355075!, MEL 2257669!, OXF!, P!, TCD!, W!) [= *S. diuroides* Lindl. subsp. *nanum* Carlquist].

*Stems* contracted and often partially buried, rarely shortly elongated. *Mature leaves* in a compact basal rosette, 0.5–2 cm long. *Scapes* with sterile bracts in 1 or 2(3) whorls. (Figure 9)

*Illustrations.* R. Erickson, *Triggerplants* p. 108, Plate 30, No. 10 (1958), as *S. brunonianum* var. *minor*; B.J. Grieve & W.E. Blackall, *How Know W. Austral. Wildfl.* 4: 732, No. 8a (1982), as *S. brunonianum* subsp. *minor*; J. Wheeler, N. Marchant & M. Lewington, *Fl. South West* 2: 917 (2002), as *S. brunonianum* subsp. *minor*.

*Selected specimens.* WESTERN AUSTRALIA: 250 m E of Needs Rd on Muir Hwy, 18 Nov. 1990, A.R. Anells ARA 1299 (PERTH); site 22 Walpole fine grain mosaic, 50 m S of intersection of Western and Mountain Rds, 7 Nov. 2008, R.J. Cranfield 23450 (PERTH); Coben Soak Rd, E of junction with Bokal Rd South, 10.5 km SE of Moodiarrup, 2 Oct. 1999, V. Crowley DKN 996 (PERTH); site 178, NE of Dinninup, 28 Oct. 1998, R. Davis 8324 (PERTH); Kendenup, Oct. 1952, R. Erickson s.n. (PERTH); Stirling Range National Park, Stirling Range Dr, 11 km from Chester Pass Rd, 23 Oct. 1991, W. Greuter 23142 (PERTH); Collie basin, 6 Dec. 1979, J. Koch CJK 123 (PERTH); 4 km S of Collie on road to Mumballup, 8 Nov. 1985, A.N. Rodd & G. Fensom ANR 4850 (NSW, PERTH); 6 miles S of Tunney, S of Kojonup, 4 Oct. 1963, R.D. Royce 8054 (PERTH); 400 m SE on Yeriminup Rd from Frankland–Cranbrook Rd, Yeriminup Nature Reserve, 13 Nov. 2002, J.A. Wege 830 (PERTH); Gorrie Rd, 680 m S from Great Eastern Hwy, S of Chidlow, 24 Oct. 2006, J.A. Wege 1364 (CANB, MEL, PERTH); 3.8 km N on St John Rd West from Mowen Rd, St John Forest Block, NW of Nannup, 8 Nov. 2007, J.A. Wege & R. Butcher JAW 1481 (MEL, PERTH); 1.8 km on Boyup Brook–Arthur River Rd from Dinninup turnoff, 30 Oct. 2002, J.A. Wege & D. Coates JAW 764 (MEL, PERTH); 2.5 km SW on Crawler Rd from Kent Rd, SE of Chidlow, 1 Nov. 2007, J.A. Wege & K. Hufford JAW 1448 (PERTH); c. 150 m along Washpool Rd from Knight Rd, N of the Porongurups, 31 Oct. 2003, J.A. Wege & C. Wilkins JAW 1063 (MEL, PERTH).



Figure 9. *Stylidium tenue* subsp. *tenue*. A – the leaves are short with attenuate apices, and form compact basal rosettes; B – mauve-pink, vertically-paired corolla lobes with six throat appendages; C – side view of a flower showing the glabrous hypanthium. Photographs © J.A. Wege from *J.A. Wege* 830.

*Distribution.* *Stylidium tenue* subsp. *tenue* is widespread in the Jarrah Forest bioregion with occurrences in the southern Avon Wheatbelt and western Fitzgerald subregion (Figure 7C). It grows on ridges, hillslopes, plains and occasionally adjacent to swamps, in gravelly loam, clayey sand or sand over laterite or sandstone, or in association with granite outcropping. The associated vegetation is varied and includes *Eucalyptus marginata* forest, *E. marginata* and *E. decipiens* or *E. wandoo* woodland, low mallee shrubland, or heath with emergent mallees.

*Phenology.* Flowering from late September to early December, with peak flowering from mid-October to mid-November.

*Conservation status.* This taxon is common and widespread: no conservation code is warranted.

*Chromosome number.* James (1979) recorded a count of  $n = 9$  from a population east of Cranbrook (PERTH 02915294), under *S. brunonianum* subsp. *minor*.

*Common name.* Little Fountain Triggerplant (here designated).

*Typification.* Upon raising *S. brunonianum* var. *minor* to subspecific level, Carlquist (1969) did not refer to the type gatherings, which are all referable to *S. tenue* with the exception of the Drummond gathering, which is of *S. diuroides* Lindl. subsp. *nanum* Carlquist. A lectotype must therefore be designated to fix the application of this name. Of the gatherings cited by Bentham under *S. brunonianum*

var. *minor*, he viewed the following sheets: ‘Kalgan River, W. Aust.’, *Oldfield s.n.* (K 000060664); ‘Sand Plain, Kalgan’, *Oldfield* 267 (MEL 2258649); ‘Sand Plain, Kalgan R., W. Aust.’, *Oldfield* 267b (MEL 2258653); ‘wet rocks nr the Harvey, W. Aust.’, *Oldfield s.n.* (MEL 2258650); and Swan River, *J. Drummond* 4: 170 (CGE, K 000060666, MEL 2257669). No Mueller specimen with the locality ‘foot of Stirling Ranges’ has been located. This locality may have been given in error: MEL 2258656, which is from ‘Porongorup’ [the nearby Porongurup Range], is annotated by Bentham as ‘very near *S. diuroides*’, an observation that is repeated in the protologue of *S. brunonianum* var. *minor* (‘this variety almost connects the species with *S. diuroides*’). It is, however, of note that collections by Mueller from ‘towards Mt Barker’ (MEL 2258654), ‘towards the Kalgan’ (MEL 2258655), and ‘towards the upper Hay River’ (MEL 2258657) were also seen by Bentham but not cited in the protologue. Similarly, Bentham does not cite *L. Preiss* 2263 (the type gathering of *S. tenue*) although he makes it clear in his introduction to *Flora Australiensis* that Sonder’s Australian Herbarium was loaned to him in its entirety from Hamburg (Bentham 1863: 10) and as such as he must have viewed MEL 2258647 prior to its purchase by MEL.

Of the syntypes of *S. brunonianum* var. *minor*, the Drummond gathering does not have ‘very acute leaves’ as described in the protologue and is therefore not a suitable lectotype. The designated lectotype, which was collected by Oldfield, is of high quality and is not only annotated by Bentham but bears a ‘Flora Australiensis’ label. The unnumbered Oldfield collection at BR is a good match for this material and is treated as an isolectotype. I am uncertain whether the numbered Oldfield collections at MEL from the same locality are duplicates of the lectotype and have thus listed them as paralectotypes.

*Notes.* Refer to the comparative comments provided under the notes for *S. brunonianum*.

***Stylidium tenue* subsp. *majusculum* Wege, subsp. nov.**

*Type:* Chevin Road, 300 m east from Canning Mills Road, south-east of Perth, Western Australia, 24 October 2006, J.A. Wege 1380 (*holotype*: PERTH 08024537 Sheet 1 of 2, PERTH 08024588 Sheet 2 of 2; *isotypes*: CANB, MEL).

*Stylidium* sp. Darling Range (H. Bowler 371), Western Australian Herbarium, in *FloraBase* <http://florabase.dpaw.wa.gov.au/> [accessed 6 July 2014].

[*Stylidium brunonianum* auct. non Benth. (1837): J. Lindley, *Sketch Veg. Swan R.*: xxix (1839) and in *sched.* (CGE!); O.W. Sonder, in Lehm., *Pl. Preiss.* 1(3): 380 (1845), *p.p.*; G. Bentham, *Fl. Austral.* 4: 19 (1868), *p.p.*; J. Mildbraed, in Engl., *Pflanzenr.* IV. 278 (Heft 35): 65 (1908), *p.p.*; R. Erickson, *Triggerplants* p. 109 (1958), *p.p.*; J. Wheeler, N. Marchant & M. Lewington, *Fl. South West* 2: 917 (2002), *p.p.*; J.R. Wheeler in N.G. Marchant *et al.*, *Fl. Perth Region* 2: 612 (1987), *p.p.*; G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 548 (2000), *p.p.*]

*Illustrations.* R. Erickson, *Triggerplants* p. 108, Plate 30, Nos 1–9 (1958), as *S. brunonianum*.

*Stems* elongated to 10 cm and with distinct nodes or occasionally contracted, situated above ground level. *Mature leaves* in a spreading basal rosette, (1.2–)2–5 cm long. *Scapes* with sterile bracts in (1)2–5 whorls. (Figure 10)

*Selected specimens.* WESTERN AUSTRALIA: Ellis Brook Valley Reserve, 16 Oct. 1999, H. Bowler 371 (PERTH); Zig-zag road [Zig Zag Scenic Dr], Lesmurdie, Darling Range, 2 Oct. 1967, S. Carlquist



Figure 10. *Styliidium tenue* subsp. *majusculum*. A – leaf rosette, elongated stem and stilted habit; B – mauve-pink, vertically-paired corolla lobes with six throat appendages; C – side view of a flower showing the glabrous hypanthium. Photographs © J.A. Wege from J.A. Wege 1380 (A, B) and J.A. Wege & B.P. Miller JAW 1926 (C).

3591 (PERTH, RSA); Dobaderry Rd, 7.3 km N of Dale West Rd intersection, 8 Oct. 1997, R. Davis 4261 (PERTH); Bolgart, 29 Sep. 1953, R. Erickson s.n. (PERTH); Serpentine National Park, 3 Nov. 1990, B. Evans s.n. (PERTH); bushland, N of Lambert Lane, Wungong, 13 Nov. 2003, M. Hislop MK 4-6 (PERTH); Cardup Nature Reserve, Serpentine Shire, 20 Oct. 1992, G.J. Keighery 13285 (PERTH); Talbot Rd Reserve, Oct. 2005, G.J. Keighery & B.J. Keighery 575 (PERTH); Wongamine Nature Reserve, c. 13 km N of Toodyay, 29 Oct. 1995, T.R. Lally & B.J. Lepschi 790 (AD, PERTH); Helena Valley, 26 Sep. 1977, J. Seabrook 290 (CANB, PERTH); 7.6 km W on Calingiri–Wongan Hills Rd from Great Northern Hwy, 9 Oct. 2002, J.A. Wege 661 (PERTH); SW corner of Morangup Nature Reserve, SW of Toodyay, 11 Nov. 2003, J.A. Wege 1091 (PERTH); 5.25 km E on Coalfields Rd from South West Hwy, W of Bunbury, 13 Nov. 2003, J.A. Wege 1122 (PERTH); Brookton Nature Reserve, c. 2 km W of Bartram Rd on Brookton Hwy, 15 Oct. 2014, J.A. Wege 1961 (CANB, MEL, PERTH); c. 18.8 km from Great Northern Hwy on Bindoon–Dewars Pool Rd, Minyerring Block, Julimar Forest, 31 Oct. 2006, J.A. Wege & F. Hort JAW 1388 (PERTH); Burnside Road Nature Reserve, c. 3.8 km on Burnside Rd from Pinjarra–Williams Rd, 14 Oct. 2010, J.A. Wege & K.A. Shepherd JAW 1788 (MEL, PERTH).

*Distribution and habitat.* *Styliidium tenue* subsp. *majusculum* is common in the Northern Jarrah Forest, with scattered occurrences in the adjacent Southern Jarrah Forest, Avon Wheatbelt and eastern Swan Coastal Plain, extending from west of Calingiri to east of Dardanup (Figure 7D). It favours hillslopes and ridges, where it grows in gravelly lateritic soils or in shallow sand. Associated vegetation is varied

and includes *Eucalyptus marginata* and *Corymbia calophylla* forest, woodland with *E. wandoo* and *E. accedens*, *C. calophylla*, *E. lane-poolei* or *Banksia*, low *Allocasuarina* shrubland, and mixed heath.

*Phenology*. Flowering from late September to November.

*Conservation status*. This taxon is locally abundant at a number of sites within the conservation estate and as such no conservation listing is required.

*Chromosome number*. Hitherto unpublished chromosome counts of  $n = 9$  have been recorded from two populations near Perth (PERTH 02855550 and PERTH 08542031); the latter voucher was found amongst Sid James' personal effects at UWA.

*Etymology*. The subspecies epithet is from the Latin *majusculus* (somewhat larger or greater) in reference to its tendency to have larger leaves and a more showy appearance than the typical subspecies.

*Common name*. Showy Fountain Triggerplant (here designated).

*Notes*. Refer to the comparative comments provided under the notes for *S. brunonianum*.

#### Typification of *S. striatum* var. *glaucum*

*Stylidium striatum* var. *glaucum* was named by Bentham (1868) but this name was not considered by Mildbraed (1908) and has never been applied in Western Australia. Lectotypification of this name is necessary since it is based on gatherings that represent four distinct species, underscoring the difficulties Bentham experienced correctly interpreting pressed triggerplant material.

***Stylidium rosulatum*** Wege, *Nuytsia* 17: 424–425 (2007). *Type*: Stirling Range National Park, Western Australia [precise locality withheld for conservation purposes], 13 November 2002, *E.M. Sandiford* EMS 678 (*holotype*: PERTH 06787959; *isotype*: MEL).

*Stylidium striatum* var. *glaucum* Benth., *Fl. Austral.* 4: 18 (1868), *syn. nov.* *Type citation*: 'Swan River, *Preiss* n. 2238; Swan and Vasse rivers, *Oldfield*, also *Drummond*, 5<sup>th</sup> Coll. n. 348, 349.' *Type specimens*: Swan River [Western Australia, 1847–1849], *J. Drummond* 5: 349 (*lectotype*, here designated: K 000060637!; *isolectotypes*: BM 000797478!, CGE!, FI 006757!, K 000355311!, MEL 2259119A!, OXF!, P 00712434!, TCD!, W!). *Paralectotypes*: Vasse River, Western Australia, *s. dat.*, *A. Oldfield s.n.* (K 000355085!, MEL 2259120!) [= *S. lowrieianum* Carlquist]; Mt Eliza, Perth, Western Australia., *s. dat.*, *A. Oldfield* 1208 (MEL 2259117); near Perth, Western Australia, *s. dat.*, *A. Oldfield* 958 (MEL 2259122!); Swan River, 2 Oct. 1839, *L. Preiss* 2238 (BR 0000013344665 image seen, FI 006837!, G 00358886–8!, LD 1001186!, M!, MEL 293427–9!, P 00712433!, TCD! [as *Preiss* 523], UPS V-211710!, W!) [= *S. neurophyllum* Wege]. Swan River [Western Australia, 1847–1849], *J. Drummond* 348 (BM!, CGE!, OXF!, K 000355310!, MEL 2296915!, P!, TCD!, W!) [= *S. bellum* Wege].

*Stylidium* sp. Mt Success (*E.M. Sandiford* EMS 678), Western Australian Herbarium, in *FloraBase*, <http://florabase.dec.wa.gov.au/> [accessed June 2007].

*Lectotypification*. Bentham viewed the following specimens: *Drummond* 348 (CGE, K 000355310, MEL 2296915 = *S. bellum* Wege); *Drummond* 349 (CGE, K 000060637, MEL 2259119 = *S. rosulatum* Wege); *Oldfield s.n.* (K 000355085, MEL 2259120A = *S. lowrieianum*); *Oldfield* 1208 (MEL 2259117

= *S. neurophyllum*); Oldfield 958 (MEL 2259122 = *S. neurophyllum*); Preiss 2238 (MEL 293427–9 [ex Herbarium O.W. Sonder] = *S. neurophyllum*). Although the Preiss material is not annotated by Bentham, he had access to Sonder's Australian Herbarium in the course of preparing *Flora Australiensis* (refer to the typification notes under *S. tenue*).

The gathering by Drummond of *S. rosulatum* is the best fit for Bentham's description of *S. striatum* var. *glaucum*, in which the inflorescence is described as 'looser' [than the typical form of *S. striatum*] and 'often branched' (unlike *S. rosulatum*, the remaining species have racemose inflorescences, with the exception of *S. bellum* which on rare occasions has a sparingly branched inflorescence). I have selected K 000060637 as the lectotype of *S. striatum* var. *glaucum* since it is a high quality specimen that is annotated by Bentham and bears a 'Flora Australiensis' label.

### Acknowledgements

This research has primarily been supported by the Australian Biological Resources Study and the Department of Parks and Wildlife (formerly the Department of Environment and Conservation). I thank the many people who have assisted me with field work, the Directors and staff at the cited institutions for access to their collections, specimen loans and curatorial assistance, and Barbara Rye, Michael Hislop and Kevin Thiele for comments on the manuscript.

### References

- Armbruster, W.S., Edwards, M.E., Debevec, E.M. (1994). Floral character displacement generates assemblage structure of western Australian triggerplants (*Stylidium*). *Ecology* 75: 315–329.
- Bentham, G. (1837). Stylidiaceae. In: Endlicher, S.F.L., Bentham G., Fenzl, E. & H. Schott (eds). *Enumeratio plantarum quas in Novae Hollandiae ora austro-occidentali ad Fluvium Cygnorum et in Sinu Regis Georgii collegit Carolus liber baro de Hügel*. pp. 71–74. (F. Beck: Vienna.)
- Bentham, G. (1863). *Flora Australiensis*. Vol. 1. (Reeve and Co.: London.)
- Bentham, G. (1868). *Flora Australiensis*. Vol. 4. (Reeve and Co.: London.)
- Carlquist, S.J. (1969). Studies in Stylidiaceae: new taxa, field observations, evolutionary tendencies. *Aliso* 7: 13–64.
- Department of the Environment (2013). *Australia's bioregions (IBRA)*, IBRA7, Commonwealth of Australia. <http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra#ibra> [accessed 2 January 2014].
- Erickson, R. (1958). *Triggerplants*. (Paterson Brokensha: Perth.)
- James, S.H. (1979). Chromosome numbers and genetic systems in the triggerplants of Western Australia (*Stylidium*; Stylidiaceae). *Australian Journal of Botany* 27: 17–25.
- Lindley, J. (1839). *A sketch of the vegetation of the Swan River colony. Appendix to the first twenty-three volumes of Edward's Botanical Register*. (James Ridgeway: Piccadilly, London.)
- Mildbraed, J. (1908). Stylidiaceae. In: Engler, A. (ed.) *Das Pflanzenreich*. Heft 35. IV: 278. (Wilhelm Engelmann: Weinheim.)
- Sonder, O.G. (1845). Stylidiaceae. In: Lehmann, C. (ed.) *Plantae Preissianae*. Vol. 1. pp. 370–393. (Meissner: Hamburg.)
- Short, P.S. & Sinkora, D.M. (1988). The botanist Joachim Steetz (1804–1862). *Muelleria* 6: 449–494.
- Stone, G.L. (1972). *Biosystematics in the Stylidium brunonianum Benth. group*. Honours Thesis. (The University of Western Australia: Crawley, Western Australia.)
- Wege, J.A. (2007). New species and new concepts in *Stylidium* (Stylidiaceae). *Nuytsia* 17: 415–432.
- Western Australian Herbarium (1998–). *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. <http://florabase.dpaw.wa.gov.au/> [accessed 17 July 2015].
- Wheeler, J. (1987). Stylidiaceae. In: Marchant, N.G., Wheeler, J.R., Rye, B.L., Bennett, E.M., Lander, N.S. & Macfarlane, T.D., *Flora of the Perth region*. Part 2. pp. 606–626. (Western Australian Herbarium: Perth.)
- Wheeler, J., Marchant, N. & Lewington, M. (2002). *Flora of the south west*. Vol. 2. (Australian Biological Resources Study: Canberra.)