

## An account of the reed triggerplants (*Stylidium* sect. *Junceae*: Stylidiaceae)

Juliet A. Wege

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

### Abstract

Wege, J.A. An account of the reed triggerplants (*Stylidium* sect. *Junceae*: Stylidiaceae). *Nuytsia* 24: 215–247 (2014). This taxonomic review of *Stylidium* sect. *Junceae* Mildbr. recognises eight species endemic to south-western Western Australia and presents a new circumscription for *S. junceum* R.Br., the original description of which was based on a mixed gathering comprising three distinct taxa. A lectotype is designated in order to fix the application of the name *S. junceum* to one of these, a species with a diminutive habit, pale creamy yellow to apricot-pink corolla lobes, and a column morphology that is unique within the genus. A neotype is designated for *S. junceum* subsp. *brevius* (E.Pritz.) Carlquist, which is not recognised as distinct. *Stylidium scariosum* DC. is reinstated and *S. hesperium* Wege, *S. hygrophilum* Wege, *S. paludicola* Wege and *S. thryonides* Wege described as new. Revised descriptions are provided for *S. squamosotuberosum* Carlquist and *S. laciniatum* C.A.Gardner, with *S. junceum* var. *volubile* F.Muell. lectotypified and placed into synonymy under the latter species. Descriptions, distribution maps, illustrations and photographs are supplied for each species, and an identification key provided. *Stylidium hygrophilum* has a highly localised distribution on the Blackwood Plateau south of Busselton and may warrant listing as Threatened. *Stylidium paludicola*, a species confined to swamps on the Swan Coastal Plain, is also listed as being of conservation concern, with targeted surveys required to better understand its conservation status.

### Introduction

A small group of triggerplants (*Stylidium* Sw.: Stylidiaceae) endemic to south-western Australia possess an unusual reed-like growth form with slender scapes arising from a thickened stem stock, leaves absent in mature plants or confined to a comparatively small basal rosette or tuft, and flowers in dense terminal racemes (Figure 1). Species belonging to this group often provide striking floral displays when in full bloom but can be difficult to detect when sterile, especially when growing through dense vegetation, since the flowering scapes are the dominant feature. The scapes of some species in the group have elongated, photosynthetic palisade cells in the outer cortex (Burns 1900; Wege 2001) and comprise the principal photosynthetic organ of the plant. On the basis of this distinctive habit, combined with the presence of scarious, basally-spurred inflorescence bracts and flowers with free basal placentation, Mildbraed (1908) erected sect. *Junceae* Mildbr. and included a single species, *S. junceum* R.Br. (Brown 1810). Since Mildbraed's revision, two additional species have been described: *S. laciniatum* C.A.Gardner (Gardner 1942) and *S. squamosotuberosum* Carlquist (Carlquist 1969). *Stylidium laciniatum* is arguably the most distinctive and spectacular of all species in the genus, having

large, lacinate corolla lobes and an extraordinary twining habit (Figure 1B) with scapes up to three metres high. *Stylidium squamosotuberosum* is also highly distinctive on account of its well-developed rhizome (Figure 1C, inset) and morphologically unique flowers.

The circumscription of *S. junceum*, however, is less clear. Brown's description is based on material he collected in December 1801 from King George Sound in Albany, during Flinders' *Investigator* expedition. Sonder (1845), Bentham (1868) and Mildbraed (1908) subsequently applied this name to a range of morphologically variable collections across a wide geographic range from Albany to Perth (and potentially as far north as Mogumber), treating the morphologically distinct *S. scariosum* DC. (de Candolle 1839) as conspecific. Subsequent authors (Erickson 1958; Carlquist *in sched.*; Wheeler 1987; Paczkowska & Chapman 2000; Wheeler *et al.* 2002) maintained a broad circumscription of *S. junceum* and expanded it to incorporate collections extending north to the Eneabba vicinity.

Pritzel described a diminutive variety of *S. junceum*, collected from the Stirling Range and at the mouth of the Swan River during a botanical expedition to Western Australia with Diels, as *S. junceum* var. *brevius* E.Pritz. (Diels & Pritzel 1905). No additional diagnostic features were provided nor were any specimens cited. Mildbraed (1908) maintained this taxon as a variety of *S. junceum*, citing a Diels collection from north of Albany (*L. Diels* 5521). Carlquist (1969: 32) elevated this taxon to a subspecies on the basis of its diminished height and south coast distribution; however, he did not provide a revised description nor did he cite type material or refer to Pritzel's protologue, which indicated a broader geographical concept. Due to inadequacies in its circumscription, the name *S. junceum* subsp. *brevius* has since been applied to specimens of small stature from throughout the geographic range of the species complex.

Increased collection effort throughout south-western Australia has resulted in significantly more herbarium specimens of reed triggerplants (>460) becoming available for taxonomic study at the Western Australian Herbarium (PERTH). Close examination of these collections, in conjunction with field observations, shows that sect. *Junceae* comprises eight species. Of these, seven were collected during early botanical exploration of the south-west region and sent to various destinations in Europe. Both Bentham (1868) and Mildbraed (1908) viewed material of more taxa than they recognised; however, with relatively few specimens at their disposal and without the aid of field observations, their respective concepts of *S. junceum* were understandably broad. *Stylidium* is notoriously difficult to work with in a dried state and the reed triggerplants, even with the aid of field observations, have proven to be particularly taxonomically challenging. These difficulties are underscored by Brown's type gathering of *S. junceum*, which consists of three distinct species, a fact hitherto overlooked.

### Typification of *Stylidium junceum*

Three species from sect. *Junceae* occur in the vicinity of King George Sound in Albany, the type locality of *S. junceum*, all of which have been recorded flowering in the Albany region during December (the month of Brown's type collection). The first (Figure 1A) is a delicate, pale-flowered taxon with diminutive scapes, persistent basal leaves, a creamy yellow to pale apricot-pink corolla, and a short column (5.8–7 mm long) with narrow anther locules, yellow pollen and a prominently stalked stigma. This species is referable to Mildbraed's (1908) concept of *S. junceum* var. *brevior* [*sic*] and Carlquist's (1969) *S. junceum* subsp. *brevius*. In the Albany region it favours lateritic hillslopes and coastal granitic hills, often growing with jarrah, marri or sheoak. Herbarium records from the Albany region include populations on Mt Clarence (e.g. PERTH 07889259), Mt Adelaide (PERTH 04529898) and in Gull Rock National Park (e.g. PERTH 05669103, PERTH 04433378).



Figure 1. Habit variation in sect. *Junceae*. A – the diminutive habit of *Stylidium junceum*, as recircumscribed herein (J.A. Wege & C. Wilkins JAW 1867); B – the twining scapes of *S. laciniatum* (J.A. Wege & B.P. Miller JAW 1510); C – the rhizomatous *S. squamosotuberosum* (J.A. Wege & R. Butcher JAW 1577; rhizome inset from J.A. Wege & B.P. Miller JAW 1906); D – the reed-like habit of *S. scariosum* showing the relatively small leaf rosette (J.A. Wege & W.S. Armbruster JAW 1707); E – the reed-like habit of *S. thryonides* (J.A. Wege & B.P. Miller JAW 1905).

The second species, named by Carlquist (1969) as *S. squamosotuberosum* (Figure 1C), is a leafless, rhizomatous taxon with robust scapes, prominently caudate and very unequal calyx lobes, medium to deep purple-pink corolla lobes with distinctive, mottled throat markings, and a long column (10.5–14 mm) with greenish pollen and a broad, sessile stigma. *Stylidium squamosotuberosum* prefers peaty, waterlogged depressions and seasonally wet drainage lines, and tends to grow in dense shrublands, thickets and sedgeland, and in dense coastal heath with sedges and pockets of *Agonis flexuosa*. Records from the Albany region include collections from Gull Rock National Park (e.g. PERTH 06941907), Torndirrup National Park (e.g. PERTH 08541019) and Mt Clarence (e.g. PERTH 06941877). At the type locality near Nornalup (west of Albany), Carlquist (1969: 34) noted *S. squamosotuberosum* growing with *S. junceum* subsp. *brevius* (i.e. the delicate, pale-flowered taxon). Whilst the latter is occasionally recorded in swampy habitats (e.g. PERTH 02857863), I have not observed these two species growing together. It is possible that they were growing in close proximity at Carlquist's site but in different vegetation units—the region is known for its diverse and complex, fine-scale vegetation patterning (Sandiford & Barrett 2010).

The third species occurring in the Albany region (Figure 1E), not recognised in previous taxonomic works, has a compact, somewhat lignotuberosus, leafy or leafless stem stock, acute to acuminate and subequal calyx lobes, medium pink corolla lobes with dark pink or purplish pink throat markings, and a column of intermediate length (7–9.5 mm) with yellow pollen and a shortly stalked stigma. This taxon grows on coastal dune systems in association with *Agonis flexuosa*, either in low woodland or dense coastal heath. There are herbarium records from south of the township (e.g. PERTH 03124487, PERTH 06962513), including a recently discovered site in Torndirrup National Park where it grows intermixed with *S. squamosotuberosum* (PERTH 08541027) without hybridisation.

I have located and examined type material of *S. junceum* at BM, E, FI, K and P. Individuals of the delicate, pale-flowered taxon are clearly identifiable on BM 000812596 (Figure 2) and K 000060236 by the presence of basal leaves, relatively short, delicate scapes, and the highly distinctive floral columns. Brown also collected taller individuals with longer columns; however, confidently assigning this material to either *S. squamosotuberosum* or to the medium pink-flowered taxon is difficult in view of their similarity once pressed, the age of the material, and the fact that some of it is fragmentary (i.e. lacking the diagnostic stem stock). Moreover, I have not had the opportunity to directly compare the types housed at these different institutions, having instead viewed them in a piecemeal fashion over a number of years. Nonetheless, I have come to the opinion that Brown gathered material of both taxa. The left hand individual on BM 000812584, and the individuals and fragments on FI-W 113157, E 00208676 and E 00208675 appear referable to the medium pink-flowered taxon on account of their small, compact stem stock, persistent leaves and acute to acuminate and subequal calyx lobes. I am inclined to refer the two individuals and scape fragment on K 000355053 (mounted to the left of K 00060236, a specimen of the pale-flowered taxon) to *S. squamosotuberosum* due to the prominently caudate calyx lobes. The rhizomes are somewhat poorly developed for this species (although the rhizome of the left hand individual appears to have been incompletely sampled). I am also confident that the two scape fragments on BM 000812596 with developing capsules are *S. squamosotuberosum* on the basis of the capsule shape (capsules in this species are more or less ellipsoid to obloid while those in the medium-pink flowered taxon are ovoid to deltoid). I have also tentatively referred the scape fragments on P 00313152 and the central fragment and right hand individual on BM 000812584 to *S. squamosotuberosum*. It is worth noting that Ferdinand Bauer, artist on board the Flinders' expedition, also made a gathering of *S. squamosotuberosum* (K 000060233).

Brown's (1810) description of *S. junceum* is short and mentions features characteristic of all three species including the glabrous scapes with adnate bracts, lacinate calyx lobes, glandular-hairy throat





Figure 2. Part of Robert Brown's type gathering of *Stylidium junceum* (BM 000812596). The three individuals herein designated as the lectotype of *S. junceum* are indicated with a black arrow head. The left hand specimen is treated as an isolectotype while the two remaining scape fragments have been referred to *S. squamosotuberosum*.

appendages and the lack of lateral appendages on the labellum. He describes the leaves as basal and linear (a feature that is at odds with *S. squamosotuberosum*, which is usually leafless at maturity, and with his fragmentary collections). Brown's descriptive slip for *S. junceum*, housed in the botany library of the Natural History Museum London, was examined for additional information; however, this was of little use since the handwriting was partly illegible.

I have chosen to apply the name *S. junceum* to the delicate, pale-flowered taxon due to the relatively certain identity of those specimens and my uncertainty in interpreting some of the remaining specimens collected by Brown. Three individuals on BM 000812596 have been chosen as the lectotype (Figure 2). The left hand individual, which is in fruit, bears a separate label and is annotated as 'Stylidium junceum?' by Brown and is herein treated as an isolectotype. With *S. junceum* thus defined, *S. junceum* subsp. *brevius* can be treated as a synonym (typification notes are provided below under *S. junceum*), *S. squamosotuberosum* remains valid, and the medium pink-flowered taxon requires a name (treated below as *S. thryonides* Wege). This treatment also recognises De Candolle's *S. scariosum* as well as a further three new species: *S. hesperium* Wege, *S. hygrophilum* Wege and *S. paludicola* Wege.

### Methods

This study is based on examination of herbarium specimens, spirit collections and wild populations. Habit and foliage characters and gross inflorescence features (e.g. scape height, bract length, flower number) were mostly coded from material housed at PERTH. Flowers preserved in 70% ethanol were dissected for accurate measurement of floral features from the following *J.A. Wege* collection numbers: *S. hesperium* – 924, 1080, 1225, 1132, 1135, 1207, 1218, 1261, 1262; *S. hygrophilum* – 1131, 1263; *S. junceum* – 83, 784, 808, 821, 1068, 1138, 1234, 1272, 1276, 1802; *S. laciniatum* – 458, 864; *S. paludicola* – 1081, 1130, 1246c, 1383, 1475; *S. scariosum* – 652, 671, 736, 936, 911, 1085, 1102, 1106; *S. squamosotuberosum* – 806, 841, 856, 1310, 1326, 1906; *S. thryonides* – 1309, 1323, 1328, 1905.

Sorting of herbarium collections at PERTH was hindered by the difficulties associated with interpreting pressed material. Diagnostic floral characteristics such as shape and colour of the corolla lobes and throat markings, column length and morphology, and stigma dimensions are difficult or impossible to accurately discern from herbarium specimens. Furthermore, it is not uncommon for collectors to sample the upper portion of the scape whilst leaving the diagnostic stem stock *in situ* (e.g. herbarium specimens of *S. squamosotuberosum* often lack the characteristic rhizome that is buried to a depth of up to 10 cm). In some instances, specimen identification was aided by applying knowledge gleaned from field work.

The eight taxa recognised herein each have a combination of morphological characters or features that is unique within *Stylidium*. Column morphology is of taxonomic utility, including overall length (from base to tip when fully extended), length of the anther locules (measured when full of pollen), width of the column head (the tissue at the tip of the column which is connected to the anthers and stigma), morphology and size of the stigma (the measurements given are the dimensions of the stigmatic surface at maturity), and whether there is a line of demarcation between the main axis of the column and the head (present to varying degrees in three of the taxa and a unique feature within the genus, to my knowledge). Column morphology is normally very consistent within species of *Stylidium*. Species boundaries make sense ecologically, both in terms of distribution patterns and habitat preferences. Distribution maps are based on PERTH specimen data and include *Interim Biogeographic Regionalisation for Australia* (IBRA) bioregions (Department of the Environment 2013).

**Key to *Stylidium junceum* and allies**

1. Scapes twining, 1.5–3 m high; corolla lobes lacinate; column 17–24 mm long  
[Warren and adjacent Southern Jarrah Forest] ..... **S. laciniatum**
- 1: Scapes erect, suberect or ascending, <1.5 m high; corolla lobes entire;  
column <14 mm long
2. Stems elongated and rhizomatous, usually well-buried; basal leaves  
absent (very rarely present)
3. Corolla pale pink to apricot-pink, suffused darker pink at margins,  
with discrete pinkish red throat markings and a white or yellow throat;  
calyx lobes with a hyaline border for all or at least 3/4 of their length,  
greenish with red flecks with the longest lobes acuminate; pollen yellow  
[Southern Jarrah Forest] ..... **S. hygrophilum**
- 3: Corolla medium to deep purple-pink with a white throat and red or mauve  
mottled markings; calyx lobes with a hyaline border for the lower 1/2–3/4  
of their length, usually dark reddish black (rarely greenish red), the longest  
lobes strongly caudate; pollen greenish [Warren, Southern Jarrah Forest] ..... **S. squamosotuberosum**
- 2: Stems compact, situated above ground level or shallowly buried but never  
forming an elongated rhizome; basal leaves present (sometimes caducous,  
particularly in older individuals)
4. Calyx lobes caudate, with the hyaline border not extending beyond the lower  
3/4 of the lobe; column 9–10.5 mm long [Swan Coastal Plain and adjacent  
Southern Jarrah Forest] ..... **S. paludicola**
- 4: Calyx lobes attenuate or acuminate, with a hyaline border for all or at least  
3/4 of their length; column <9 mm long
5. Calyx lobes subequal, the two external lobes to 1.3 mm longer than the  
three axial lobes
6. Corolla creamy yellow to apricot-pink, usually suffused darker at the  
margins; column with a sharp line of demarcation between the axis and  
the head; anther locules 0.2–0.4 mm wide; stigma 0.1–0.2 × 0.1–0.15 mm  
[Fitzgerald, Warren, Jarrah Forest, southern tip of Swan Coastal Plain] ..... **S. junceum**
- 6: Corolla pale to medium pink; column with a faint line or no demarcation  
between the axis and the head; anther locules 0.4–0.7 mm wide;  
stigma ≥0.2 × 0.2 mm
7. The two larger calyx lobes 3–6 mm long and usually 1–2 mm longer  
than the 3 smaller lobes; mature stigma 0.2–0.3 × 0.15–0.2 mm;  
column with a faint line of demarcation between the axis and the head;  
corolla commonly pale pink, or medium pink [Swan Coastal Plain,  
Warren (Leeuwin-Naturaliste ridge)] ..... **S. hesperium**
- 7: The two larger calyx lobes 3.5–4.2 mm long and <1(–1.3) mm longer  
than the 3 smaller lobes; mature stigma 0.4–0.6 × 0.3–0.5 mm;  
column with no line of demarcation between the axis and the head;  
corolla medium pink [Warren, Southern Jarrah Forest near Albany] ..... **S. thryonides**
- 5: Calyx lobes markedly unequal, the two external lobes 1.5–3 mm longer  
than the three axial lobes

8. Inflorescence with an overall markedly scarious appearance due to the broad hyaline borders on the floral bracts and calyx lobes, the apex of the 3 smaller lobes obtuse or obcordate; column dilated distally, with a sharp line of demarcation between the axis and the head [Lesueur Sandplain, Swan Coastal Plain, Northern Jarrah Forest] ..... **S. scariosum**
- 8: Inflorescence scarious but less so than above, the hyaline border of the 3 smaller calyx lobes tapering to the apex or stopping a little below the apex; column tapering from the main bend to the tip, with a very faint line of demarcation between the axis and the head [Lesueur Sandplain, Swan Coastal Plain, Warren (Leeuwin-Naturaliste ridge)] ..... **S. hesperium**

### Taxonomy

#### **Styloidium hesperium** Wege, *sp. nov.*

*Type:* c. 1.5 km east along Jurien Bay Road from Indian Ocean Drive, Western Australia, 1 October 2004, J.A. Wege & K.A. Shepherd JAW 1218 (*holotype:* PERTH 07212305; *isotypes:* CANB, MEL).

[*Styloidium junceum* auct. non R.Br.: G. Bentham, *Fl. Austral.* 4: 9 (1868), *p.p.*; J. Mildbraed, in Engl., *Pflanzenr.* IV. 278 (Heft 35): 51 (1908), *p.p.*; J.R. Wheeler in N. Marchant *et al.*, *Fl. Perth Region 2:* 619 (1987), *p.p.*]

*Reed-like perennial herb* 10–70 cm high, with a compact *stem* often positioned at or just above soil level or occasionally shallowly buried; stilt roots often present. *Glandular trichomes* 0.15–0.4 mm long, with red to reddish black, ellipsoid or obloid heads. *Leaves* in a basal rosette or tuft, persistent throughout flowering or caducous, subulate to linear or narrowly oblanceolate, 1–3.5 cm long, 0.7–2.5 mm wide, acute and usually shortly mucronate, entire, glabrous (rarely minutely papillose). *Scapes* 2–30 per individual, erect to suberect or ascending, unbranched (rarely with tendril-like lateral branches), 10–70 cm high, 0.5–2 mm wide, with scattered sterile bracts, glabrous except for the glandular hairs above the lowest flower; sterile bracts 2.5–8 mm long, with a basal spur 1–3 mm long, ± caducous. *Inflorescence* a dense, head-like or shortly elongate raceme, 3–40-flowered, 1–4.5 cm long; bracts lanceolate, 4–9 mm long, 1.8–2.8 mm wide, attenuate, hyaline to just below the apex with the hyaline border ± entire or erose and 0.4–0.8 mm wide, with a basal spur 0.5–2.5 mm long, glabrous; prophylls paired at distal end of pedicel, linear-lanceolate or subulate, 3–5 mm long, 0.6–1.4 mm wide, sparsely glandular-hairy (rarely glabrous); pedicels 1.5–3 mm long, glandular-hairy (the hairs sometimes restricted to the axial side). *Hypanthium* ovate to elliptic, usually slightly arcuate on axial side, 2.3–4 mm long, 1.3–2 mm wide, glandular-hairy (the hairs sometimes restricted to the axial side). *Calyx lobes* free, unequal in length, attenuate or acuminate, hyaline throughout or to just below the apex with the hyaline portion entire or somewhat erose and 0.1–0.5 mm wide, glandular-hairy or occasionally glabrous; the larger (external) two lobes 3.5–6 mm long, 1–2 mm longer than the three smaller (axial) lobes which are 2.5–4.2 mm long. *Corolla* tube 1–2 mm long; lobes very pale to medium pink, darker on the reverse, with pink throat markings and a yellow or white throat, paired laterally with the posterior pair overlapping the anterior pair, elliptic to obovate, 4.5–6.8 mm long, 2.8–4.8 mm wide, entire, glandular-hairy abaxially. *Labellum* reflexed and angled across the calyx, ovate, 0.7–1.1 mm long, 0.6–0.8 mm wide, with a terminal appendage 0.1–0.6 mm long, glabrous or sparsely glandular-hairy on the margin and/or abaxial surface; lateral appendages absent. *Throat appendages* comprising irregular, glandular-hairy protuberances arranged in a semi-circle, to 0.3 mm high. *Column* with a single bend at the throat of the flower when poised, sometimes slightly upturned at the apex, with a slight lateral curve when extended, tapering from the main bend to the head, with a



faint line of demarcation evident between the axis and the head and sometimes with a faint constriction, yellow near the base and pinkish red or purplish pink distally with a purplish maroon marking usually present immediately above the hinge, 6.5–8.8 mm long, 0.8–1.2 mm wide at the head, glabrous; anther locules yellow fading to yellow-brown, *c.* 0.9–1.2 mm long, 0.5–0.6 mm wide; pollen yellow; stigma stalked, 0.2–0.3 mm long, 0.15–0.2 mm wide. *Capsule* ovoid to deltoid, usually slightly arcuate on axial side, 2.5–6 mm long excluding calyx lobes; *seeds* brown, 0.6–1 mm long, 0.25–0.3 mm wide, the surface with membranous sculpturing. (Figure 3)

*Diagnostic features.* The following features differentiate *S. hesperium* from the other species in sect. *Junceae*: three smaller (axial) calyx lobes with a membranous border that tapers to an attenuate apex or stops a little below (forming an acuminate apex); two larger (external) calyx lobes 3.5–6 mm long and 1–2 mm longer than the three smaller lobes; a column 6.5–8.5 mm long with a faint line of demarcation between the axis and the head; a stalked stigma (0.2–0.3 mm × 0.15–0.2 mm); pale to medium pink corolla lobes that are usually a darker shade on the undersurface (and therefore in bud); a compact stem stock (shallowly buried or not so) with persistent or caducous basal leaves.

*Selected specimens.* WESTERNAUSTRALIA: near Bunker Bay, E of Cape Naturaliste, 30 Oct. 1983, *M.G. Corrick* 8989 (MEL, PERTH); boundary Lesueur/Drovers, Lesueur National Park, 18 Sep. 1993, *B. Evans* WE 691 (PERTH); Cockleshell Gully, 15 Oct. 1946, *C.A. Gardner* 8414 (PERTH); N side of Hooley Rd, *c.* 1 km from beach, Leeuwin-Naturaliste National Park (Plot: hr3), 28 Nov. 1989, *N. Gibson & M. Lyons* 258 (PERTH); Redemptora Rd, Naval Base, Perth to Rockingham, 25 Oct. 1987, *G.J. Keighery* 9227 (PERTH); Nambung National Park, 110 miles N of Perth, 9 Oct. 1971, *R.D. Royce* 9774 (PERTH); 2.9 km E on Eneabba – Coolimba Rd from Indian Ocean Drive, 8 Oct. 2003, *J.A. Wege* 924 (CANB, MEL, PERTH); W end of White Hill Rd, Yalgorup National Park, 6 Nov. 2003, *J.A. Wege* 1080 (PERTH); Sugar Loaf Rock Rd, Leeuwin-Naturaliste National Park, 15 Nov. 2003, *J.A. Wege* 1135 (CANB, MEL, PERTH); *c.* 400 m N of track to Illawong, Indian Ocean Drive, N of Leeman, 29 Sep. 2004, *J.A. Wege & K.A. Shepherd* JAW 1207 (CANB, MEL, PERTH); 600 m E on Forest Grove Rd from Caves Rd, Leeuwin-Naturaliste National Park, 3 Nov. 2004, *J.A. Wege* 1262 (CANB, MEL, PERTH); Cape Naturaliste, 5 Nov. 1974, *D.J.E. Whibley* 5024 (AD, PERTH).

*Proposed vernacular name.* Western Reed Triggerplant.

*Phenology.* Flowers from August to November, with peak flowering in September and early October in the north of its range, and late October to mid-November in the south of its range.

*Distribution and habitat.* Occurs on sandy soils in limestone habitats in the Lesueur Sandplain subregion, and the Swan Coastal Plain and Warren bioregions, from Dongara to the Leeuwin-Naturaliste ridge (Figure 3J). South of Perth, it has mostly been recorded from coastal scrub or heath, *Eucalyptus gomphocephala* or *Agonis flexuosa* woodland, and low *Melaleuca* shrubland with scattered *Agonis* and *Nuytsia*. There is an isolated record from mixed *Eucalyptus* forest south-east of Margaret River. In the Perth region and north thereof, *S. hesperium* is mostly known from mallee heath, low coastal heath or coastal scrub. A possible record of *S. hesperium* from clay soils in a seasonal wetland south-east of the Pinnacles (PERTH 06378633) requires field validation since it may be referable to *S. paludicola*.

*Conservation status.* Locally common within conservation reserves at several sites across its range. No conservation code is warranted.

*Chromosome number.* James (1979) recorded a chromosome number of  $n = 16$  from a population near Margaret River, as *S. junceum* subsp. *junceum* (PERTH 02858088).

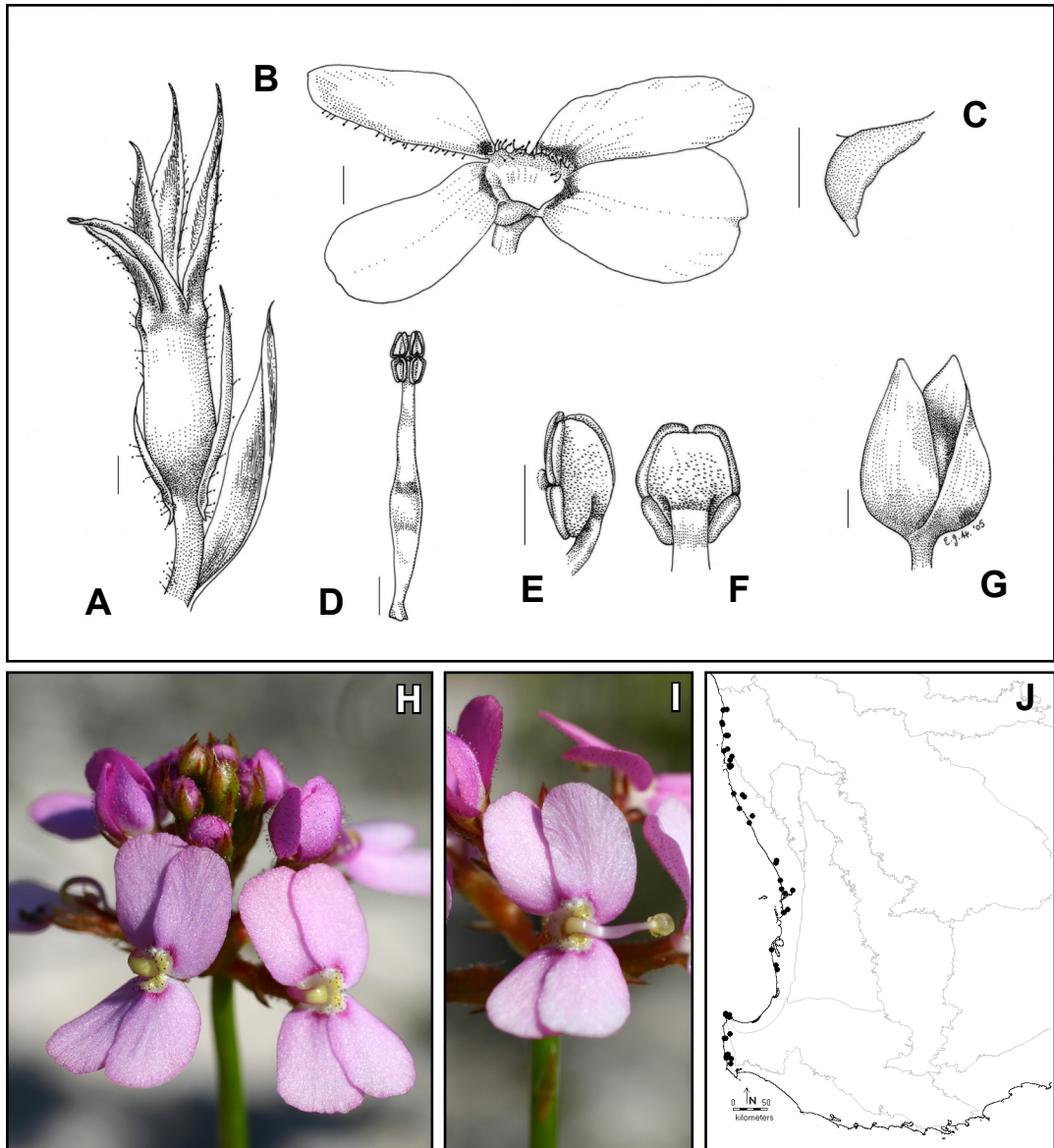


Figure 3. *Stylidium hesperium*. A – hypanthium and calyx lobes with subtending floral bract and paired prophylls; B – corolla; C – labellum; D – column; E – side view of column apex showing developing stigma; F – head of column showing the faint line of demarcation with the main axis; G – capsule; H – inflorescence; I – flower with the column triggered; J – distribution in the south-west of Western Australia. Scale bars at 1 mm. Drawings by Ellen Hickman from *J.A. Wege* 924 with scale bars at 1 mm; photographs from *J.A. Wege* 1207.

**Etymology.** The epithet is derived from the Latin *hesperius* (western), and reflects the west coast distribution of this species.

**Affinities.** *Stylidium hesperium* may be confused with *S. scariosum*. The most obvious difference between these two species is the hyaline border of the calyx lobes and bracts, which tends to be less prominent in *S. hesperium*, tapering evenly to the tip of the three smaller calyx lobes or stopping a little below the apex. In contrast, the margin is broadly hyaline at the apex of the three smaller calyx

lobes in *S. scariosum* and shaped to form an obtuse to obcordate rather than attenuate or acuminate apex. Columns of the two species differ in morphology (although these differences are very difficult to detect on pressed material). In *S. hesperium*, the column tapers evenly from the main hinge to the head of the column and there is a faint line of demarcation between the axis of the column and the head (Figure 3D, F, I). In *S. scariosum*, the column is a little dilated distally (see Figure 8I) and has a strong line of demarcation between the axis and the head (see Figure 8F). *Stylidium hesperium* prefers coastal limestone habitats and has a more westerly distribution to that of *S. scariosum*.

On the Swan Coastal Plain, *S. paludicola* may also be confused with *S. hesperium*, although it is confined to swampy habitats. *Stylidium paludicola* is most readily differentiated from *S. hesperium* by the apices of the longest calyx lobes, which are prominently caudate rather than attenuate or acuminate (i.e. the membranous margin stops well below the apex). It also has a longer column (9–10.5 mm *cf.* 6.5–8.5 mm in *S. hesperium*) with no line of demarcation evident between the axis and the head, and a larger stigma (0.4–0.8 × 0.3–0.5 mm *cf.* 0.2–0.3 × 0.15–0.2 mm in *S. hesperium*) and usually has corolla lobes that are a deeper shade of pink and with more prominent throat appendages. *Stylidium thryonides* differs from *S. hesperium* in column morphology, with no line of demarcation evident between the column axis and head, and a larger stigma (0.4–0.6 × 0.3–0.5 mm). The difference between the two longest and three shortest lobes tends to be less pronounced in *S. thryonides* (usually <1 mm). *Stylidium thryonides* is restricted to the south coast and does not overlap in distribution with *S. hesperium*.

*Notes.* *Stylidium hesperium* can exhibit quite a stunted habit, particularly in windswept areas along the coast. A specimen from such a habitat is likely to have been included by Pritzel under his concept of *S. junceum* var. *brevius* (refer to the typification section under *S. junceum*). Historical collections of *S. hesperium* include those by Hügel (K 000060232!, W!), Drummond (K 000060224!), Collie (K 000355067!) and Mangles (CGE!).

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

*Type:* south of Busselton, Western Australia [precise locality withheld for conservation purposes], 14 November 2003, J.A. Wege 1131 (*holotype*: PERTH 06962505; *isotypes*: CANB, MEL).

[*Stylidium junceum* *auct. non* R.Br.: G. Bentham, *Fl. Austral.* 4: 9 (1868), *p.p.*]

*Reed-like perennial herb* 20–70 cm high, with a well-buried, rhizomatous *stem*; stilt roots absent. *Glandular trichomes* 0.2–0.6 mm long, with reddish black or black, ellipsoid or obloid heads. *Leaves* reduced to small, reddish brown scales on the rhizome and sometimes on the lower portion of the scape. *Scapes* 1–3(–9) per individual, erect, unbranched or branched in lower portion, 20–70 cm long, 1.2–3.2 mm wide, with scattered sterile bracts, glabrous except for glandular hairs above the lowest flower; sterile bracts 4–9 mm long, with a basal spur 1.7–4.5 mm long, ± caducous. *Inflorescence* a dense, head-like or shortly elongate raceme, 3–30-flowered, 2–8 cm long; bracts lanceolate, 5.5–10 mm long, 1.5–2.5 mm wide, attenuate to acuminate, the lower 3/4 of the margin with a ± entire or faintly erose hyaline border 0.3–0.6 mm wide, with a basal spur 1.2–5 mm long, glabrous or sparsely glandular-hairy; prophylls paired at distal end of pedicel, linear-lanceolate, 3–4.5 mm long, 0.5–1.2 mm wide, glabrous or sparsely glandular-hairy; pedicels 1–3.5 mm long, glandular-hairy. *Hypanthium* narrowly elliptic to oblong, slightly arcuate on axial side, 3.5–5.5 mm long, 1.5–2.3 mm wide, glandular-hairy. *Calyx lobes* free, unequal in length, attenuate to acuminate, hyaline for all or at least 3/4 of the length with the hyaline portion ± entire to faintly erose and 0.1–0.4 mm wide, sparsely glandular-hairy; the

larger (external) two lobes 3.5–5.5 mm long, 1–1.7 mm longer than the three shorter (axial) lobes which are 2.5–3.8 mm long. *Corolla* tube 1.5–2.5 mm long; lobes pale pink or apricot-pink, usually suffused a darker shade at margins and on the reverse, with pinkish red throat markings and a white or yellow throat, paired laterally, with the posterior pair overlapping the anterior pair, narrowly elliptic to oblong, 5–8.2 mm long, 3–4.5 mm wide, entire, glandular-hairy abaxially. *Labellum* reflexed and angled across the calyx, ovate, 1–1.5 mm long, 0.8–1.2 mm wide, with a terminal appendage 0.3–0.8 mm long, glabrous; lateral appendages absent. *Throat appendages* comprising irregular, glandular-hairy protuberances arranged in a semi-circle, to c. 0.2 mm high. *Column* sigmoid when poised, with a slight lateral curve when extended, evenly tapering from the main bend to the head and with no line of demarcation evident between the axis and the head, yellow near the base and dark pinkish red distally with a reddish maroon marking immediately above the hinge, 11–13 mm long, 1.4–2 mm wide at the head, glabrous; anther locules yellowish brown fading to brownish black, 1–1.5 mm long, 0.6–0.8 mm wide; pollen yellow; stigma sessile, 0.6–1 mm long, 0.5–0.8 mm wide. *Capsules* obloid, slightly arcuate on axial side, 7–11.5 mm long excluding calyx lobes; *seeds* not seen. (Figure 4)

*Diagnostic features.* The following features can be used to differentiate *S. hygrophilum* from the other species in sect. *Junceae*: a leafless, rhizomatous habit; pale pink or apricot-pink corolla lobes that are usually suffused a darker shade at the margins and on the undersurface; calyx lobes with a membranous border for all or at least 3/4 of their length; a long column (11–13 mm) with yellow pollen and a large, sessile stigma; obloid capsules.

*Selected specimens.* WESTERNAUSTRALIA: [localities withheld for conservation purposes] 16 Nov. 2001, R.J. Cranfield 17512 (PERTH); *s. dat.*, J. Drummond 133 (MEL); *s. dat.*, J. Drummond *s.n.* (K); [1859–1863], A.F. Oldfield *s.n.* (K); 3 Nov. 2004, J.A. Wege 1263 (PERTH); 14 Nov. 2013, J.A. Wege & A. Webb JAW 1931 (PERTH).

*Proposed vernacular name.* Blackwood Reed Triggerplant.

*Phenology.* Flowering has been recorded in November.

*Distribution and habitat.* Known from a small number of sites on the Blackwood River Plateau, south of Busselton in the Southern Jarrah Forest (Figure 4J). Grows in seasonally wet swamp flats in shallow white-grey peaty sand over clay in open *Taxandria fragrans* or *T. linearifolia* shrubland (occasionally extending into forest ecotones under *Corymbia calophylla*) or in sedgeland with very open *Melaleuca preissiana*. Additional indicator species include *Melanostachya ustulata*, *Hodgsoniola junciformis*, *Dasyogon bromeliifolius* and *D. hookeri*.

*Conservation status.* Currently listed as Priority One under Department of Parks and Wildlife Conservation Codes for Western Australian Flora (Smith 2013). *Stylidium hygrophilum* has a highly specific habitat preference and is known from only three localities. Targeted surveys in November 2013 recorded a total of 124 plants, with severe habitat decline observed at one site due to the apparent depletion of ground water supplies upon which the swamp habitats rely. Mining related activities in the region may also pose a threat to this species. Further surveys are planned for 2014 with a view to nominating this species for listing as Threatened in Western Australia.

*Chromosome number.* Unknown.

*Etymology.* The epithet is from the Greek *hygrophilus* (moisture-loving), and refers to the swampy habitat preference of this species.



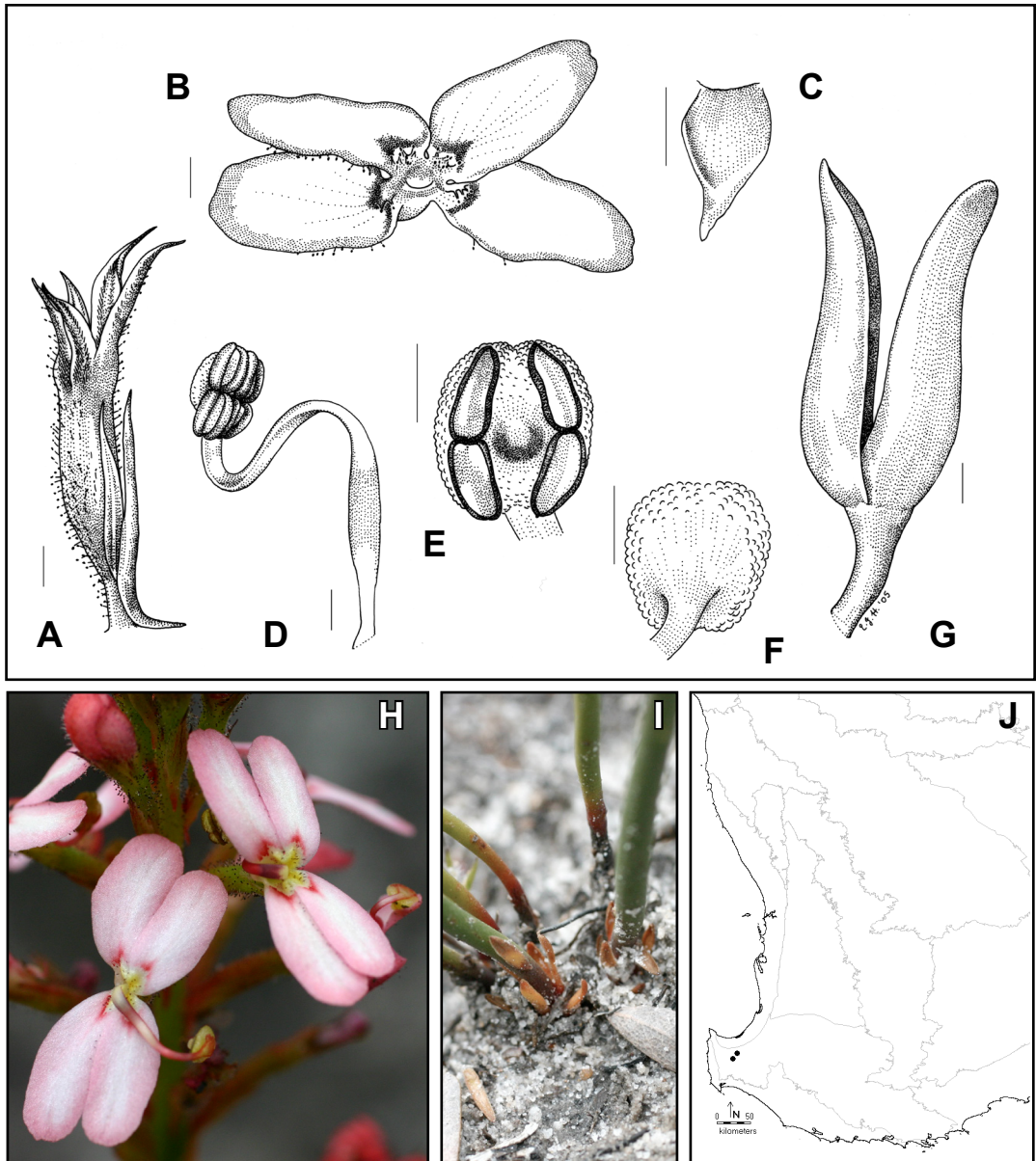


Figure 4. *Stylidium hygrophilum*. A – hypanthium and calyx lobes with subtending floral bract and paired prophylls; B – corolla; C – labellum; D – column; E – dehiscent anthers and developing stigma; F – column head, which is broad and not demarcated with respect to the column axis; G – capsule; H – flowers (the column on the left hand one has been triggered); I – base of an individual showing reddish brown scales at the base of the scapes and the sandy substrate (the stems are rhizomatous and well-buried); J – distribution in the south-west of Western Australia. Drawings by Ellen Hickman from J.A. Wege 1263 with scale bars at 1 mm; photographs also from J.A. Wege 1263.

*Affinities.* *Stylidium hygrophilum* co-occurs with *S. squamosotuberosum* at the type locality and at a nearby site (PERTH 08540918); however, the two species occur on distinct soil types, with the former confined to shallow greyish sand over clay and the latter to heavy brownish clays. They grow intermixed in some areas due to the complex, fine-scale patterning of these soil types. Both species have a rhizomatous habit and obloid capsules but their flowers are markedly different. *Stylidium hygrophilum* is characterised by a pale pink or apricot-pink corolla that is usually suffused darker pink at the margins

and on the undersurface (and hence in bud), and bears discrete pinkish red markings near the throat (Figure 4B, H). In contrast, *S. squamosotuberosum* has a much darker purple-pink corolla that is a similar (or only slightly darker) shade on the undersurface, with distinctive red to mauve and white mottled markings near the throat (see Figure 9B, H, I). The posterior corolla lobes overlap the anterior pair in both species, however, they are slightly raised above the anterior pair in *S. squamosotuberosum*. The two species are difficult to distinguish when pressed. *Stylidium hygrophilum* tends to have slightly longer hypanthia (3.5–5.5 mm long *cf.* 2.5–4 mm in *S. squamosotuberosum*) and the tips of the calyx lobes (which are attenuate to acuminate and with the hyaline border often extending to near the tip) are less prominent than those of *S. squamosotuberosum* (which are very prominently caudate, and with the hyaline border stopping well below the apex). The colour of the calyx lobes tends to differ between the taxa (greenish flecked with red in *S. hygrophilum* *cf.* usually dark reddish black in *S. squamosotuberosum*). Pollen colour is also informative (yellow in *S. hygrophilum* and greenish in *S. squamosotuberosum*) although this can be difficult to accurately interpret, particularly on older specimens.

*Stylidium hygrophilum* may be confused with *S. junceum*, a species that also occurs on the Blackwood Plateau and that has similarly pale pink to apricot-pink corolla lobes that are darker near the margins and on the undersurface. Unlike *S. hygrophilum*, *S. junceum* grows in lateritic soils in forested habitats and has a non-rhizomatous habit with a distinct, basal leaf rosette, a shorter column (<7 mm long), a narrower column tip and anthers, and a smaller, stalked stigma.

*Notes.* *Stylidium hygrophilum* was collected in the 1800s by Oldfield (K 000355064!, K 000355065!), Drummond (K 000355048!, MEL 2259688!) and Miss Bunbury (MEL 2257765!, MEL 2258669B!) but was not recollected until 2001, when Ray Cranfield gathered a voucher specimen (as *S. junceum*) as part of a rare flora survey of the Central Forest Region.

**Stylidium junceum** R.Br., *Prodr. Fl. Nov. Holland.*: 569 (1810). *Candollea juncea* (R.Br.) F.Muell., *Syst. Cens. Austral. Pl.*: 85 (1882). *Type citation*: '(M.) v.v.' *Type specimen*: Princess Royal Harbour, King George's Sound, [Western Australia], December 1801, R. Brown s.n. [Bennett No. 2598] (*lectotype, here designated*: BM 000812596! [the three individuals with numerous scapes]; *isolectotypes*: BM 000812596! [left hand individual], K 000060236! [right hand individual]. *Paralectotypes*: BM 000812584! [left hand individual], E 00208675!, E 00208676!, FI-Webb 113157!, K 000355053! [left hand individuals and scape fragment] = *S. thryonides*; BM 000812596! [scape fragments either side of the 3 lectotype individuals], BM 000812584! [central fragment and right hand individual], K 000355053!, P 00313152! = *S. squamosotuberosum*).

*Stylidium junceum* subsp. *brevius* (E.Pritz.) Carlquist, *Aliso* 7(1): 32 (1969). *Stylidium junceum* var. *brevius* E.Pritz., in Diels & E. Pritz., *Bot. Jahrb. Syst.* 35: 591 (1905); *S. junceum* var. *brevior*, orth. var., J. Mildbraed, in Engl., *Pflanzenr.* IV. 278 (Heft 35): 51 (1908), *syn. nov.* *Type citation*: 'in solo aridiore, e. gr. in dunis arenoso-calcareis ad ostium fluminis Swan River flor. m. Nov. et in distr. Stirling pr. Albany in silvis arenoso-glareosis.' *Type specimens*: [not cited; given by J. Mildbraed, *op. cit.* 53 as 'West-Australien: Distr. Stirling: S. Plantagenet nördlich von Albany, in niedrigen auf Kiesboden', 15 November 1901, L. Diels 5521] (*syn.*: B n.v., destroyed in WWII). *Neotype*: Chester Pass Road, south boundary of Stirling Range National Park, Western Australia, 13 October 2011, J.A. Wege & C. Wilkins JAW 1867 (*neotype, here designated*: PERTH 08541000; *isoneotypes*: CANB, MEL).

*Illustrations.* F. Mueller, *Icon. Candollaceous Pl.* (1892), as *Candollea juncea*.

*Diminutive or reed-like perennial herb* 7–30(–50) cm high, with a compact or shortly elongate *stem* positioned above soil level; stilt roots usually present. *Glandular trichomes* 0.15–0.5 mm long, with red to reddish black, ellipsoid to obloid heads. *Leaves* in a basal rosette or tuft, persistent throughout flowering, subulate to linear or narrowly-oblongate, 0.5–2.2 cm long, 0.5–1.8 mm wide, acute to attenuate and usually shortly mucronate, entire, glabrous or minutely papillose. *Scapes* (1)2–25 per individual, erect to suberect or ascending, unbranched, 7–30(–50) cm long, 0.4–1.6 mm wide, with scattered sterile bracts, glabrous except for glandular hairs above the lowest flower; sterile bracts 1.7–5 mm long, with a basal spur 0.5–1.5 mm long, ± caducous. *Inflorescence* a dense head-like or shortly elongate raceme, 3–25-flowered, 1–4 cm long; bracts linear-lanceolate to lanceolate, 2.5–7 mm long, 0.8–1.5 mm wide, acute to attenuate, hyaline to just below the apex with the hyaline border ± entire to erose and 0.1–0.3 mm wide, with a basal spur 0.5–2 mm long, glabrous; prophylls paired at distal end of pedicel, linear-lanceolate, 2–4 mm long, 0.5–0.7 mm wide, glabrous or sparsely glandular-hairy; pedicels 1.5–6 mm long, glandular-hairy, with the hairs often restricted to the axial side. *Hypanthium* narrowly ovate, elliptic or oblong, 1.5–5 mm long, 0.6–1.8 mm wide, glandular-hairy, with the hairs sometimes restricted to axial side. *Calyx lobes* free, unequal in length, attenuate to acuminate, hyaline for all or at least 3/4 of their length with the hyaline portion ± entire or erose and 0.1–0.3 mm wide, sparsely glandular-hairy or glabrous; the larger (external) two lobes 3–4.5 mm long, 0.2–1 mm longer than the three shorter (axial) lobes which are 2.5–3.7 mm long. *Corolla* tube 1–1.7 mm long; lobes creamy yellow to pale apricot-pink, usually suffused a darker shade at margins and on the reverse, with pink throat markings and a yellow throat, paired laterally, with the posterior pair overlapping the anterior pair, elliptic to oblong, 3–6.5 mm long, 1.8–3.8 mm wide, entire, glandular-hairy abaxially. *Labellum* reflexed and angled across the calyx, ovate, 0.6–0.8 mm long, 0.4–0.7 mm wide, with a terminal appendage 0.2–0.7 mm long, glabrous; lateral appendages absent. *Throat appendages* comprising irregular, glandular-hairy protuberances arranged in a semi-circle, to c. 0.2 mm high. *Column* with a single bend at the throat of the flower when poised, with a slight lateral curve when extended, evenly tapering towards the head and with a strong line of demarcation between the axis and the head, yellow, occasionally pink at distal end, 5.8–7 mm long, 0.5–0.9 mm wide at the head, glabrous; anther locules pale yellow, distinctly narrow, 0.9–1.2 mm long, 0.2–0.4 mm wide; pollen yellow; stigma stalked, 0.1–0.2 mm long, 0.1–0.15 mm wide. *Capsules* ovoid to narrowly ovoid or obloid, axial side often slightly arcuate, 4–8 mm long excluding calyx lobes; *seeds* brown, 0.8–1 mm long, 0.2–0.3 mm wide, the surface with membranous sculpturing. (Figures 1A; 5)

*Diagnostic features.* The following features differentiate *S. junceum* from the other species in sect. *Junceae*: a short column (5.8–7 mm long) with a strong line of demarcation between the axis and the head, unusually narrow anther locules (0.2–0.4 mm wide) and a small, stalked stigma; a stilt habit with persistent basal leaves; pale creamy yellow, apricot-pink or pink corolla lobes which are usually suffused a darker shade at the margins and on the undersurface (and therefore in bud). Note the morphology of the column tip (see Figure 5E, F) is usually clearly visible on flowering specimens and is highly distinctive within the genus.

*Selected specimens.* WESTERN AUSTRALIA: Porongurups mountains, 27 Oct. 1962, *S. Carlquist* 945 (G, K, RSA); near 14 mile peg from Albany on Chester pass Rd, 13 Oct. 1967, *S. Carlquist* 3763 (RSA); c. 5 miles W of Nornalup, 10 Nov. 1967, *S. Carlquist* 4059 (NSW, RSA); along the Stewart Hwy from Pemberton to Nannup, 19 Oct. 1974, *S. Carlquist* 6076 (RSA); S off Bowelling Duranillin Rd, 1.5 km WSW of Wunnenberg Rd junction, 2.5 km SSW of Bowelling, 25 Sep. 1995, *V. Crowley* DKN 769 (PERTH); 5 miles W of Cape Riche HS, 26 Oct. 1965, *A.S. George* 6909 (PERTH); Stirling Range National Park, Stirling Range Drive, 11 km from Chester Pass Rd, valley NW of Toolbrunup Peak, 23 Oct. 1991, *W. Greuter* 23140 (PERTH); Saddleback Timber Reserve, Tunnel Rd, Boddington, 4 Oct. 2007, *F. Hort, J. Hort, J. Allen & P. Bullock* 3066 (PERTH); c. 2 miles W Karri

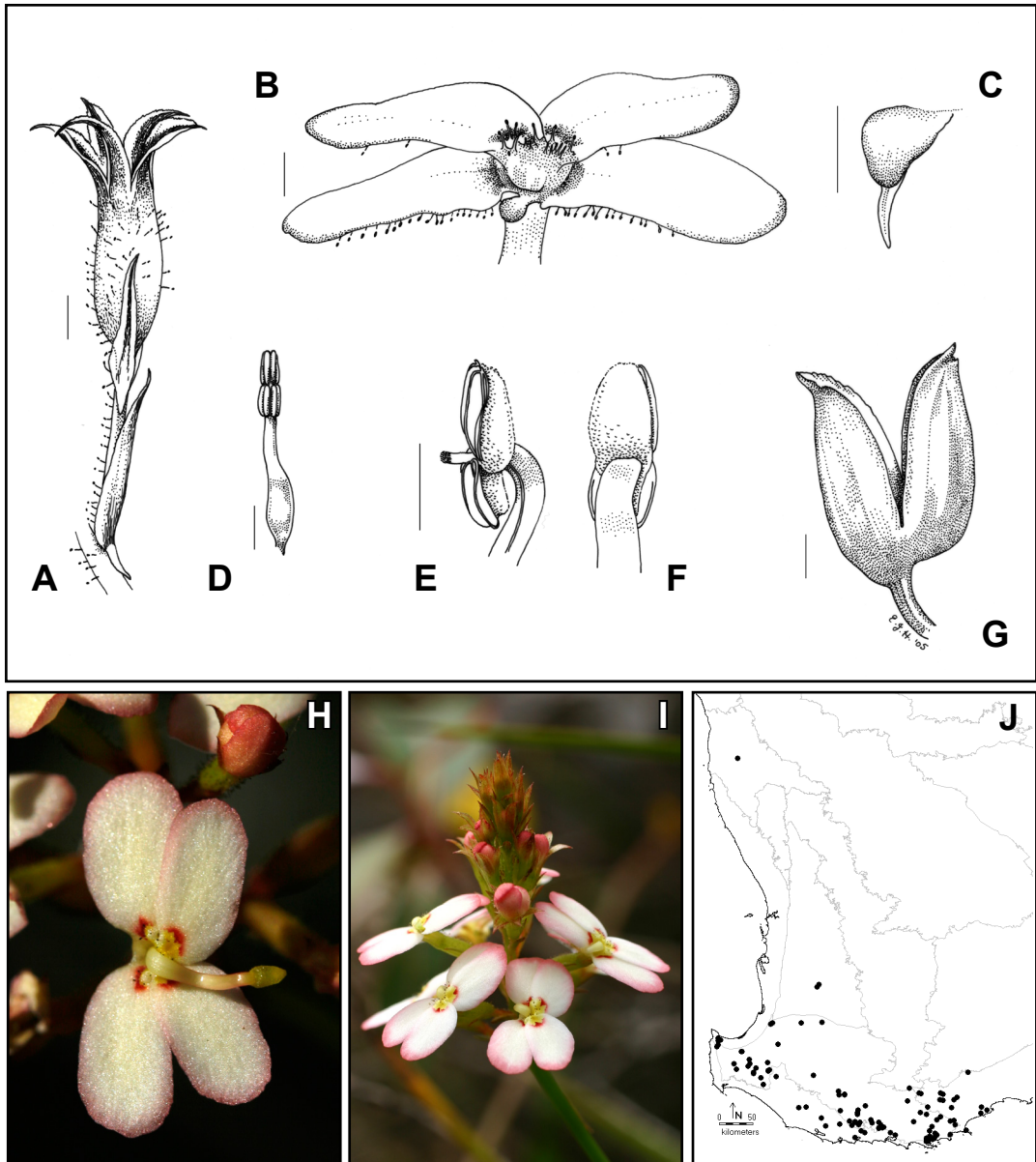


Figure 5. *Styloidium junceum*. A – hypanthium and calyx lobes with subtending floral bract and paired prophylls; B – corolla; C – labellum; D – column; E – dehiscent anthers and small, stalked stigma; F – tip of the column showing the strong line of demarcation between the axis and the head; G – capsule; H – flower with the column triggered; I – inflorescence showing the darker shade of the buds; J – distribution in the south-west of Western Australia. Drawings by Ellen Hickman from *J.A. Wege* 821 with scale bars at 1 mm; photographs from *J.A. Wege* 1802 (H) and *J.A. Wege & B.P. Miller* JAW 1234 (I).

Bank, Porongurup Rd, Oct. 1966, *S. James* 66.10/29 (PERTH); Yelverton Forest, Carter Rd, 23 km NW Margaret River, 7 Nov. 1989, *G.J. Keighery* 10931 (CANB, PERTH); SW Lake, Unicup Nature Reserve, 25 Oct. 1997, *G.J. Keighery & N. Gibson* 2349 (PERTH); 21 km from Donnybrook along road to Bridgetown, 18 Nov. 1982, *A. Strid* 21508 (PERTH); c. 5.3 km W of Sues Hwy on Denny Rd, ESE of Margaret River, 9 Nov. 2002, *J.A. Wege* 784 (AD, CANB, PERTH); Mount Lindesay walk trail, 12 Nov. 2002, *J.A. Wege* 821 (PERTH); S boundary of Stirling Range National Park on



Chester Pass Rd, 31 Oct. 2003, *J.A. Wege & C. Wilkins* JAW 1068 (CANB, PERTH); Crooked Brook Forest, 10 Oct. 2004, *J.A. Wege & B.P. Miller* JAW 1234 (MEL, PERTH); 4.9 km S along Granite Rd from Blue Lake Rd, N of Denmark, 25 Nov. 2004, *J.A. Wege & K.A. Shepherd* JAW 1319 (MEL, PERTH); reserve at corner of Albany Hwy and Hannan Way, E of Narrikup, 2 Nov. 2010, *J.A. Wege* 1802 (CANB, MEL, PERTH).

*Proposed vernacular name.* Little Reed Triggerplant. The previous common name of ‘Reed Triggerplant’ (Erickson 1958) is somewhat misleading in view of the revised circumscription presented here (*S. junceum* is now the least reed-like of the species in sect. *Junceae*).

*Phenology.* Flowering from late September to December.

*Distribution and habitat.* Distributed across the south coast of Western Australia, from Cape Riche in the Fitzgerald subregion to near Dunsborough on the southern edge of the Swan Coastal Plain, with numerous records from the Warren bioregion and Southern Jarrah Forest subregion, and outlying records in the Northern Jarrah Forest near Boddington (Figure 5J). Grows in sand or loam over laterite in *Eucalyptus marginata* or *Corymbia calophylla* forest across most of its range, occurring on hillsides, near granite outcrops, or in gullies and creek lines. Also found in sandy clay soils in mallee heath communities in the Stirling Range and Cape Riche, and occasionally in swamp heath, shrubland or sedgeland habitats.

*Conservation status.* A widespread species that is present in numerous conservation reserves and national parks. No conservation listing is warranted.

*Chromosome number.* James (1979) recorded a chromosome number of  $n = 16$  under the name *S. junceum* subsp. *brevius* from a population near the Porongurups (PERTH 02858614).

*Typification.* Refer to the introduction for a discussion on Brown’s type gathering of *S. junceum*.

Although Carlquist’s collections of *S. junceum* subsp. *brevius* are referable to *S. junceum*, there is some ambiguity surrounding Pritzel’s original concept of *S. junceum* var. *brevius*, which he recorded from calcereous soils at the mouth of the Swan River and gravelly soils in the Stirling District (Diels & Pritzel 1905). On the basis of current understanding of species distributions and habitat preferences, his concept is likely to have included both *S. hesperium* and *S. junceum*. He did not provide an illustration and his short type description, ‘caulibus brevibus (10–15 cm)’, could refer to either species. Unusually, he did not cite a collection in his protologue and, according to his index of collections, did not collect this taxon. The collections of *Stylidium* from Diels and Pritzel’s expedition housed at Botanical Museum Berlin–Dahlem (B) were destroyed during WWII (Botanical Museum Berlin–Dahlem 1999); however, Mildbraed viewed the collections before their destruction. In his 1908 revision, he cites a single collection (*L. Diels* 5521) under *S. junceum* subsp. *brevior* [*sic.*] collected from gravel soil in low woodland to the north of Albany. Duplicate material has not been located. The locality and habitat information, taken together with the description, indicate that Diels’ gathering is referable to *S. junceum*. A neotype, gathered from a comparable location and habitat, has been designated above to fix the application of the name. The specimen details for the Swan River syntype remain unknown although it is possible that Pritzel viewed a collection by Hügel, who is known to have collected *S. hesperium* during his visit to the Swan River colony in 1833–4 (K 000060232!, W!). It is of note, however, that Mildbraed viewed a duplicate of this Hügel collection at W and placed it under *S. junceum* rather than citing it under Pritzel’s variety.

**Stylidium laciniatum** C.A.Gardner, *J. Roy. Soc. Western Australia* 27: 198 (1942). *Type*: Frankland River, Nornalup, Western Australia, 21 January 1936, E. Gardner s.n. (*holotype*: PERTH 01659286!).

*Stylidium junceum* var. *volubile* [published as *valubilem*], F.Muell., *Fragm.* 4: 94 (1864), *syn. nov.* *Type citation*: ‘... in paludosis ad Lake Lewen ...’ [present day locality unknown]. *Type specimens*: ‘Melaleuca swamps, S.W. side of Lake Lewen’, [Western Australia, s. dat., G. Maxwell 8] (*lectotype*, here designated: K 000741796!; *isolectotypes*: MEL 2156063!, P 00313146!).

[*Stylidium junceum auct. non* R.Br.: G. Bentham, *Fl. Austral.* 4: 9 (1868), p.p.]

*Illustrations*. B.J. Grieve & W.E. Blackall, *How to Know W. Austral. Wildfl.* 4: 756, no. 79 (1982); J. Wheeler, N. Marchant & M. Lewington, *Fl. South West* 2: 909 (2002).

*Twining perennial herb* 75–300 cm high, with a compact, lignotuber-like *stem* that is shallowly buried or situated at soil level; stilt roots absent. *Glandular trichomes* 0.2–0.7 mm long, with red to reddish black, ellipsoid heads. *Leaves* on the lignotuber reduced to small, reddish scales, otherwise in a basal rosette and linear-oblongate to subulate, 0.4–2 cm long, 0.6–1.2 mm wide, acute, entire, glabrous. *Scapes* 1–5 per individual, twining, unbranched or with tendril-like lateral branches, 75–300 cm long, 0.8–4 mm wide, with scattered sterile bracts, glabrous except for glandular hairs above the lowermost flower; sterile bracts 4–13 mm long, with a basal spur 2–6 mm long, ± caducous. *Inflorescence* a head-like or shortly elongate raceme, 6–42-flowered, 3–11.5 cm long; bracts linear-lanceolate to lanceolate, 6–14 mm long, 1.2–2 mm wide, caudate, the lower 2/3 of the margin with a ± entire to erose hyaline border 0.2–0.5 mm wide, with a basal spur 1.5–5.5 mm long, glabrous; prophylls paired at distal end of pedicel, linear-lanceolate, 4.5–7 mm long, 0.8–1 mm wide, glabrous or sparsely glandular-hairy; pedicels 2.5–8 mm long, glandular-hairy. *Hypanthium* oblong, usually slightly arcuate on axial side, 3.5–6 mm long, 0.8–1.8 mm wide, glandular-hairy, sometimes with the hairs restricted to the axial side. *Calyx lobes* free, very unequal in length, caudate, the lower 1/2–2/3 of the margin with a ± entire or erose hyaline border 0.1–0.3 mm wide, glabrous or sparsely glandular-hairy; the larger (external) two lobes 6–8.5 mm long, 2.5–4 mm longer than the three shorter (axial) lobes which are 2.5–4.2 mm long. *Corolla* tube 3.5–5 mm long; lobes pale lilac or pink with mottled pink and white markings external to the yellow throat, paired laterally, with the posterior pair overlapping the anterior pair and markedly raised above them, elliptic to narrowly obovate or ovate, 7–9.5 mm long, 5–9 mm wide, deeply incised, glandular-hairy on the abaxial surface and margin. *Labellum* reflexed and angled across the calyx, ovate, 1.3–2 mm long, 1–1.2 mm wide with a terminal appendage 0.7–1.5 mm long, glabrous or sparsely glandular-hairy; lateral appendages absent. *Throat appendages* highly reduced and restricted to the posterior lobes, tooth-like, tipped with a glandular hair. *Column* sigmoid when poised, with a slight lateral curve when extended, evenly tapering from the main bend to the head and with no line of demarcation evident between the axis and the head, white near the base and lilac-pink distally, 17–24 mm long, 1.8–3 mm wide at the head, glabrous; anther locules yellowish fading brown, 1.5–2 mm long, 0.8–0.9 mm wide; pollen yellow; stigma sessile, 0.9–1.4 mm long, 0.7–0.9 mm wide. *Capsules* obloid, arcuate on axial side, 7–11 mm long excluding calyx lobes; *seeds* brown, 0.9–1.3 mm long, 0.4–0.5 mm wide, the surface with membranous sculpturing. (Figures 1B; 6)

*Diagnostic features*. *Stylidium laciniatum* can be distinguished from all other species in the section, and indeed the genus, by its tall (to 3 m high), twining scapes and its large, pale lilac or pink corolla lobes with deeply incised margins. Other useful features to aid identification include its compact and usually leafless stem stock, extremely long column (17–24 mm), and obloid capsules.

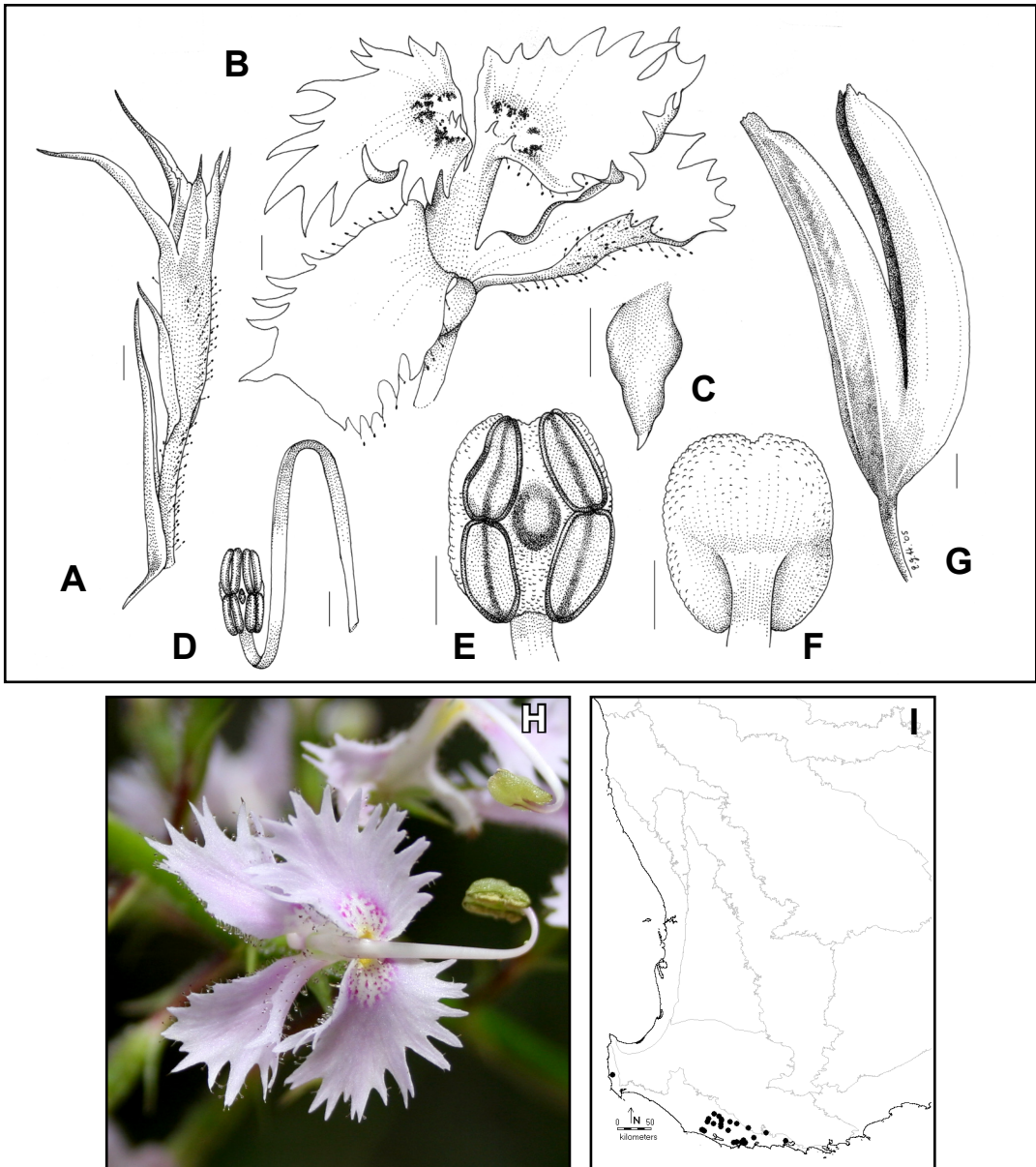


Figure 6. *Stylidium laciniatum*. A – hypanthium and markedly unequal calyx lobes, with subtending floral bract and one of two prophylls visible; B – corolla, showing the distinctive lacinate margin and the elevation of the posterior lobes above the anterior pair; C – labellum; D – column; E – dehiscent anthers and developing stigma; F – the broad column head showing the lack of demarcation with respect to the axis; G – capsule; H – corolla showing the long, triggered column; I – distribution in the south-west of Western Australia. Drawings by Ellen Hickman from *J.A. Wege* 864 with scale bars at 1 mm; photograph from *J.A. Wege & B.P. Miller* JAW 1510.

*Selected specimens.* WESTERN AUSTRALIA: 1.125 km E down Forest Grove Rd, 19 Dec. 1996, *T. Annels & C. Godden* SC 125.4 (PERTH); Fernhook Falls, 16 Mar. 2006, *G. Byrne* 1778 (PERTH); 2.3 km along Pool Rd from junction with Jones Rd, 13 Feb. 1997, *P. Ellery & C. Godden* W 46.4 (PERTH); Deeside Coast Rd, c. 2 km N of junction with Chesapeake Rd, 2 Feb. 1976, *A.S. George* 14230 (MEL, PERTH); Denmark Shire, creek crossing on Break Rd, 50 m E from Fernlea Rd, 4 Feb. 2000, *B.G. Hammersley* 2409 (PERTH); Shannon Rock, 12 Jan. 1988, *G.J. Keighery* 11275 (PERTH);

75 m on Mac Rd from Preston Rd, SE of Shannon, 20 Jan. 2003, *J.A. Wege & B.P. Miller* JAW 864 (MEL, PERTH); 3.7 km E of Warham Rd on Weld Rd, N of Walpole, 26 Jan. 2008, *J.A. Wege & B.P. Miller* JAW 1510 (PERTH); Gully to N of Weld River on South Western Hwy, SE of Shannon, 31 Jan. 2009, *J.A. Wege* 1597 (PERTH); Walpole-Nornalup National Park, Monastery Rd, 2.9 km E of Gully Rd, 27 Jan. 1993, *J.R. Wheeler & S.J. Patrick* JRW 3809 (PERTH).

*Vernacular name.* Tattered Triggerplant (Erickson 1958).

*Phenology.* Flowering from mid-December to March.

*Distribution and habitat.* Largely confined to the Warren bioregion, extending into the Southern Jarrah Forest subregion between Denmark and Walpole. Mostly known from between Northcliffe and Denmark, with outlying occurrences near Witchcliffe (Figure 6I). Grows in grey sandy loam or brown loam in dense vegetation of seasonally wet lowland sites, or adjacent to permanent swamps and creeks. Associated vegetation includes *Taxandria linearifolia* and *T. parviceps* shrubland (sometimes with emergent *Melaleuca preissiana* or *Eucalyptus megacarpa*), *E. diversicolor* forest, and *E. diversicolor*, *E. marginata* and *Corymbia calophylla* forest over dense *Taxandria* and *Acacia*.

*Conservation status.* This species has a restricted distribution but occurs in several national parks and does not appear to warrant conservation-listing.

*Chromosome number.* Unknown.

*Typification.* Mueller (1864) first described this taxon as a variety of *S. junceum*. Relevant herbarium sheets have been located at K, MEL and P, all of which bear a blue Botanical Museum of Melbourne label annotated by Mueller with his varietal name and a locality. The locality statement on the specimens at MEL and K are the same (see above), while the specimen at P bears the more generic statement 'S.W. Australia'. This material was undoubtedly sent to Mueller since he had yet to embark on a collecting expedition to Western Australia (indeed, he did not collect *S. laciniatum* until 1877; MEL 2156065 and MEL 2156066). Although Mueller did not cite a collector in his protologue, the MEL specimen bears a field label in George Maxwell's hand which repeats the locality information and provides a collecting number (Maxwell's name is not provided on either the K or P specimens). There is a degree of uncertainty as to whether these specimens are part of the same gathering, particularly since the K specimen is in full flower, the P specimen is mostly in bud, and the MEL specimen bears fruit; however, *S. laciniatum* flowers over an extended period and the fruit on the MEL specimen appears to be from the previous season. I am unaware of any other historical collections of this species, and it is therefore likely that the three specimens are part of the same gathering. The specimen at Kew has been selected as the lectotype since it is the best quality specimen and most closely conforms to the protologue. This specimen was not received by Kew until 1867 and was therefore available to Mueller when he compiled his description.

*Notes.* The twining scapes of *S. laciniatum* coil around other plants in the surrounding dense vegetation, often producing tendrils from the axils of the scape bracts to provide additional support. It is also common for the scapes of one or more individuals to twine around each other. The only other triggerplant to approach the height of *S. laciniatum* is the climbing species *S. nymphaeum* Wege (sect. *Verticillatae* (Benth.) Milbr.). Indeed, the two species may well be confused since *S. nymphaeum* has an overlapping distribution, is also summer-flowering, and has similar large, pink or mauve corollas with irregularly incised margins. The habit of the two species is, however, completely different: *S. laciniatum* has



compact, often leafless stems and tall, twining scapes, whereas *S. nymphaeum* has tall, wiry stems with whorls of linear leaves with curled tips, and much shorter scapes (<25 cm long). The flowers of *S. nymphaeum* are also quite distinct, with ornate throat appendages, long lateral labellum appendages, a glandular-hairy column, and apiculate anthers.

***Stylidium paludicola* Wege, sp. nov.**

*Type*: Maralla Nature Reserve, north of Perth, Western Australia [precise locality withheld for conservation reasons], 31 October 2006, J.A. Wege & F. Hort JAW 1383 (*holotype*: PERTH 07855656; *isotypes*: CANB, MEL).

*Reed-like perennial herb* (35–)50–100 cm high, with a shallowly buried, compact, lignotuber-like stem; stilt roots absent. *Glandular trichomes* 0.2–0.6 mm long, with red to reddish black, ellipsoid to obloid heads. *Leaves* in a basal rosette or tuft, persistent throughout flowering or caducous, subulate to narrowly oblanceolate, 0.8–3.5 cm long, 0.7–1.5 mm wide, acute or with a short mucro, entire, glabrous. *Scapes* (1)2–c. 15 per individual, erect to suberect, unbranched (rarely with tendril-like lateral branches), 35–100 cm long, 0.7–2.5 mm wide, with scattered sterile bracts, glabrous except for glandular hairs above the lowest flower; sterile bracts 3.5–8 mm long, with a basal spur 1–4 mm long, ± caducous. *Inflorescence* a dense head-like or shortly elongate raceme, (3–)7–40-flowered, 2–7 cm long; bracts lanceolate, 3.5–10 mm long, 1–3 mm wide, attenuate to acuminate, the lower 3/4–4/5 of the margin with a ± entire or scarcely erose hyaline border 0.3–0.6 mm wide, with a basal spur 0.5–3 mm long, glabrous; prophylls paired at distal end of pedicel, linear-lanceolate, 2.5–5.5 mm long, 0.6–1 mm wide, sparsely glandular-hairy or glabrous; pedicels 1.5–4 mm long, glandular-hairy on axial side. *Hypanthium* elliptic to narrowly ovate, ± arcuate on axial side, 2–3.5 mm long, 1.3–2 mm wide, with glandular hairs mostly restricted to the axial side. *Calyx lobes* free, very unequal in length, hyaline for 3/4–4/5 of length with the hyaline border ± entire to erose and 0.1–0.6 mm wide; the larger (external) two lobes (3–)4.5–7 mm long, (0.9–)1.5–3 mm longer than the three smaller (axial) lobes, caudate, glabrous; three shorter lobes (2–)3–4.5 mm long, attenuate to acuminate, sparsely glandular hairy. *Corolla* tube c. 2 mm long; lobes medium to deep pink, a similar or slightly darker shade on the reverse, with dark reddish to purplish pink throat markings and a white throat, paired laterally, with the posterior pair overlapping the anterior pair, elliptic to obovate, 4.5–6.6 mm long, 3–5.2 mm wide, entire, glandular-hairy abaxially. *Labellum* reflexed and angled across the calyx; ovate to broadly ovate, 0.8–1 mm long, 0.6–0.9 mm wide, with a terminal appendage 0.2–0.4 mm long, glabrous or sparsely glandular-hairy; lateral appendages absent. *Throat appendages* comprising irregular, glandular-hairy protuberances arranged in a semi-circle, 0.3–0.5 mm high. *Column* sigmoid when poised, with a slight lateral curve when extended, evenly tapering from the main bend to the head and with no line of demarcation evident between the axis and the head, creamy white near the base and distally pinkish red with a purple marking immediately above the hinge, 9–10.5 mm long, 1–1.5 mm wide at the head, glabrous; anther locules reddish brown fading black, 1–1.2 mm long, 0.5–0.6 mm wide; pollen yellow; stigma ± sessile or shortly stalked, 0.4–0.7 mm long, 0.3–0.5 mm wide. *Capsule* ovoid to deltoid, ± arcuate on axial side, 4–5 mm long excluding calyx lobes; mature seeds not seen. (Figure 7)

*Diagnostic features.* The following features differentiate *S. paludicola* from the other species in sect. *Junceae*: compact, shallowly buried stems; prominent caudate calyx lobe tips (the margin hyaline for less than 3/4 of the length of the lobe); a long column (9–10.5 mm); two larger calyx lobes (3–)4.5–7 mm long and (0.9–)1.5–3 mm longer than the three smaller lobes; yellow pollen; medium to deep pink corolla lobes with dark reddish to purplish pink throat markings.

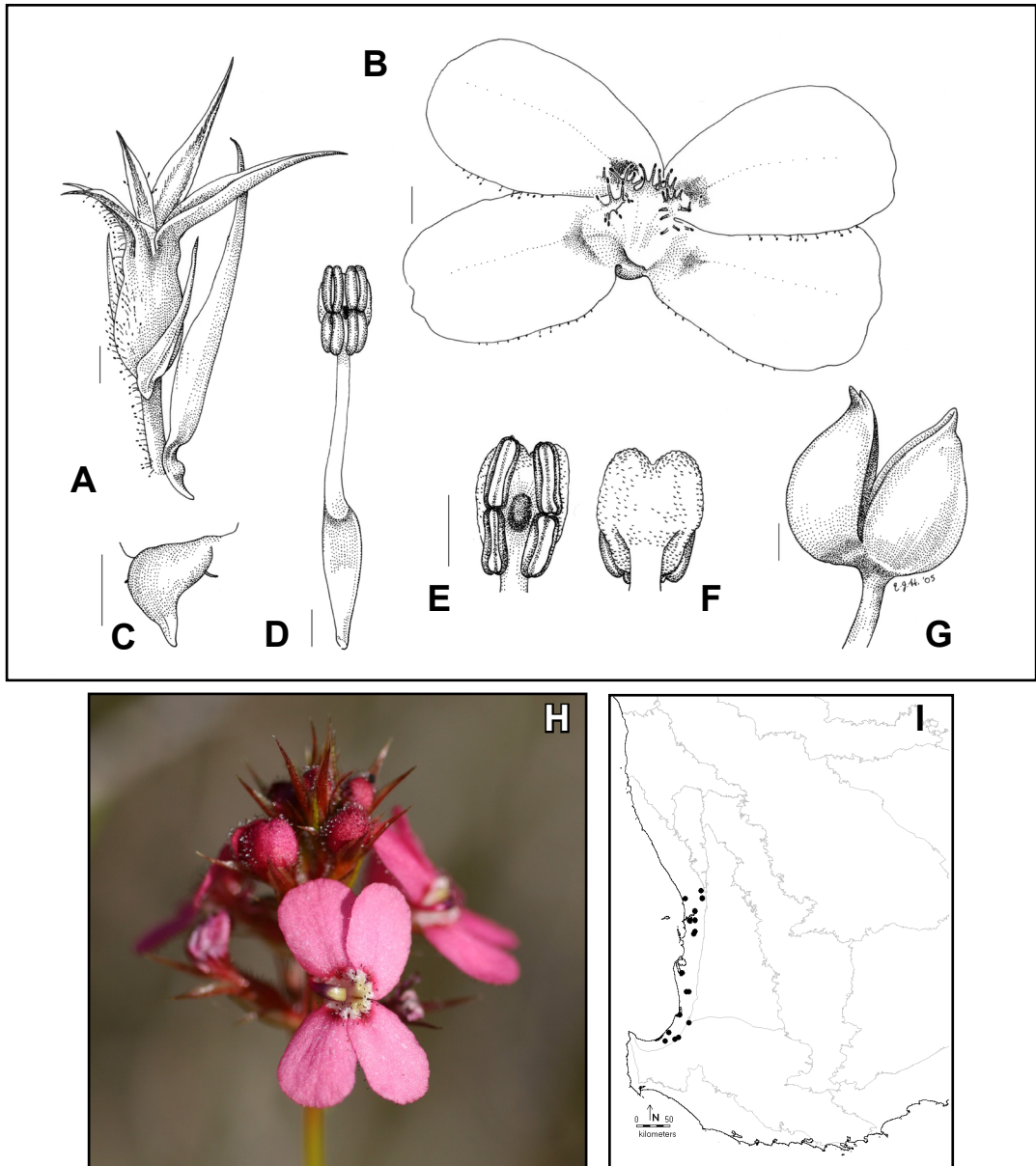


Figure 7. *Styliidium paludicola*. A – hypanthium and calyx lobes with subtending floral bract and paired prophylls; B – corolla; C – labellum; D – column; E – dehiscent anthers and developing stigma; F – the broad column head showing the lack of demarcation with respect to the axis; G – capsule; H – inflorescence with prominently caudate calyx apices; I – distribution in the south-west of Western Australia. Drawings by Ellen Hickman from *J.A. Wege* 1081 with scale bars at 1 mm; photograph from *J.A. Wege* & *F. Hort* JAW 1383.

*Selected specimens.* WESTERN AUSTRALIA: [localities withheld for conservation reasons] Nov. 1979, *P. Bridgewater* s.n. (PERTH); 22 Nov. 2005, *D. Bright* & *C. Mykytiuk* MYA 10 (PERTH); 26 Nov. 2007, *V. English* & *M. Batista* VE 06 (PERTH); 9 Nov. 1987, *G.J. Keighery* 9515 (PERTH); 8 Nov. 1902, *A. Morrison* 531 (K); 21 Nov. 1999, *J.E. Wajon* 166 (PERTH); 6 Nov. 2003, *J.A. Wege* 1081 (CANB, MEL, PERTH); *J.A. Wege* 1246 C, 1 Nov. 2004 (K, PERTH, W); 7 Nov. 2007, *J.A. Wege* & *R. Butcher* JAW 1475 (PERTH).

*Proposed vernacular name.* Swamp Reed Triggerplant.

*Distribution and habitat.* Known from scattered populations on the Swan Coastal Plain, from near Bullsbrook to Ruabon, extending into the Southern Jarrah Forest east of Capel and Dardanup (Figure 7I) (see note under the distribution and habitat for *S. hesperium* with respect to PERTH 06378633 from near the Pinnacles). Occurs in seasonally wet localities in grey to black peaty sand over clay. Associated vegetation includes dense *Melaleuca* shrubland, *Corymbia calophylla* and *Melaleuca preissiana* woodland, or low shrubland with emergent scattered *Melaleuca*. There is a single record from clay soils in *Corymbia haematoxylon* woodland near Dardanup.

*Conservation status.* Recently listed as Priority Three under Department of Parks and Wildlife Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). *Stylidium paludicola* has a scattered distribution in a region marked by extensive land clearing and subject to ongoing development pressures. Only a small number of populations are known from nature reserves and population sizes and threats are not known. Further survey is required.

*Chromosome number.* James (1979) recorded a chromosome number  $2n = 32$  under *S. junceum* from a population in Capel. This count may correspond to *S. paludicola* which is known to occur in the region; however, no voucher specimen has been located at either PERTH or UWA.

*Etymology.* The epithet is Latin for ‘a dweller in marshes’.

*Affinities.* *Stylidium paludicola* is similar to *S. thryonides*, differing most obviously in calyx lobe morphology. The two external lobes are prominently caudate in *S. paludicola*, a character that is particularly conspicuous in the flower buds (Figure 7H), and have a hyaline border 0.4–0.6 mm wide and not extending beyond 3/4 of the length of the lobe (0.1–0.3 mm wide in *S. thryonides*, and bordering more than 3/4 of the length of the lobe, often extending to just below the apex). Although the length of the two external calyx lobes is not disjunctly different between the two species, they are more commonly longer in *S. paludicola* and there is usually a greater difference in length between them and the three shorter calyx lobes [(1–)1.5–3 mm as compared to 0.3–1(–1.3) mm in *S. thryonides*]. *Stylidium paludicola* has a longer column (9–10.5 mm long as compared to 7–8.5 mm in *S. thryonides*) and also tends to have more prominent throat appendages. The two species do not overlap in distribution, with *S. thryonides* restricted to the south coast of the state.

Refer to the notes under *S. hesperium* for a comparison with that species.

***Stylidium scariosum* DC., Prodr. 7(2): 783 (1839).** *Type:* Swan River [Western Australia, 1835–1838], *J. Drummond s.n. (holotype: G–DC!; isotypes: ?BM 001041339!, BR 0000013332716 image seen, CGE!, ?E 00279225!, ?E 00279226!, FI-W 113153!, FI-W 113155!, ?G 00358863!, ?K 000060223!, ?K 000355056!, ?K 000741808!, M 0175787!, ?OXF!, ?P 00313155!, ?P 00313156!).*

[*Stylidium junceum* auct. non R.Br.: J. Mildbraed, in Engl., *Pflanzenr.* IV. 278 (Heft 35): 51 (1908), *p.p.*; R. Erickson, *Triggerplants*, p. 152 (1958), *p.p.*; S. Carlquist, *Aliso* 7(1): 32 (1969); J.R. Wheeler in N. Marchant *et al.*, *Fl. Perth Region* 2: 619 (1987), *p.p.*; J. Wheeler, N. Marchant & M. Lewington, *Fl. South West* 2: 908 (2002), *p.p.*]

*Illustrations.* S. Carlquist, *Aliso* 7(1): 35, Figures 39–41, as *S. junceum* subsp. *junceum*; B.J. Grieve & W.E. Blackall, *How to Know W. Austral. Wildfl.* 4: 743, No. 44 (1982), as *S. junceum* subsp. *junceum*.

*Reed-like perennial herb* 10–80 cm high, with a compact or shortly elongate *stem* positioned above soil level or rarely shallowly-buried; stilt roots usually present. *Glandular trichomes* 0.15–0.6 mm long, with red to reddish black, ellipsoid to obloid heads. *Leaves* in a basal rosette or tuft, persistent throughout flowering or caducous, subulate to linear or narrowly-oblongate, 0.75–4 cm long, 0.7–2 mm wide, acute or attenuate and often shortly mucronate, entire, glabrous or minutely papillose. *Scapes* 1–5(–20) per individual, erect to suberect, unbranched (very rarely with lateral branches), 10–80 cm long, 0.7–2.5 mm wide, with scattered sterile bracts, glabrous except for glandular hairs above the lowermost flower; sterile bracts 2–9.5 mm long, with a basal spur 0.5–3 mm long, ± caducous. *Inflorescence* a dense head-like or shortly elongate raceme, 8–40-flowered, 1.5–6 cm long; bracts lanceolate, 5–10 mm long, 1.5–3 mm wide, attenuate to acuminate, hyaline throughout or to just below the apex with the hyaline border ± entire or erose and 0.4–1 mm wide, with a basal spur 0.5–2 mm long, glabrous or glandular-hairy; prophylls paired at distal end of pedicel, linear-lanceolate to lanceolate, 3.2–6 mm long, 0.7–2 mm wide, glabrous or sparsely glandular-hairy; pedicels 1–3.5 mm long, glandular-hairy, with the hairs sometimes restricted to the axial side. *Hypanthium* narrowly ovate to elliptic, 2.7–4.5 mm long, 1.1–2.5 mm wide, glandular-hairy, with the hairs sometimes restricted to the axial side. *Calyx lobes* free, very unequal in length, with an erose (rarely ± entire) hyaline border 0.3–0.7 mm wide, glandular-hairy or occasionally glabrous; the two longer (external) lobes 4–6.5 mm long, 1.5–3 mm longer than the three shorter (axial) lobes, acute, attenuate or acuminate, hyaline throughout or to just below the apex; three shorter lobes 3.5–4.5 mm long, with an obtuse or obcordate hyaline border around the apex. *Corolla* tube 1.2–2.5 mm long; lobes very pale pink to apricot-pink or occasionally medium pink (rarely white), a darker shade on the reverse and often at the margins, with dark pink or pinkish red throat markings and a yellow throat, paired laterally, with the posterior pair overlapping the anterior pair, elliptic to obovate, 4.5–7 mm long, 3–5 mm wide, entire, glandular-hairy abaxially. *Labellum* reflexed and angled across the calyx, ovate to elliptic, 0.7–1.2 mm long, 0.5–0.9 mm wide, with a terminal appendage 0.1–0.5 mm long, glabrous or sparsely glandular-hairy; lateral appendages absent. *Throat appendages* comprising irregular, glandular-hairy protuberances arranged in a semi-circle, *c.* 0.1–0.4 mm high, occasionally with the hairs extending a little beyond the throat. *Column* with a single bend at the throat of the flower when poised, with a slight lateral curve when extended, dilated distally and constricted just below the head, with a distinct line of demarcation between the axis and the head, yellow near the base and pink distally, 6–8.5 mm long, 0.8–1.2 mm wide at the head, glabrous; anther locules pale yellow, 0.8–1 mm long, 0.4–0.5 mm wide; pollen yellow; stigma stalked, 0.15–0.3 mm long, 0.15–0.2 mm wide. *Capsules* ovoid to deltoid, ± arcuate on axial side, 4–7 mm long excluding calyx lobes; *seeds* brown, *c.* 1 mm long, 0.5 mm wide, the surface with membranous sculpturing. (Figures 1D; 8)

*Diagnostic features.* The following features can be used to differentiate *S. scariosum* from the other species in sect. *Junceae*: calyx lobes that are noticeably unequal in length (with a 1.5–3 mm difference between the two larger and three smaller lobes); an inflorescence with an overall markedly scarious appearance due to the broad hyaline border on the floral bracts and calyx lobes, with the hyaline margin broadening distinctively around the tip of three smallest calyx lobes (the apex of these lobes obtuse or obcordate); column 6–8.5 mm long, dilated in the upper half (see Figure 8I), constricted just below the head and with a strong line of demarcation between the axis and the head (see Figure 8F); compact stems often supported just above the ground by stilt roots and with basal leaves present, or tending buried and leafless when growing in deep sand; pale pink or apricot-pink corolla lobes (less often medium pink or very rarely white).

*Selected specimens.* WESTERNAUSTRALIA: Ellis Brook Valley Reserve, 9 Oct. 1999, *H. Bowler* 379 (PERTH); near 37 mile peg Perth – Albany road, 8 Sep. 1947, *N.T. Burbidge* 2255 (CANB, PERTH); corner of Lesmurdie Rd and Sampson Rd, Lesmurdie, Darling Range, 23 Oct. 1967, *S. Carlquist* 3874



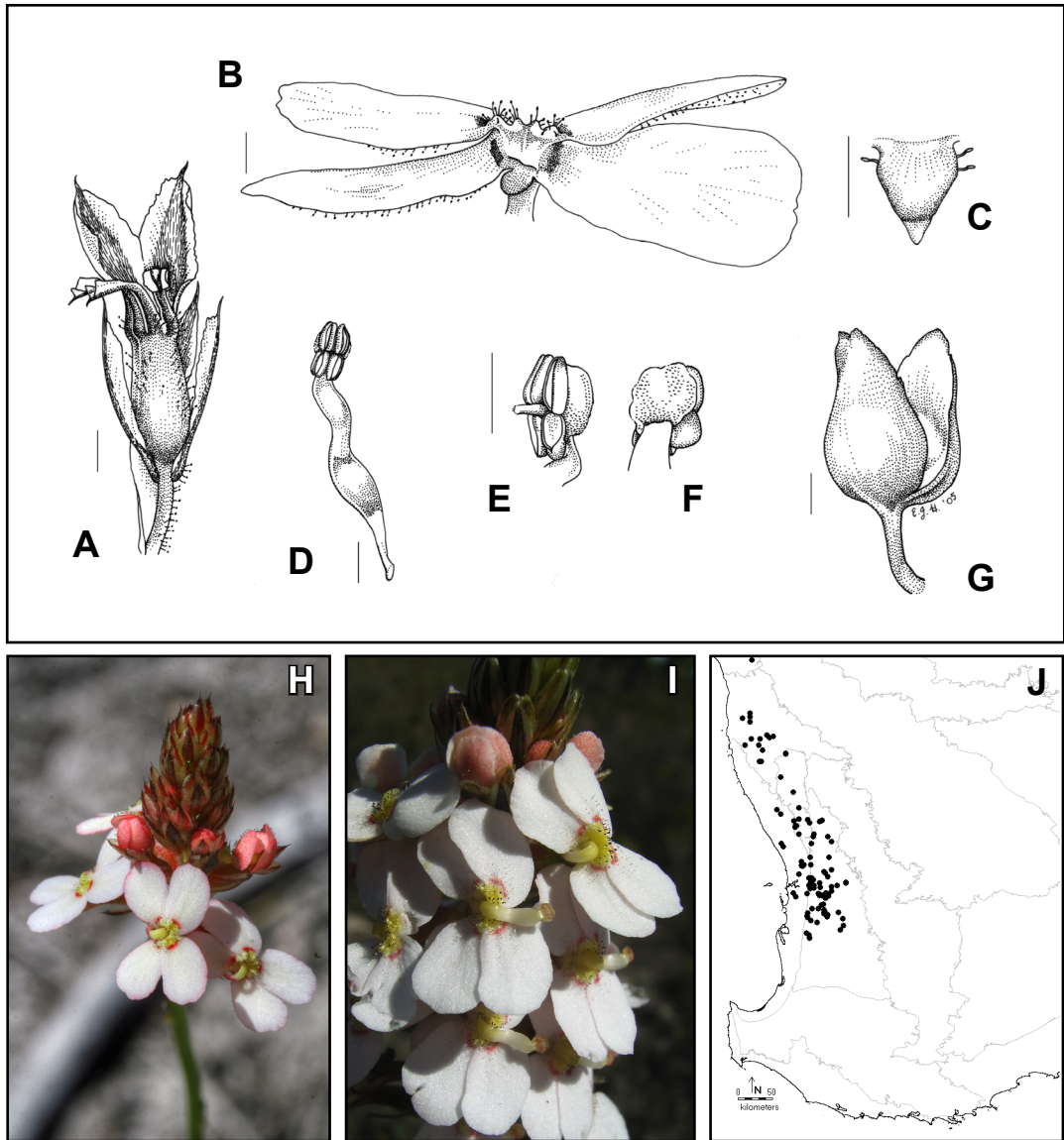


Figure 8. *Stylidium scariosum*. A – hypanthium and unequal calyx lobes with broadly scarious margins, particularly at the apex of the three smaller lobes; B – corolla; C – labellum; D – column; E – column apex, showing the stalked stigma protruding beyond the dehisced anthers; F – column apex, showing the strong line of demarcation between the column axis and head; G – capsule; H – inflorescence; I – triggered flowers showing the distally dilated columns; J – distribution in the south-west of Western Australia. Drawings by Ellen Hickman from *J.A. Wege* 911 with scale bars at 1 mm; photograph from *J.A. Wege* & *W.S. Armbruster* JAW 1707.

(MEL, NSW, PERTH, RSA); 20 km E of Armadale along road to Brookton, 11 Oct. 1991, *W. Greuter* 22689 (PERTH); Hi Vallee property (D. & J. Williams), 23 Oct. 1999, *M. Hislop* 1737 (PERTH); 16 km N of Hill River Bridge along Brand Hwy, 29 Sep. 1979, *J. Taylor, M.D. Crisp* & *R. Jackson* JT 947 (CANB, PERTH); 1.7 km S on Kent Rd from Talbot West Rd, Shire of York, 16 Oct. 2002, *J.A. Wege* & *F. Hort* JAW 671 (PERTH); 2.4 km E along Kingsley Dr from South West Hwy, 6 Nov. 2003, *J.A. Wege* 1085 (MEL, PERTH); 1.69 km on Canning Rd from Pickering Brook Rd, National Park, 12 Nov. 2003, *J.A. Wege* 1102 (PERTH); c. 780 m SE of Kangaroo Gully Bridge on Brookton Hwy,

12 Nov. 2003, *J.A. Wege* 1106 (PERTH); c. 4.6 km W of Tootbardie Rd on Coorow – Greenhead Rd, Alexander Morrison National Park, 30 Sep. 2004, *J.A. Wege & K.A. Shepherd* JAW 1212 (CANB, MEL, PERTH); 6.65 km NW of Williams Rd on Del Park Rd, NW of Dwellingup, 2 Nov. 2006, *J.A. Wege & B.P. Miller* JAW 1396 (PERTH); 4.7 km E along Wannamal West Rd from Brand Hwy, Boonanarring Nature Reserve, 23 Oct. 2009, *J.A. Wege & W.S. Armbruster* JAW 1707 (K, MEL, PERTH); lookout toward the end of Lesueur Scenic Drive, c. 600 m from Cockleshell Gully Rd, Lesueur National Park, 16 Sep. 2009, *J.A. Wege & C. Wilkins* JAW 1766 (AD, CANB, HO, MEL, NSW, PERTH).

*Proposed vernacular name.* Common Reed Triggerplant.

*Phenology.* Flowering from August to December, with peak flowering during September and October in the northern part of its range, and October to November in the greater Perth region.

*Distribution and habitat.* Widespread in the Northern Jarrah Forest, Geraldton Sandplains and Swan Coastal Plain bioregions, extending from near Dwellingup north of Eneabba (Figure 8J). Grows in shallow sandy loam in upland lateritic habitats, in *Eucalyptus wandoo* woodland, *E. marginata* or *Corymbia calophylla* forest (often in association with *Allocasuarina fraseriana*), and *E. todtiana* and *Banksia menziesii* woodland. In the northernmost part of its range, *S. scariosum* grows on shallow white sand over laterite in mallee heathland or low mixed heath. This species is also known from deeper sand in pockets of *Banksia* woodland on the Swan Coastal Plain.

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

*Chromosome number.* Unknown.

*Affinities.* *Stylidium scariosum* is most likely to be confused with *S. hesperium* (refer to the affinities under that species for comparative notes).

*Notes.* A population in Badgingarra National Park (e.g. PERTH 08137099) has an atypical floral column (it lacks the dilation above the main hinge) but otherwise appears referable to *S. scariosum*.

***Stylidium squamosotuberosum*** Carlquist, *Aliso* 7(1): 34 (1969). *Type:* 5 miles west of Nornalup on road to Manjimup, Western Australia, 10 November 1967, *S. Carlquist* 4060 (*holotype:* RSA 0005441!; *isotypes:* CANB 195623.1!, K 000355300!, US 00147161 image seen).

[*Stylidium junceum* *auct. non* R.Br.: G. Bentham, *Fl. Austral.* 4: 9 (1868), *p.p.*; J. Mildbraed, in Engl., *Pflanzenr.* IV. 278 (Heft 35): 51 (1908), *p.p.*]

*Illustrations.* S. Carlquist, *Aliso* 7(1): 35, Figures 43–45 (1969); B.J. Grieve & W.E. Blackall, *How to Know W. Austral. Wildfl.* 4: 744, No. 45 (1982); J. Wheeler, N. Marchant & M. Lewington, *Fl. South West* 2: 909 (2002).

*Reed-like perennial herb* 35–115 cm high, with a well-buried, rhizomatous *stem*; stilt roots absent. *Glandular trichomes* 0.2–0.6 mm long, with reddish black or black, ellipsoid or obloid heads. *Leaves* usually reduced to small, reddish scales on the rhizome and occasionally on the lower portion of scape, rarely forming a basal rosette, subulate, c. 1–2 cm long, 1.2–1.5 mm wide, acute, entire, glabrous. *Scapes* 1–5(–c. 9) per individual, erect to suberect, unbranched (rarely branched in lower portion), 35–115 cm long, 0.7–2.5 mm wide, with scattered sterile bracts, glabrous except for glandular hairs

above the lowermost flower; sterile bracts 3.5–10 mm long, with a basal spur 1.5–4.2 mm long, ± caducous. *Inflorescence* a dense head-like or shortly elongate raceme, 6–30-flowered, 2.5–5 cm long; bracts lanceolate, 6–10 mm long, 1.4–2.2 mm wide, attenuate to caudate, hyaline for lower 1/2–3/4 with the hyaline border ± entire to erose and 0.3–0.7 mm wide, with a basal spur 0.7–3 mm long, glabrous; prophylls paired at distal end of pedicel, linear-lanceolate, 3.5–6 mm long, 0.8–1.5 mm wide, glandular-hairy near base; pedicels 1.5–3 mm long, glandular-hairy, with the hairs sometimes restricted to the axial side. *Hypanthium* narrowly elliptic to oblong, slightly arcuate on axial side, 2.5–4 mm long, 1.3–1.8 mm wide, glandular-hairy, with the hairs sometimes restricted to the axial side. *Calyx lobes* free, very unequal in length, acuminate to caudate, the lower 1/2–3/4 of the margin with a ± entire to somewhat erose hyaline border 0.2–0.6 mm wide, glabrous or sparsely glandular-hairy; the larger (external) two lobes 4–6.5 mm long, (1–)1.5–3 mm longer than the upper (axial lobes) which are 3.2–4 mm long. *Corolla* tube c. 2–3 mm long; lobes medium to deep purple-pink, a similar or slightly darker shade on the reverse, with a white throat and mottled red or mauve markings, paired laterally, with the posterior pair overlapping the anterior pair and raised a little above them, elliptic, 5–6.5 mm long, 3.2–4.7 mm wide, entire, glandular-hairy abaxially. *Labellum* reflexed and angled across the calyx, orbicular to ovate, 0.8–1.1 mm long, 0.7–1.1 mm wide, with a terminal appendage 0.3–1.2 mm long, glabrous or sparsely glandular-hairy; lateral appendages absent. *Throat appendages* comprising irregular, glandular-hairy protuberances arranged in a semi-circle, 0.2–0.6 mm high. *Column* sigmoid when poised, with a slight lateral curve when extended, evenly tapering from the main bend to the head and with no line of demarcation evident between the axis and the head, white near the base and dark pinkish red distally with a purple marking near the hinge, 10.5–14 mm long, 1.5–2 mm wide at the head, glabrous; anther locules yellowish green fading to black, 1.2–1.5 mm long, 0.6–0.7 mm wide; pollen greenish; stigma sessile, 0.6–1 mm long, 0.4–0.7 mm wide. *Capsules* obloid (rarely ellipsoid), ± arcuate on axial side, 5–10 mm long excluding calyx lobes; *seeds* brown, 0.6–0.8 mm long, 0.2–0.3 mm wide, the surface with membranous sculpturing. (Figures 1C; 9)

*Diagnostic features.* The following features can be used to differentiate *S. squamosotuberosum* from the other species in sect. *Junceae*: a leafless, rhizomatous habit; medium to deep purple-pink corolla lobes with mottled red or mauve markings external to the throat, with the posterior lobes raised a little above the anterior pair; calyx lobes with prominent, dark reddish black, acuminate apices (the margin hyaline for less than 3/4 of the length of the lobe); a column 10.5–14 mm long; greenish pollen; obloid (rarely ellipsoid) capsules 5–10 mm long.

*Selected specimens.* WESTERNAUSTRALIA: 3 miles N of Windy Harbour, 18 Oct. 1974, *S. Carlquist* 6070 (PERTH, RSA); N side of Scott Rd, 0.7 km E of Lake Smith, D'Entrecasteaux National Park, 7 Apr. 1991, *N. Gibson & M. Lyons* 537 (PERTH); Nutcracker Rd, 2.6 km W from Denmark – Mount Barker road, 2 Dec. 1994, *B.G. Hammersley* 1305 (PERTH); Champion Lane, Denmark, 300 m N along farm boundary from the end of Champion Lane, 26 Dec. 2008, *F. Hort, J. Hort, A. Daems & M. Daems* 3389 (PERTH); Boulder Hill, Betty's Beach, 35 km E Albany, 27 Nov. 1986, *G.J. Keighery* 8719 (PERTH); Ten Mile Brook, Bramley National Park, S of Margaret River, 14 Nov. 2007, *G.J. & B.J. Keighery* 1148 (PERTH); 3–5 km from Windy Harbour along road to Northcliffe, 17 Nov. 1982, *A. Strid* 21473 (PERTH); 15.2 km N of Salmon Beach Rd on Windy Harbour Rd, 11 Nov. 2002, *J.A. Wege* 806 (MEL, PERTH); 2.95 km S from Ledge Beach Rd on Gull Rock Rd, E of Albany, 9 Dec. 2002, *J.A. Wege* 856 (PERTH); 10.5 km SE of Milyeannup Coast Rd on Woodarburrup Rd, Gingilup Swamps Nature Reserve, 26 Nov. 2004, *J.A. Wege & K.A. Shepherd* JAW 1326 (MEL, PERTH); W from Sues Rd, S of Busselton, 8 Dec. 2008, *J.A. Wege & R. Butcher* JAW 1567 (PERTH); SW corner of Gum Link Rd and Nornalup Rd, NE of Walpole, 11 Dec. 2008, *J.A. Wege & R. Butcher* JAW 1577 (PERTH); 500 m SE of the road to The Gap on Frenchman's Bay Rd, Torndirrup National Park, S of Albany, 28 Nov. 2011, *J.A. Wege & B.P. Miller* JAW 1906 (CANB, K, MEL, PERTH).

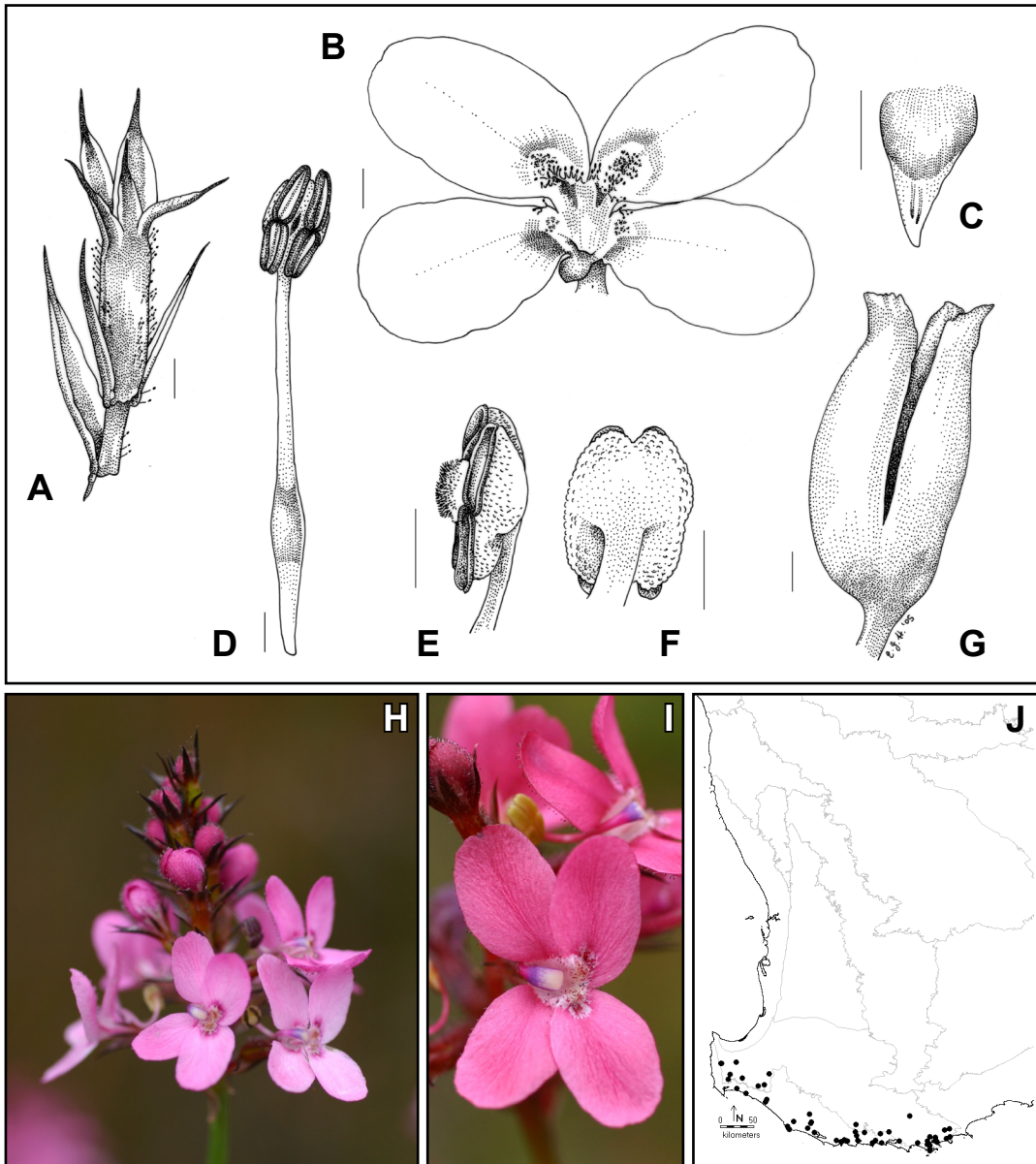


Figure 9. *Styliidium squamosotuberosum*. A – hypanthium, calyx lobes, subtending floral bract and paired prophylls; B – corolla; C – labellum; D – column; E – column apex, showing the dehiscent anthers and developing stigma; F – the broad column head showing the lack of demarcation with respect to the axis; G – capsule; H – inflorescence with prominent, dark, caudate calyx lobe tips; I – corolla lobes, showing the diagnostic mottled throat markings; J – distribution in the south-west of Western Australia. Drawings by Ellen Hickman from *J.A. Wege* 856 with scale bars at 1 mm; photographs from *J.A. Wege* & *K.A. Shepherd* JAW 1310 (H) & JAW 1326 (I).

**Proposed vernacular name.** Rhizomatous Reed Triggerplant. The previous common name of ‘Fleshy-rhizomed Trigger Plant’ (Western Australian Herbarium 1998–) is somewhat misleading since the rhizome is somewhat woody rather than fleshy.

**Phenology.** The peak flowering period for *S. squamosotuberosum* is from mid-November to early January; however, flowers have been recorded as early as mid-October (PERTH 02949164) and as late as March (PERTH 02858452).

*Distribution and habitat.* Known from the Warren and adjacent Southern Jarrah Forest bioregions, extending from the Manypeaks area to the Blackwood Plateau (Figure 9J). Grows in clay or sandy peat in seasonally wet swamps or stream gullies across its range. The associated vegetation includes myrtaceous shrubland or heath with species such as *Taxandria fragrans*, *T. linearifolia*, *T. parviceps*, *Astartea* sp., *Homalospermum firmum* and *Beaufortia sparsa*, open forest of *Eucalyptus marginata*, *E. patens* or *Corymbia calophylla* over dense Myrtaceae-dominated shrubland, *Eucalyptus rudis* tall woodland with tall sedges, *Agonis flexuosa* woodland with sedges and *Dasypogon*, *Corymbia calophylla* forest with *Banksia seminuda* and *B. littoralis*, and dense sedgeland. *Stylidium squamosotuberosum* has been observed growing with *S. thryonides* (at PERTH 08541019), *S. hygrophilum* (at the type locality and PERTH 08540918) and *S. junceum* (Carlquist 1969).

*Conservation status.* Locally common in a number of conservation reserves across its range and as such does not require conservation listing.

*Chromosome number.* Unknown.

*Affinities.* *Stylidium squamosotuberosum* is most likely to be confused with *S. thryonides*, a species with a widely overlapping distribution that can look very similar when pressed. Whilst *S. squamosotuberosum* tends to prefer wetter habitats, I have observed these two species growing in sympatry at a site within Torndirrup National Park near Albany (at PERTH 08541019) with no intermediates evident. The two species are readily distinguished in the field by differences in floral morphology (compare Figures 9B, I with 7B, H)—the deep purple-pink corolla lobes of *S. squamosotuberosum* have highly distinctive mottled red or mauve markings around the white throat, and the posterior lobes are raised a little above the level of the anterior pair. *Stylidium squamosotuberosum* also has a longer column (10.5–14 mm versus 7–8.5 mm long in *S. thryonides*) with larger anther locules and greenish (rather than yellow) pollen.

The characteristic rhizome of *S. squamosotuberosum* is usually prominently elongated and well-buried, with leaves reduced to small red scales on the rhizome that occasionally extend up the buried portion of the scape (although if the growing tip of the rhizome is exposed at the soil surface, a rosette of green leaves may be formed, e.g. PERTH 04530055 and PERTH 02858452). In contrast, the compact stem stock of *S. thryonides* is more irregular in shape and is positioned at or just above ground level or sometimes shallowly buried. Mature green leaves are usually present in *S. thryonides*, although they are sometimes caducous (particularly on older individuals with numerous scapes). Pressed specimens of the two species in which the stem stock has not been sampled are difficult to separate, although the tips of the calyx lobes are informative—prominently caudate in *S. squamosotuberosum* (with the margin hyaline for the lower 3/4), and attenuate to acuminate in *S. thryonides* (the margin hyaline for c. 3/4 to all of the length). Column length and pollen colour can also sometimes be used to distinguish between pressed specimens of these two species (see above), and capsules can be diagnostic if they have been collected (obloid or more rarely ellipsoid and 5–10 mm long in *S. squamosotuberosum*, and ovate to deltoid and 4–6 mm long in *S. thryonides*).

A comparison between *S. squamosotuberosum* and *S. hygrophilum*, a similarly rhizomatous species which co-occurs with *S. squamosotuberosum* on the Blackwood Plateau, is provided under that species.

*Notes.* Although not described until 1969, *S. squamosotuberosum* was collected by a range of botanists in the 1800s including Drummond (3: 179, e.g. CGE!, FI!, G!, K 000355054!, MEL 2156064!, OXF!, TCD!, W!), Preiss (2265: G!, MEL 2156068!), Mueller (e.g. MEL 2254229!), Oldfield (MEL 2259110!), Cunningham (BM!, CGE!, K 000060231!), Baxter (K 000060226!), Bauer (K 000060233!), and Brown (refer to the typification notes in the introduction).



**Styloidium thryonides** Wege, *sp. nov.*

*Type:* 500 m south-east of the road to The Gap on Frenchman's Bay Road, Torndirrup National Park, south of Albany, Western Australia, 28 November 2011, *J.A. Wege & B.P. Miller* JAW 1905 (*holotype:* PERTH 08541027; *isotypes:* CANB, K, MEL).

*Reed-like perennial herb* 30–50(–75) cm high, with a ± shallowly buried, compact, lignotuber-like stem; stilt roots absent. *Glandular trichomes* 0.15–0.4 mm long, with red to reddish black, ellipsoid to obloid heads. *Leaves* in a basal rosette or tuft, persistent throughout flowering or caducous, subulate to narrowly oblanceolate, 0.5–3 cm long, 0.7–1 mm wide, acute or with a short mucro, entire, glabrous, occasionally reduced to small red scales. *Scapes* (1)2–c. 50 per individual, erect to suberect, unbranched, 20–75 cm long, 0.7–1.7 mm wide, with scattered sterile bracts, glabrous except for glandular hairs above the lowest flower; sterile bracts 2.8–6 mm long, with a basal spur 0.5–3 mm long, ± caducous. *Inflorescence* a dense head-like or shortly elongate raceme, (2–)6–30-flowered, 1.5–5 cm long; bracts lanceolate, 4–6.2 mm long, 1–2 mm wide, attenuate to acuminate, hyaline for 3/4 of length or to just below the apex with the hyaline border entire to scarcely erose and 0.2–0.6 mm wide, with a basal spur 0.5–2 mm long, glabrous; prophylls paired at distal end of pedicel, linear-lanceolate, 3–4.5 mm long, 0.5–0.8 mm wide, glabrous or sparsely glandular-hairy; pedicels 1.5–4 mm long, glandular-hairy on axial side. *Hypanthium* ovate to elliptic, ± arcuate on axial side, 2–3.5 mm long, 1–2 mm wide, with glandular hairs mostly restricted to axial side. *Calyx lobes* free, a little unequal in length, attenuate to acuminate, hyaline for 3/4 of length or to just below the apex with the hyaline border ± entire to erose and 0.1–0.3 mm wide, the larger (external) two lobes 3.5–4.2 mm long, 0.3–1(–1.3) mm longer than the three smaller (axial) lobes, glabrous or with the occasional glandular hair; smaller lobes 2–3.5 mm long, sparsely glandular-hairy. *Corolla* tube c. 1.5–2 mm long; lobes medium to deep pink, a similar or slightly darker shade on the reverse, with dark pink to purplish throat markings and a yellowish or white throat, paired laterally, with the posterior pair overlapping the anterior pair, elliptic to obovate, 3.8–5.7 mm long, 2.7–4.7 mm wide, entire, glandular-hairy abaxially. *Labellum* reflexed and angled across the calyx; ovate to broadly ovate, 0.7–1 mm long, 0.6–0.8 mm wide, with a terminal appendage 0.2–0.6 mm long, glabrous or sparsely glandular-hairy; lateral appendages absent. *Throat appendages* comprising irregular, glandular-hairy protuberances arranged in a semi-circle, to 0.3 mm high. *Column* sigmoid when poised, with a slight lateral curve when extended, evenly tapering from the main bend to the head and with no line of demarcation evident between the axis and the head, creamy yellow or white near the base and distally pink or pinkish red with a purple marking near the hinge, 7–8.5 mm long, 1–1.4 mm wide at the head, glabrous; anther locules brownish green or brownish yellow fading black, 0.8–1 mm long, 0.5–0.7 mm wide; pollen yellow; stigma shortly stalked, 0.4–0.6 mm long, 0.3–0.5 mm wide. *Capsule* ovoid to deltoid, ± arcuate on axial side, 4–6 mm long excluding calyx lobes; *seeds* brown, c. 0.6–1 mm long, 0.25–0.4 mm wide, the surface with membranous sculpturing. (Figures 1E; 10)

*Selected specimens.* WESTERN AUSTRALIA: Emu Point, Albany, 5 Nov. 1954, *R. Erickson s.n.* (PERTH); 1.3 km on Sandpatch Rd from Prison Farm Rd, Albany, 3 Dec. 2003, *J.A. Wege* 1155 (MEL, PERTH); 4.8 km on Quararup Rd from Frenchman's Bay Rd, Albany, Western Australia, 24 Nov. 2004, *J.A. Wege & K.A. Shepherd* JAW 1309 (PERTH); Rame Head track, 100 m W of Williams Rd, Walpole-Nornalup National Park, 25 Nov. 2004, *J.A. Wege & K.A. Shepherd* JAW 1323 (CANB, PERTH); 300 m N of Milyeannup Coast Rd on Scott River Rd, 26 Nov. 2004, *J.A. Wege & K.A. Shepherd* JAW 1328 (AD, BRI, PERTH); Walpole-Nornalup National Park, Long Point track 1.1 km NE of junction with Little Long Point track, 30 Nov. 1992, *J.R. Wheeler & S.J. Patrick* JRW 3597 (PERTH).

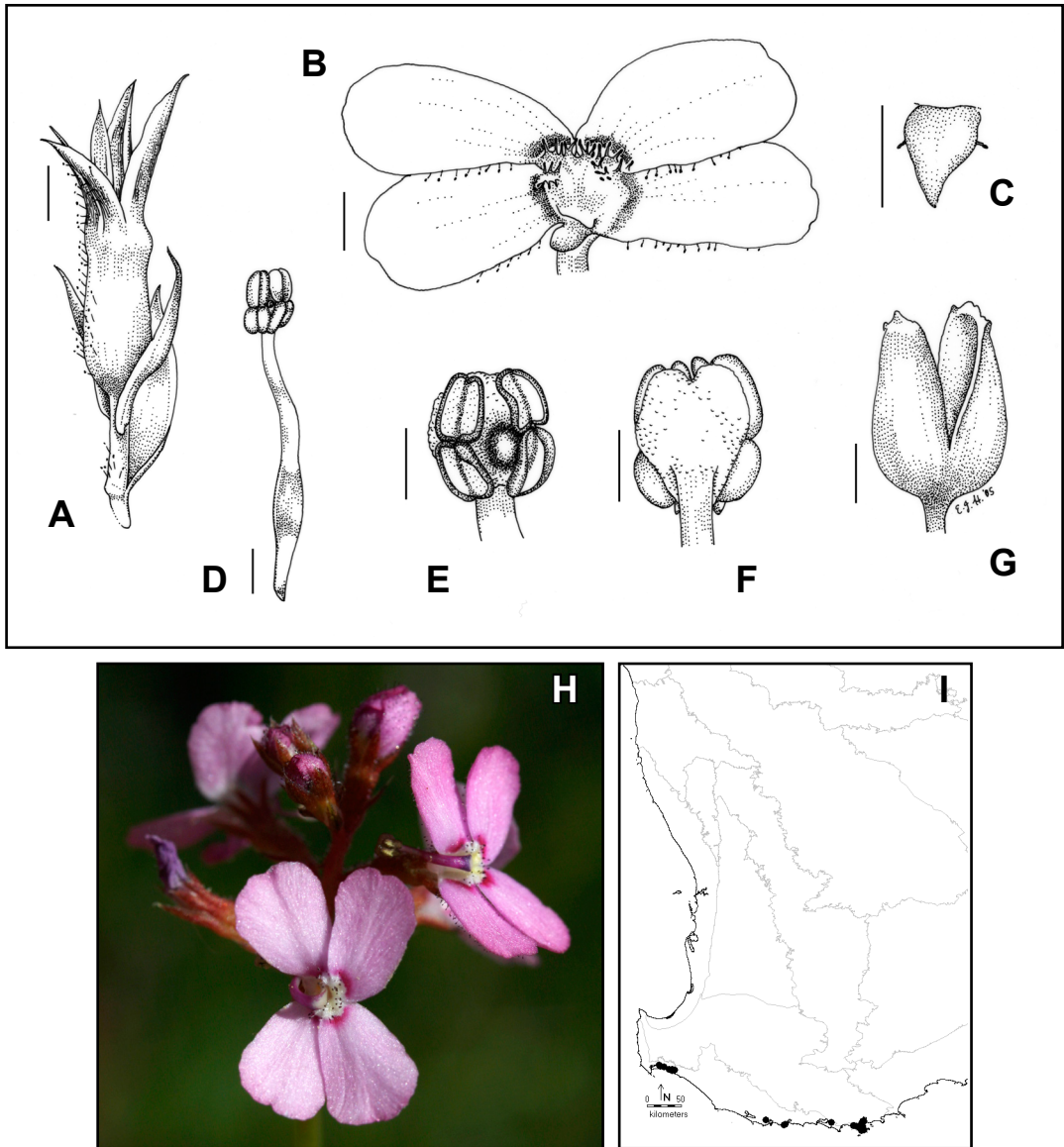


Figure 10. *Stylidium thryonides*. A – hypanthium and slightly unequal calyx lobes, with subtending floral bract and prophylls; B – corolla; C – labellum; D – column; E – dehiscent anthers and developing stigma; F – broad column head which is not demarcated with respect to the column axis; G – capsule; H – inflorescence; I – distribution in the south-west of Western Australia. Drawings by Ellen Hickman from *J.A. Wege* 1308 with scale bars at 1 mm; photograph from *J.A. Wege & B.P. Miller* JAW 1905.

*Diagnostic features.* The following features can be used to differentiate *S. thryonides* from the other species in sect. *Junceae*: compact, shallowly buried stems with basal leaves either persistent during flowering or caducous; two external calyx lobes 3.5–4.2 mm long and 0.3–1(–1.3) mm longer than the three axial ones, with a membranous margin that either tapers evenly to the apex (apex attenuate) or stops a little below the tip (apex acuminate); medium pink corolla lobes that are a similar shade or only a fractionally darker shade on the undersurface (and therefore in bud); a column 7–8.5 mm long with no line of demarcation evident between the axis and the head; a prominent, shortly stalked stigma 0.4–0.6 × 0.3–0.5 mm at maturity; ovoid to deltoid capsules.

*Proposed vernacular name.* Southern Reed Triggerplant.

*Phenology.* Flowering from October to December.

*Distribution and habitat.* Mostly restricted to the Warren bioregion, extending into the Southern Jarrah Forest bioregion near Albany (Figure 10I). Grows in moist grey sand, often over limestone, in *Agonis flexuosa* woodland or scrub, *Corymbia calophylla* and *Eucalyptus marginata* forest with *Persoonia longifolia* and *A. flexuosa* over a dense mixed understorey, *C. calophylla* and *A. flexuosa* woodland with *Spyridium globulosum*, and dense low heath/sedgeland with emergent *Melaleuca preissiana*.

*Conservation status.* *Stylidium thryonides* has not been collected from many localities (many of the PERTH specimens represent multiple collections from the same sites). However, conservation listing does not appear to be warranted in view of a number of occurrences within national parks and nature reserves.

*Chromosome number.* Unknown.

*Etymology.* From the Greek *thryon* (rush), in reference to the rush-like habit. The name is also a reference to the fact that material of this species was collected by Brown under his concept of *S. junceum* (the epithet of which also means rush-like).

*Affinities.* Refer to the introduction for information on Brown's collection of this taxon, and the comparative comments under *S. hesperium*, *S. paludicola* and *S. squamosotuberosum*.

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### References

- Bentham, G. (1868). *Flora Australiensis*. Vol. 4. (Reeve and Co.: London.)
- Botanical Museum Berlin-Dahlem (1999). *List of families including extant collections of the Botanical Museum Berlin-Dahlem (B) from the time before 1943*. <http://www.bgbm.fu-berlin.de/BGBM/research/colls/herb/phanerog.htm> [accessed 25 February 2010].
- Brown, R. (1810). *Prodromus Florae Novae Hollandiae et Insulae Van Diemen*. (J. Johnson and Co: London.)
- Burns, G.P. (1900). Beiträge zur Kenntniss der Stylidiaceen. *Flora* 87: 313–354.
- Candolle, A.P. de (1839). *Prodromus systematis naturalis regni vegetabilis*. Vol 7. (Treuttel & Wurtz: Paris.)
- 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 28 April 2014].
- Diels, L. & Pritzel, E. (1905). Fragmenta Phytographiae Australiae Occidentalis. Beiträge zur Kenntnis der Pflanzen Westaustraliens, ihrer Verbreitung und ihrer Lebensverhältnisse. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 35: 582–599.

- Erickson, R. (1958). *Triggerplants*. (Paterson Brokensha: Perth.)
- Gardner, C.A. (1942). Contributions florae Australiae occidentalis XI. *Journal of the Royal Society of Western Australia* 27: 165–210 (1942).
- James, S.H. (1979). Chromosome numbers and genetic systems in the triggerplants of Western Australia (*Stylidium*; Stylidiaceae). *Australian Journal of Botany* 27: 17–25.
- Mildbraed J. (1908). Stylidiaceae. In: Engler, A. (ed.) *Das Pflanzenreich* IV, 278. Heft 35 pp. 1–98. (Endelmann: Weinheim.)
- Paczkowska, G. & Chapman, A.R. (2000). *The Western Australian Flora: a descriptive catalogue*. (Wildflower Society of Western Australia, Western Australian Herbarium, Botanic Parks and Gardens Authority: Perth, Western Australia.)
- Sandiford, E.M. & Barrett, S. (2010). *Albany regional vegetation survey, extent, type and status*. Unpublished report. (Department of Environment and Conservation: Western Australia.)
- Smith, M.G. (2013). *Threatened and Priority Flora list for Western Australia*. (Department of Parks and Wildlife: Kensington, Western Australia.)
- Sonder, O.G. (1845). Stylideae. In: C. Lehmann (ed.) *Plantae Preissianae*. Vol. 1. pp. 370–393. (Meissner: Hamburg.)
- Wege, J.A. (2001). Scape anatomy in *Stylidium* (Stylidiaceae). *Kew Bulletin* 56: 955–963.
- Western Australian Herbarium (1998–). *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. <http://florabase.dpaw.wa.gov.au> [accessed 30 April 2014].
- Wheeler, J.R. (1987). Stylidiaceae. In: Marchant, N.G., Wheeler, J.R., Rye, B.L., Bennett, E.M., Lander, N.S. & Macfarlane, T.D. (eds) *Flora of the Perth region*. Vol. 2. pp. 606–625. (Western Australian Herbarium: South Perth.)
- Wheeler, J., Marchant N. & Lewington, M. (2002). *Flora of the South West*. Vol. 2. (Australian Biological Resources Study: Canberra.)

