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## Taxonomic notes on the locket trigger plants from *Stylidium* subgenus *Tolypangium* section *Repentes*

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### Abstract

Wege, J.A. Taxonomic notes on the locket trigger plants from *Stylidium* subgenus *Tolypangium* section *Repentes*. *Nuytsia* 16(1): 207–220 (2006). Two new trigger plants from south-west Western Australia, *Stylidium perula* Wege and *Stylidium thylax* Wege, are described and illustrated. Revised descriptions are provided for the morphologically allied *S. sacculatum* F.L.Erickson & J.H.Willis and *S. pseudosacculatum* Lowrie, A.H. Burb. & Kenneally. Features of trichome structure are argued to provide important taxonomic characters at the species level in *Stylidium*. The morphology and function of the column cunabulum is explored.

### Introduction

*Stylidium* subgenus *Tolypangium* (Endl.) Mildbr. section *Repentes* Mildbr. comprises a distinct group of creeping trigger plants characterized by adpressed stem leaves bearing a small basal spur, and uni-flowered inflorescences. Prior to this study, six species were known to possess these features: *S. repens* R.Br., *S. sacculatum* F.L.Erickson & J.H.Willis, *S. diplectroglossum* (F.L.Erickson & J.H.Willis) Lowrie, A.H. Burb. & Kenneally, *S. flagellum* Lowrie, A.H. Burb. & Kenneally, *S. pingrupense* Lowrie, A.H. Burb. & Kenneally, and *S. pseudosacculatum* Lowrie, A.H. Burb. & Kenneally. Three of these entities were recently described as part of a broader taxonomic treatment of trigger plants with a creeping habit (Lowrie *et al.* 1999).

In *Stylidium sacculatum* and *S. pseudosacculatum*, the column is dilated just below the apex to form a pouch-like structure that cradles the anthers and/or stigma when the column is poised. Lowrie & Kenneally (1994; 1999) termed the dilated portion of the column a cunabulum (derived from the latin for cradle). The cradling effect is made possible by the presence of a hinge just above the cunabulum. The hinge opens out during the triggering process, enabling pollen to be deposited on, or received from, the insect vector. Erickson (1958) eloquently likened this mechanism to “a miniature locket with elastic hinges, enclosing the precious pack of pollen inside the lid”. This paper serves to revise the taxonomic boundaries within these creeping “locket” trigger plants.

### Materials and methods

This study is based on herbarium specimens housed at CANB, K, MEL, PERTH, RSA and on the field observations of the author. Morphological characters were coded using a combination of fresh,

spirit and herbarium material, with the exception of the corolla measurements, which were taken solely from material preserved in 70% ethanol. Trichomes preserved in 70% ethanol were cleared in domestic bleach, mounted in Apathy's Aqueous Mountant and examined under a compound microscope.

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

### Trichomes

Trichomes are a characteristic feature of the majority of species of *Stylidium* and their structure and distribution often provide excellent characters for the purpose of identifying and delimiting taxa. The four species discussed herein all possess trichomes on the inflorescence; however, differences in trichome length, cellular structure and/or distribution can be used to identify each entity.

*Stylidium sacculatum* possesses trichomes with multicellular, biseriate stalks and glandular heads (Figure 1A–B). They are conspicuous on the pedicels, hypanthium, abaxial surface of the corolla lobes and usually the labellum margin. In contrast to the species discussed below, the column connective is also glandular. Whilst the trichomes are *c.* 0.1–0.2 mm long on the corolla and upper hypanthium, they are significantly longer (to *c.* 1.8 mm long) at the base of the hypanthium and on the pedicels. These elongated trichomes, which often possess crinkled rather than straight stalks, have been previously been described as pilose (i.e. eglandular; Erickson & Willis 1956; Erickson 1958; Lowrie *et al.* 1999), however, glandular heads are clearly visible using compound microscopy. The heads are *c.* 20–25 µm long, subglobular, and are comprised of few (3?) cells. Unlike the bright red glandular heads characteristic of the shorter hairs, the heads of the longer hairs tend to lack pigmentation and are therefore extremely difficult to see under low magnification.

Lowrie *et al.* (1999) considered *S. pseudosacculatum* to possess a variable indumentum: “specimens from the type location [near Tammin] have a sparsely glandular hypanthium and those from the Wallaby Hills district have a pilose [eglandular] hypanthium” (p. 146). I consider this to be taxonomically significant. Specimens from the Tammin region are referable to *S. pseudosacculatum*, whilst those bearing eglandular hairs are described below as a new species (*S. perula* Wege, *sp. nov.*).

*Stylidium pseudosacculatum* possesses glandular trichomes with a comparable structure to those found in *S. sacculatum* (Figure 1C–D). They are conspicuous on the pedicels, hypanthium, labellum and abaxial surface of the corolla lobes. They range in size from 0.15–*c.* 1 mm; those at the base of the pedicels are notably longer than those found on the remainder of the inflorescence. As for *S. sacculatum*, these hairs have in the past been mistakenly described as eglandular (Lowrie *et al.* 1999).

With the exception of collections acquired near the type location of Tammin, all of the specimens cited by Lowrie *et al.* (1999) under *S. pseudosacculatum* possess an eglandular inflorescence indumentum and are referable to *S. perula*. The trichomes are typically restricted to the pedicels and hypanthium, but may be sparingly present on the abaxial surface of the corolla. They vary in size from 0.2–*c.* 1 mm long (the longer hairs tend to be crinkled), and are multicellular and biseriate (Figure 1E). *Stylidium perula* completely lacks glandular trichomes, a condition that is rare within *Stylidium*.

A fourth entity, morphologically similar to *S. pseudosacculatum* (see taxonomic notes below) but with anatomically and morphologically distinct glandular trichomes, is given specific status here

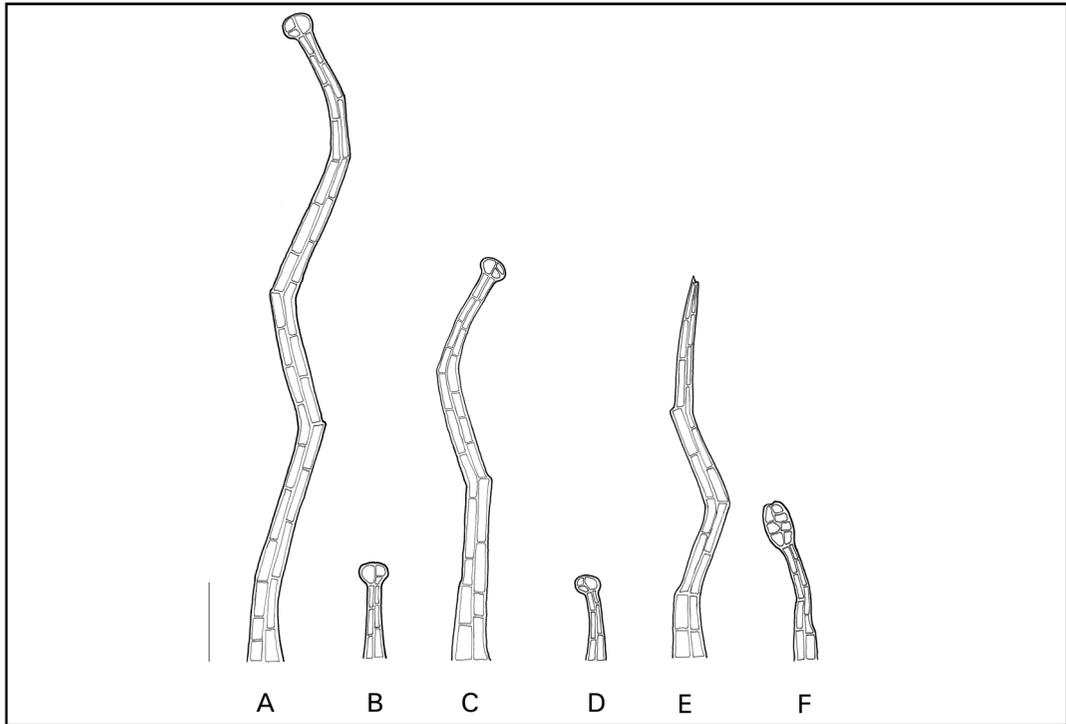


Figure 1. Trichome structure in the locket trigger plants. A, B – *Stylidium sacculatum* (Wege JAW 1087); C, D – *S. pseudosacculatum* (JAW 948); E – *S. perula* (JAW 952); F – *S. thylax* (JAW 984). Scale bar at 0.1 mm.

(*S. thylax* Wege, *sp. nov.*). The trichomes have the same distribution pattern as those in *S. pseudosacculatum*; however, unlike *S. pseudosacculatum* they are fairly consistent in length (0.15–0.3mm), and the heads are larger, ellipsoid and consist of cells arranged in 3 or 4 rows (Figure 1F).

### Taxonomy

#### Key to the creeping locket trigger plants

1. Pedicels short (<2.5 mm), hypanthium nestled amongst apical leaf rosette
  2. Labellum lateral appendages absent. Inflorescence trichomes glandular ..... **S. sacculatum**
  2. Labellum lateral appendages present, filiform. Inflorescence trichomes eglandular (pilose) ..... **S. perula**
1. Pedicels elongated (>2.5 mm), hypanthium exerted well beyond apical leaf rosette
  3. Inflorescence trichomes eglandular (pilose) ..... **S. perula**
  3. Inflorescence trichomes glandular
    4. Apical leaves ovate to lanceolate. Glandular trichomes *c.* equal in length, 0.15–0.3 mm long, heads ellipsoid ..... **S. thylax**
    4. Apical leaves linear-lanceolate. Glandular trichomes unequal (longest hairs at base of pedicel), 0.15–*c.* 1 mm long, heads subglobular ..... **S. pseudosacculatum**

**Styloidium sacculatum** F.L.Erickson & J.H.Willis *Muelleria* 1(1): 13 (1956). Base name for *Styloidium repens* R.Br. var. *sacculatum* (F.L. Erickson & J.H. Willis) Carlquist *Aliso* 7: 32 (1969). *Type*: Piawaning (N of Bolgart), Western Australia, 7 Oct. 1952, *R. Erickson s.n.* (*holo*: MEL!; *iso*: K!, PERTH 01642065!, PERTH 05906296!, PERTH 05906288!).

*Illustrations*. Erickson & Willis (1956) Figures 1–9, p. 14; Erickson (1958) Colour Plate 16, No. 1. Plate 17, Figures 17–25, p. 72; Lowrie *et al.* (1999) Figure 20, p. 147.

*Creeping perennial herb* 5–15 cm high. *Glandular trichomes* 0.1 mm to *c.* 1.8 mm long; stalks translucent, multicellular, biseriate, crinkled or straight; heads red or translucent, subglobose. *Eglandular trichomes* absent. *Stems* laterally-spreading, 1–15 shoots arising from each node; internodes glabrous, 1–18 cm long, 0.4–0.7 cm wide. *Stilt roots* papillose. *Leaves* in a terminal rosette with scattered leaves adpressed to stem, linear–lanceolate to lanceolate, 0.15–0.95 cm long, 0.5–1.2 mm wide, glabrous; margin hyaline, serrulate; base spurred; apex mucronate, mucro 0.1–0.5 mm long. *Inflorescence* uni-flowered, without visible bracts or bracteoles. *Pedicels* 0.3–2.2 mm long, glandular. *Hypanthium* nestled amongst apical leaf rosette, obloid, 4.5–8 mm long, 0.9–1.4 mm wide, glandular (hairs at base longer than those in upper portion). *Calyx lobes* free, 2.5–4.8 mm long, 0.5–0.8 mm wide; glabrous or sparingly glandular at base; margin hyaline, serrate; apex acute to mucronate. *Corolla* pale pink to white, throat markings pink, throat yellow; abaxial surface white, yellow in bud, glandular; tube 1.5–3.2 mm long; lobes laterally-paired; anterior lobes obovate, 3.7–6.8 mm long, 2–3.5 mm wide; posterior lobes elliptic to obovate, 3.2–6.5 mm long, 1.6–3.4 mm wide. *Labellum* boss greenish–yellow, narrowly ovate, 0.6–0.9 mm long, 0.3–0.5 mm wide, glandular on margins and abaxial surface; terminal appendage pink–red, 0.3–8 mm long; lateral appendages absent, rarely present (where present 0.05–0.2 mm long). *Throat appendages* 4–6, white, tooth-like to subulate; anterior appendages 0.1–0.7 mm long, 0.1–0.2 mm wide; posterior appendages absent, or present and 0.1 mm long, 0.1 mm wide. *Column* 6–7.5 mm long, dilated at distal end to form a cunabulum; connective glandular; anthers yellow, subtending hairs translucent; pollen yellow; stigma entire, sessile, circular to elliptic, cushion-like. *Capsule* and seed not viewed. (Figure 2)

*Selected specimens examined*. WESTERN AUSTRALIA: 13.9 km W of Wongan Hills on road to Calingiri, 20 Oct. 1975, *A.H. Burbidge* 2183 (PERTH); Calingiri, 23 Oct. 1998, *A.H. Burbidge s.n.* (PERTH); Bolgart, 40 km N of Toodyay, Oct. 1952, *R. Erickson s.n.* (PERTH); 10.6 miles W of Wongan Hills on road to Calingiri, Oct. 1973, *S.H. James* 73.10/24 (PERTH); On Bindoon–Moora Rd, 0.6 km S of Gillingarra, 20 Oct. 1989, *A. Lowrie s.n.* (MEL, PERTH); Bushland immediately S of the Mogumber–Yarramundah Rd on Great Northern Hwy, 9 Oct. 1995, *J.A. Wege & K.A. Shepherd* JAW 19 (K, MEL, PERTH); Drummond Nature Reserve, W of Bolgart, 11 Nov. 2003, *J.A. Wege* JAW 1087 (AD, CANB, MEL, NSW, PERTH, W); 15 km W of Coomberdale, 2 Nov. 1974, *D.J.E. Whibley* 4924 (AD, PERTH).

*Distribution and habitat*. Known from several scattered populations in the vicinity of Coomberdale, Gillingarra, Bolgart and Wongan Hills. Grows on clayey-sand or sand in open *Eucalyptus wandoo* or *Corymbia calophylla* woodland. (Figure 2A)

*Phenology*. Flowering specimens are known from October and November.

*Conservation status*. Conservation Codes for Western Australian Flora: Priority Three. Although Lowrie *et al.* (1999) describe *S. sacculatum* as “locally abundant and currently not under threat”, it remains a relatively poorly collected trigger plant, with only 14 records from *c.* 10 localities housed at PERTH. This species is well represented within Drummond Nature Reserve, west of Bolgart; however, it is not clear how many of the remaining localities occur on protected land. Further field observations and collections of this species are required.

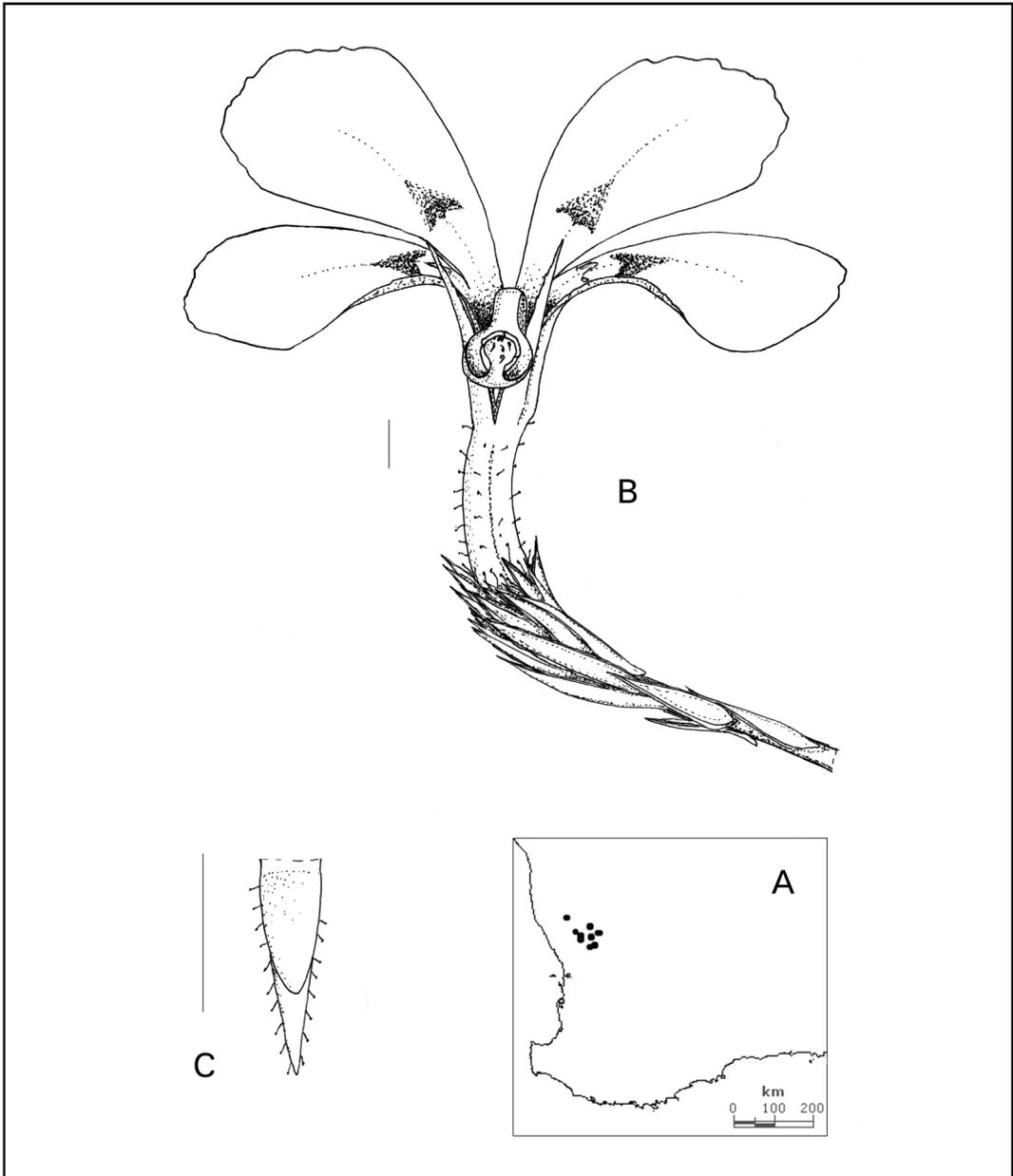


Figure 2. *Stylidium sacculatum*. A – distribution map; B – inflorescence; C – labellum. Scale bar at 1 mm. Drawn from JAW 1087.

*Chromosome number.* Unknown.

*Notes.* *Stylidium sacculatum* is distinct within section *Repentes* on account of its extremely short pedicels and its obloid hypanthium that is distinctively nested amongst the apical leaf rosette (Figure 2B). Unlike the species specifically discussed herein, the labellum typically lacks long lateral appendages (Figure 2C); however, rudimentary appendages from 0.05–0.2 mm long were observed in some flowers from some collections (e.g. *Burbidge s.n.* and JAW 1087).

A large bombyliid fly and smaller grey flies were observed pollinating plants at JAW 1087. Ants were also observed running over the laterally-spreading stems of individuals at this site. Erickson (1958: 69) also perceived insect visitors to be conspicuously active on this species. She similarly noted two species of fly (*Comptosia cuneata* Ed. and *C. carculum* Newm.) acting as pollinating agents and ants (*Iridomyrmex* sp.) scurrying over the stems (Erickson & Willis 1956; Erickson 1958). Whilst she observed ants drinking nectar, prompting the column to trigger, it is not known whether they are effective pollinating agents.

***Styldium pseudosacculatum*** Lowrie, A.H. Burb. & Kenneally *Nuytsia* 13(1): 143 (1999). *Type*: On Great Eastern Hwy, 3.2 km W of Tammin, Western Australia, 16 Oct. 1990, A. Lowrie 112 (*holo*: PERTH 05091284!; *iso*: MEL!).

*Illustrations*. Lowrie *et al.* (1999) Figure 19, p. 145.

*Creeping perennial herb* 4–15 cm high. *Glandular trichomes* 0.15–c. 1 mm long; stalks translucent, multicellular, biseriolate, crinkled or straight; heads red, or translucent, subglobular. *Eglandular trichomes* absent. *Stems* laterally-spreading, 2–5(9) shoots arising from each node; internodes glabrous, 0.8–24 cm long, 0.5–0.7 cm wide. *Stilt roots* papillose. *Leaves* in a terminal rosette with scattered leaves below, adpressed to stem, linear–lanceolate to lanceolate, 0.2–0.55 cm long, 0.6–1.2 mm wide, glabrous; margin hyaline, serrulate; base spurred; apex mucronate, mucro 0.15–0.3 mm long. *Inflorescence* uni-flowered, without visible bracts and bracteoles. *Pedicels* 3–8 mm long, glandular (longer hairs present at base, shorter hairs above). *Hypanthium* exerted beyond the apical leaf rosette, obloid to ellipsoid, 1.5–4 mm long, 0.7–1.5 mm wide, glandular. *Calyx lobes* free, 2–4 mm long, 0.7–1 mm wide; glabrous or sparingly glandular at base; margin hyaline, serrate; apex acute to mucronate. *Corolla* white, throat markings pink, throat green; abaxial surface flushed pink, glandular; tube 1.2–2 mm long; lobes laterally-paired, elliptic to narrowly obovate; anterior lobes 3.3–5.5 mm long, 1.6–2.8 mm wide; posterior lobes 3.3–5.5 mm long, 1.6–2.5 mm wide. *Labellum* boss greenish–yellow, ovate, 0.5–0.7 mm long, 0.3–0.5 mm wide, glandular on margins and abaxial surface; terminal appendage pink, 0.4–0.6 mm long; lateral appendages yellowish–green often with pink tips, 0.8–1.2 mm long. *Throat appendages* 6, white (occasionally with pink tips), subulate, 0.2–0.7 mm long, 0.1–0.2 mm wide. *Column* 4.7–6.6 mm long, dilated at distal end to form a cunabulum; connective glabrous or papillose; anthers yellow, subtending hairs translucent; pollen yellow; stigma entire, sessile, circular to elliptic, cushion-like. *Capsule* and seed not viewed. (Figure 3)

*Other specimens examined*. WESTERNAUSTRALIA: c. 2 miles W of Tammin, 5 Oct. 1975, A.H. Burbidge 2132 (PERTH); c. 110 miles E of Perth on Great Eastern Hwy, Oct. 1972, S. James 72.10/2 (PERTH); 2 miles W of Tammin, 9 Nov. 1974, G.J. Keighery 342 (PERTH); Charles Gardner Nature Reserve, S of Tammin, 13 Oct. 2003, J.A. Wege & C. Wilkins JAW 948 (CANB, PERTH).

*Distribution and habitat*. Known only from the Tammin region. Grows on sand over laterite in *Allocasuarina* heath or shrubland. (Figure 3A)

*Phenology*. Flowering specimens are known from October and November.

*Conservation status*. Conservation Codes for Western Australian Flora: Priority Two. *Styldium pseudosacculatum* is present within Charles Gardner Nature Reserve, south of Tammin; however, the type population west of Tammin is small and under threat (Lowrie *et al.* 1999). This species remains in need of further survey.

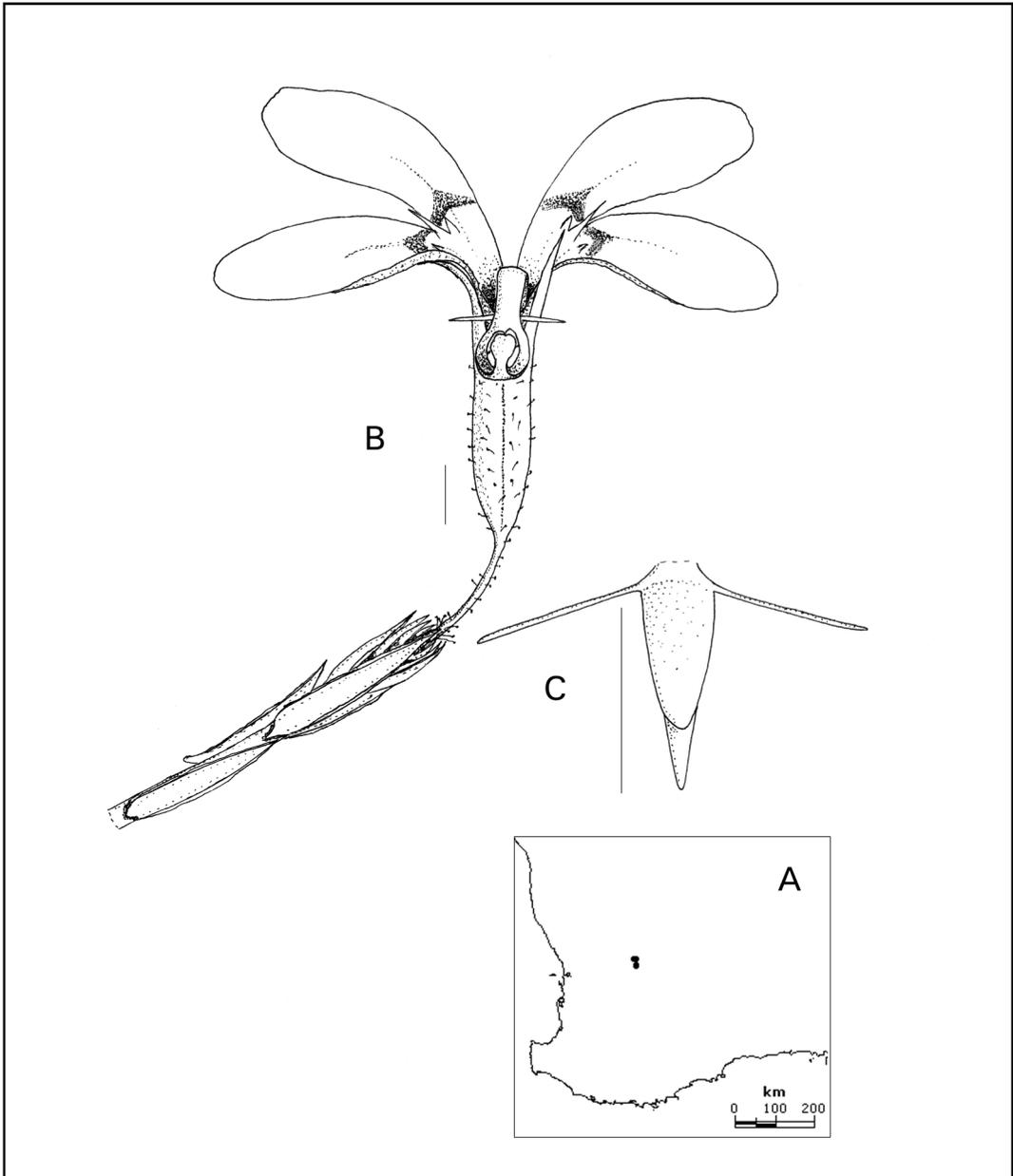


Figure 3. *Stylidium pseudosacculatum*. A – distribution map; B – inflorescence; C – labellum. Scale bar at 1 mm. Drawn from JAW 948.

*Chromosome number.* Burbidge (1984) recorded a count of  $2n=55-60$  (cited as *c.* 30 in Burbidge & James 1991). The voucher specimen (3 km W of Tammin, AHB 1691) has not been located at PERTH or UWA.

*Notes.* *Stylidium pseudosacculatum* can be readily differentiated from *S. sacculatum* by its shorter hypanthium, longer pedicels and labellum with long lateral appendages (Figure 3B–C). Differences to the two new species described herein are noted below.

**Stylidium thylax** Wege, *sp. nov.*

*Stylidio repentis* affinis sed columna sub apicem sacculata differt.

*Typus*: 33.9 km E of Forrestiana crossroads on Hyden–Norseman track, 17 Oct. 2003, *J.A. Wege & C. Wilkins* JAW 984 (*holo*: PERTH 06604773; *iso*: MEL).

*Creeping perennial herb* 4–8 cm high. *Glandular trichomes* 0.15–0.3 mm long; stalks translucent, multicellular, biseriate, straight; heads red, ellipsoid. *Eglandular trichomes* absent. *Stems* laterally-spreading, 2–5 shoots arising from each node; internodes glabrous, 0.5–7 cm long, 0.4–0.6 cm wide. *Stilt roots* papillose. *Leaves* in a terminal rosette with scattered leaves addressed to stem, ovate to lanceolate, 0.1–0.4 cm long, 0.6–1.5 mm wide, glabrous; margin hyaline, entire to serrulate; base spurred; apex mucronate, mucro 0.1–0.2 mm long. *Inflorescence* uni-flowered, without visible bracts and bracteoles. *Pedicels* 4–12 mm long, glandular (hairs of *c.* equal length). *Hypanthium* exerted beyond the apical leaf rosette, ellipsoid (rarely obloid), 1.7–3.5 mm long, 0.8–1.6 mm wide, glandular. *Calyx lobes* free, 1.4–3.2 mm long, 0.6–1 mm wide; glabrous or sparingly glandular at base; margin hyaline, serrate; apex acute to mucronate. *Corolla* white, throat markings pink, throat yellow–green; abaxial surface flushed pink, glabrous or sparingly glandular; tube 1.2–2.5 mm long; lobes laterally-paired, broadly to narrowly obovate; anterior lobes 4–6 mm long, 2.4–4 mm wide; posterior lobes 4–6 mm long, 2–3.5 mm wide. *Labellum* boss yellow, ovate, 0.5–0.8 mm long, 0.3–0.5 mm wide, glabrous or sparingly glandular on abaxial surface; terminal appendage white or pink, 0.3–0.8 mm long; lateral appendages yellowish tinged red or pink, 0.7–1.5 mm long (rarely absent). *Throat appendages* 6–8, yellow–green at base and white above, subulate, 0.1–1.8 mm long, 0.1–0.3 mm wide. *Column* 5.5–7 mm long, dilated at distal end to form a cunabulum; connective glabrous; anthers yellow or red, subtending hairs translucent; pollen yellow; stigma entire, sessile, circular, cushion-like. *Capsule* and seed not viewed. (Figure 4)

*Other specimens examined*. WESTERN AUSTRALIA: *c.* 37 km E of Newdegate, 24 Oct. 1975, *A.H. Burbidge* 2195 (PERTH); 10 km SE of Newdegate–Lake Grace Rd, along Burngup Rd, 30 Oct. 1998, *S. Donaldson & G.T. Chandler* SD1956 (CANB); South side of Kulin–Holt Rock Rd at the W boundary of Dragon Rocks Nature Reserve, 15 Oct. 2003, *J.A. Wege & C. Wilkins* JAW 969 (CANB, PERTH).

*Distribution and habitat*. Known from 3 disjunct populations located east of Newdegate, south of Hyden and east of the Forrestania crossroads. Grows on sand in heath or mallee shrubland. (Figure 4A)

*Phenology*. Flowering specimens are known from October.

*Conservation status*. Conservation Codes for Western Australian Flora: Priority Two. This species is known from only three locations, one of which is in a conservation reserve. Further survey effort is required.

*Etymology*. The species epithet is derived from the Greek (*thylax* – a bag, sack or pouch) in reference to the pouch-like swelling at the column extremity.

*Chromosome number*. Unknown.

*Notes*. *Stylidium thylax* is morphologically similar to *S. pseudosacculatum*: both species possess a dilated column, pedicels exerted beyond the apical leaf rosette, a glandular inflorescence indumentum, and long lateral labellum appendages. Unlike *S. pseudosacculatum*, in which the corolla tube is shorter

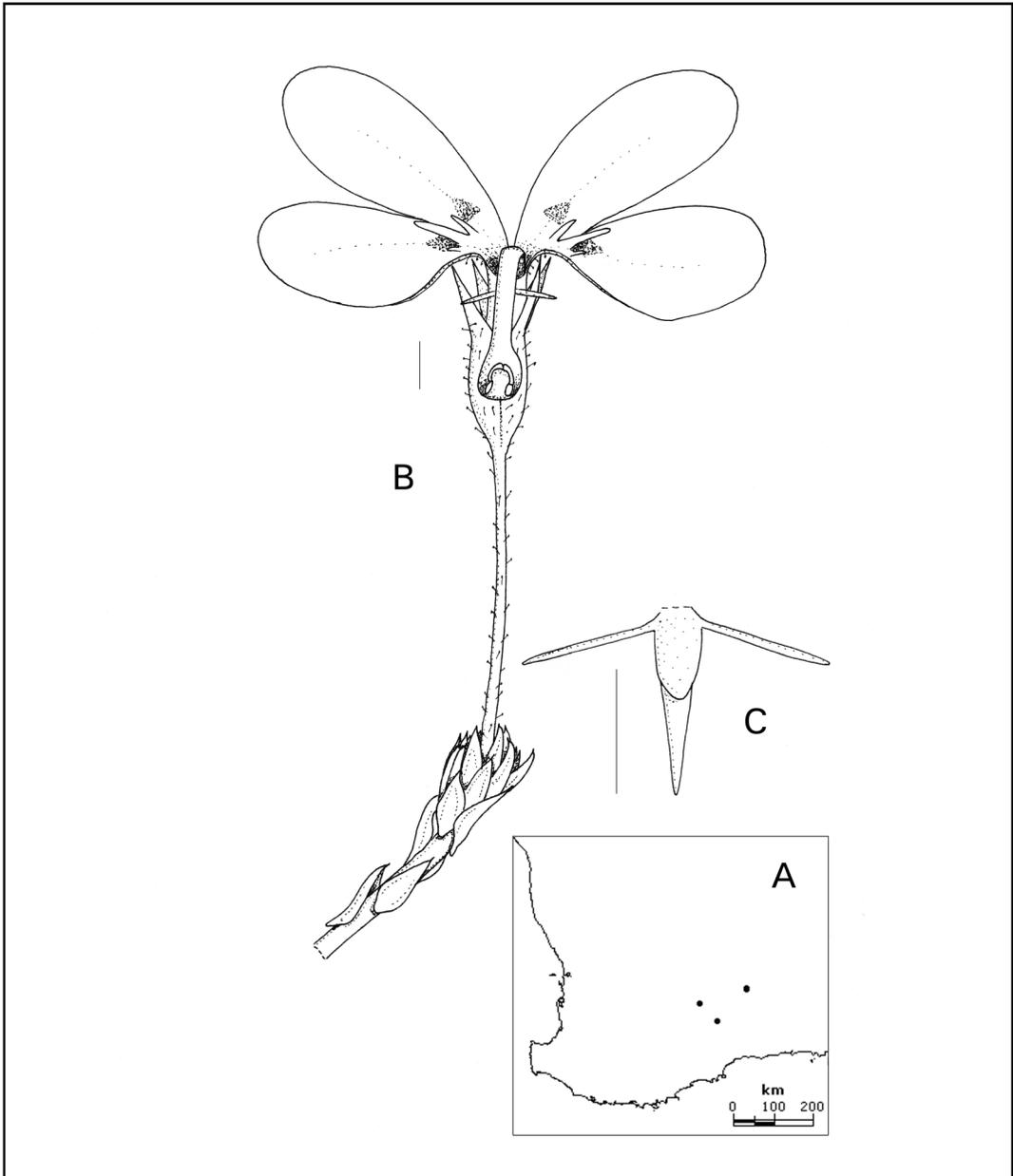


Figure 4. *Stylidium thylax*. A – distribution map; B – inflorescence; C – labellum. Scale bar at 1 mm. Drawn from JAW 984.

than the calyx lobes, *S. thylax* possesses a corolla tube roughly equal in length, or exerted beyond the calyx lobes. *Stylidium thylax* also tends to have broader corolla lobes, shorter apical leaves (ovate to lanceolate rather than linear–lanceolate) and longer throat appendages. Species of *Stylidium* can exhibit subtle variation in features such as corolla shape and size, leaf size and throat appendages number and size. The paucity of specimens available for comparison makes it difficult to ascertain whether the above morphological variation is significant; however, the delineation of *S. thylax* is supported by differences in the length and structure of the glandular trichomes (see trichome section above).

It is of note that the glandular trichomes of *S. thylax* are anatomically similar to those found in *S. repens*. Glandular trichome structure appears to be significant when assessing systematic relationships in *Stylidium*. The true affinities of *S. thylax* may therefore lie with *S. repens*, even though the latter species lacks the pouch-like broadening of the column.

***Stylidium perula* Wege, sp. nov.**

*Stylidio pseudosacculato* affinis sed indumenta eglandulosa differt.

*Typus*: W boundary track of Wallaby Hills Nature Reserve, E of York, 13 Oct. 2003, *J.A. Wege and C. Wilkins* JAW 946 (*holo*: PERTH 06604781; *iso*: CANB, MEL).

*Illustrations*. Carlquist (1969) Figure 33–34, p. 33, as photographs.

*Creeping perennial herb* 3–12 cm high. *Glandular trichomes* absent. *Eglandular trichomes* 0.2–c.1 mm long, multicellular, biseriate, crinkled or straight. *Stems* laterally-spreading, 2–14 shoots arising from each node; internodes glabrous, 0.5–1.1 cm long, 0.4–0.6 cm wide. *Stilt roots* papillose. *Leaves* in a terminal rosette with scattered leaves adpressed to stem, linear–lanceolate to lanceolate, 0.15–0.5 cm long, 0.5–1 mm wide, glabrous; margin hyaline, entire to serrulate; base spurred; apex mucronate, mucro 0.1–0.4 mm long. *Inflorescence* uni-flowered, without visible bracts and bracteoles. *Pedicels* 1–7 mm long, pilose. *Hypanthium* exerted beyond the apical leaf rosette or nestled (in part) amongst it, ellipsoid to obloid, 1.5–5 mm long, 0.7–1.4 mm wide, pilose. *Calyx lobes* free, 2–3.7 mm long, 0.7–1 mm wide, glabrous or sparingly pilose at base; margin hyaline, serrate; apex acute to mucronate. *Corolla* white to pale pink, throat markings dark pink; abaxial surface white or flushed pink, glabrous or sparingly pilose; tube 1.5–2.8 mm long; lobes laterally-paired, obovate to elliptic; anterior lobes 3.2–8 mm long, 1.5–3.8 mm wide; posterior lobes 3–7.8 mm long, 1.4–3.5 mm wide. *Labellum* boss white to yellow, ovate, 0.6–0.8 mm long, 0.3–0.5 mm wide, glabrous; terminal appendage pink, 0.5–0.7 mm long; lateral appendages pink, 0.8–2.5 mm long. *Throat appendages* 6, white, tooth-like, 0.1–0.5 mm long, 0.2–0.4 mm wide. *Column* 4.5–7.5 mm long, dilated at distal end to form a cunabulum; connective papillose; anthers yellow, subtending hairs translucent; pollen yellow; stigma entire, sessile, circular, cushion-like. *Capsule* and seed not viewed. (Figure 5)

*Selected specimens examined*. WESTERN AUSTRALIA: 12 miles NW of Wickiepin on road to Pingelly, 8 Oct. 1974, *A.H. Burbidge* 1720 (PERTH); c. 18.5 km W of Corrigin, 23 Oct. 1974, *A.H. Burbidge* 1770 (PERTH); 29.7 km W of Corrigin, 6 Oct. 1976, *A.H. Burbidge* 2329A (PERTH); Wogerlin Road, 11 km N of junction with Corrigin–Babakin Rd, 18 Sept. 1997, *R. Campbell* 470 (PERTH); 16 miles S of Narrogin, 26 Oct. 1962, *S. Carlquist* 922 (NSW, RSA); 39 miles E of Brookton on road to Corrigin, 8 Oct. 1967, *S. Carlquist* 3693 (CANB, K, MEL, NSW, PERTH, RSA); 14.5 miles W of Wandering on road to Pingelly, 9 Oct. 1967, *S. Carlquist* 3694 (CANB, K, MEL, NSW, PERTH, RSA); Quairading Shire Reserve, 23 Sept. 1999, *G.J. Keighery & N. Gibson* 2875 (PERTH); Dryandra State Forest, 23 Oct. 1987, *D.M. Rose* 420 (CANB, PERTH); Nature Reserve at junction of Jubuk Rd North and Brookton–Corrigin Rd, 14 Oct. 2003, *J.A. Wege & C. Wilkins* JAW 952 (PERTH).

*Distribution and habitat*. Known from Wallaby Hills east of York, east to the Corrigin region and south-west to Narrogin. Grows in wandoo woodland, mallee shrubland or heath and favours sandy-clay soils. (Figure 5A)

*Phenology*. Flowering specimens are known from mid September to late October.

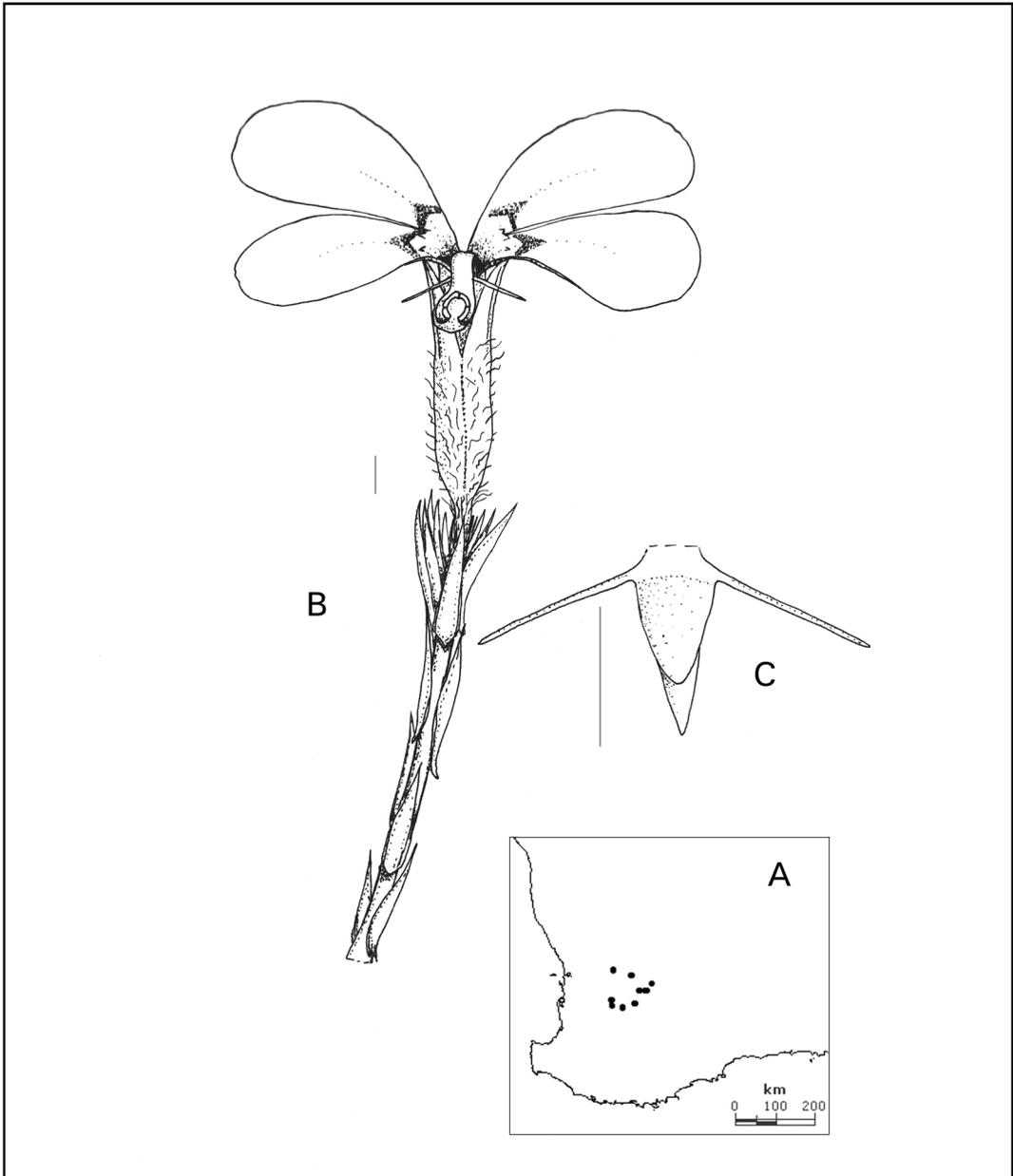


Figure 5. *Stylidium perula*. A – distribution map; B – inflorescence; C – labellum. Scale bar at 1 mm. Drawn from JAW 946.

*Conservation status.* Represented within several conservation reserves in the wheatbelt region. Not considered threatened.

*Etymology.* The species epithet is derived from the Greek (*pera* – a little wallet, a pocket) in reference to the pouch-like swelling at the column extremity.

*Chromosome number.* Unknown.

*Notes.* Differs from all other members of section *Repentes* in possessing eglandular rather than glandular hairs on the inflorescence (Figure 5). Carlquist collected this taxon west of Wandering (PERTH03161102) and erroneously considered it to be a hybrid between *S. repens* and *S. sacculatum* (Carlquist 1969).

### The Locket

In the creeping trigger plants discussed herein, the column is dilated just below the apex to form a cunabulum in which the anthers and/or stigma rest when the column is poised (Figures 6A–B). A dilated column apex is also present in a small number of morphologically dissimilar trigger plants from south-west Western Australia. *Stylidium preissii* F. Muell. (a tile-leaf trigger plant) possesses a conspicuous cunabulum that cradles the reproductive parts when poised in a manner similar to *S. sacculatum* and allies (Figure 6C). *Stylidium verticillatum* F. Muell. (a whorled-leaf trigger plant) was described by Erickson & Willis (1956) as possessing a column like that of *S. sacculatum*; however, whilst the column is broadened near the apex (Figure 6D), this broadened region is swollen and does not form a cunabulum (Figure 6E). *Stylidium scabridum* Lindl. (a scale-leaf trigger plant) possesses a similarly swollen region near the apex of the column. The column in *S. scandens* R. Br. (another whorled-leaved trigger plant) has also been questionably likened to that in *S. sacculatum* (Erickson & Willis 1956); however, although it broadens slightly above the main hinge a cunabulum is not formed (Figure 6F).

Dilated column apices are more widespread in the annual species from northern Australia (see Carlquist 1979; Lowrie & Kenneally 1994, 1996, 1997; Bean 1999, 2000). For example, *Stylidium dunlopianum* Carlquist possesses an extremely well-developed cunabulum (Figure 6G), the sides of which are laterally extended and shroud the anthers in the set position. A similarly-shaped locket is present in *S. rotundifolium* R. Br. (*K.F. Kenneally* 8589), *S. perizostera* Lowrie & Kenneally (*T. Willing* 410A; *K.F. Kenneally* 11198) and *S. claytonioides* W. Fitzg. (*D.J. Edinger* 760).

In contrast, *S. rivulosum* Lowrie & Kenneally possesses a column that is only slightly broadened above the main hinge (Figure 6H). Although described as possessing a cunabulum (Lowrie & Kenneally 1997), a distinct cradle for the anthers is not formed. *Stylidium adenophorum* Lowrie & Kenneally (*P.G. Wilson* 11352), *S. turbinatum* Lowrie & Kenneally (JAW 484) and *S. mucronatum* Lowrie & Kenneally (*n.v.*, see Figure 4 in Lowrie & Kenneally 1997) are similar in this respect. These species possess two marginal bands of eglandular hairs (unicellular papillae) on the adaxial surface of the column (Figure 5H).

The flowers of *Stylidium* are designed to promote cross-pollination: the anthers typically develop first and the stigma develops after the pollen is released. From her detailed observations of *S. sacculatum*, Erickson (1958) suggested that the locket may function as “an economical device for saving loose grains that spill out of the anthers whilst waiting for insect visitors” (p. 70). The inference here is that the “saved” pollen is in turn received by the stigma (i.e. that the locket is an adaptation to facilitate self-pollination). Carlquist (1969) steadfastly came to this conclusion; however, perennial trigger plants from southern Australia have since been shown to possess lethal systems that operate post-zygotically on the products of self-pollination (Banyard & James 1979; Coates & James 1979; James 1979; Willis & Ash 1990; Burbidge & James 1991). The study of Burbidge & James (1991) specifically demonstrated a significantly reduced amount of seed set after self-pollination as compared to cross-pollination in *S. sacculatum*<sup>1</sup>. It is therefore unlikely that the locket has evolved as a self-pollination mechanism in the perennial creeping species discussed herein.

<sup>1</sup> No voucher specimen is cited in this paper; material used in this experiment may correspond to *S. pseudosacculatum*. However, this does not change the argument presented here.

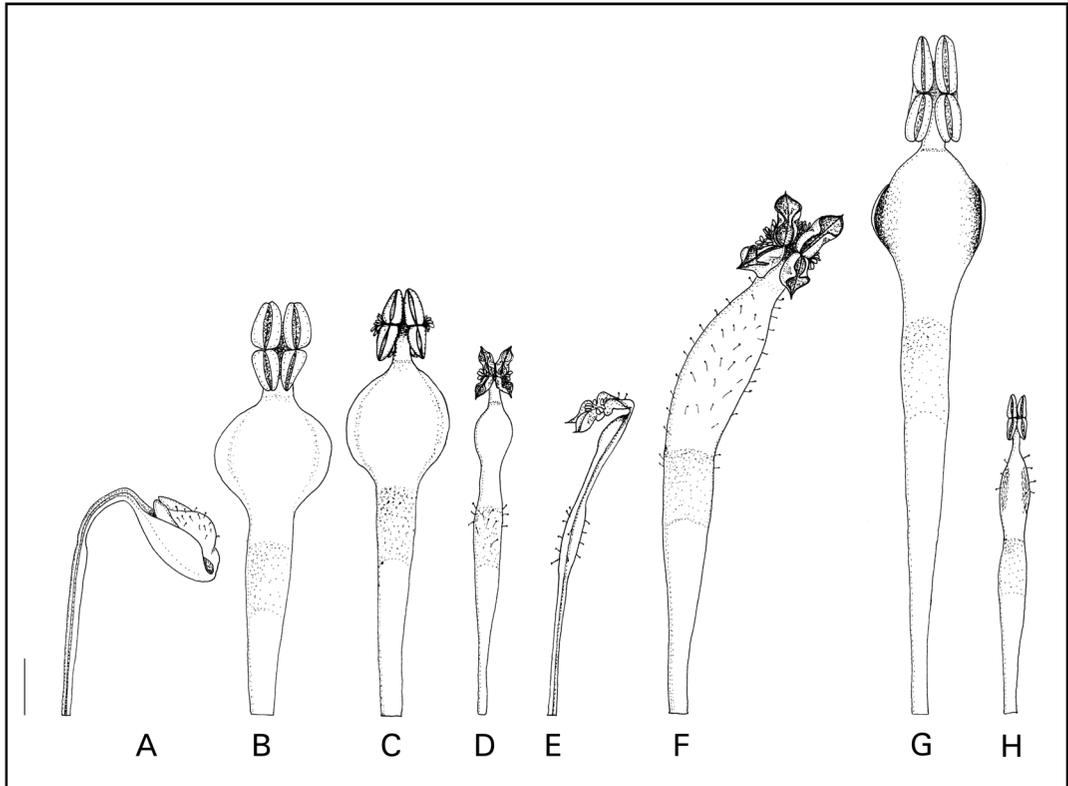


Figure 6. The dilated columns of selected species of *Stylidium*. A, B – *S. sacculatum* (JAW 1087); C – *S. preissii* (JAW 1095); D – *S. verticillatum* (JAW 863); E – *S. scandens* (JAW 814); F – *S. dunlopianum* (D.J. Edinger 566); G – *S. rivulosum* (D.J. Edinger 282). The reproductive organs are cradled by a cunabulum in A–C and G only. Scale bar at 1 mm.

Erickson (1958) suggested that the cunabulum may function to protect the pollen from dessication. Alternatively, it may help safeguard the pollen from thieving insects. Long-tongued flies have been observed by the present author hovering next to recently-triggered flowers (of an unrelated species) in order to cunningly steal pollen from the anther sacs before the column has had a chance to reset. It is not known whether this is a widespread phenomenon.

In contrast to their southern perennial counterparts, it is unlikely that annual trigger plants from tropical Australia possess efficient post-zygotic lethal systems given their reliance on high levels of seed set for regeneration (see Wege 2004). It is therefore possible that the cunabulum in these trigger plants has evolved to facilitate self-pollination. Carlquist (1978; 1979) firmly believed this to be the case. In those tropical species in which the column is only slightly broadened (i.e. *S. rivulosum* and allies), papillae present on the surface of the column may function to capture pollen for later retrieval by the stigma (thus rendering a distinct pouch unnecessary).

As mentioned by Carlquist (1969), the presence of a dilated column in a number of unrelated species of *Stylidium* suggests that this structure has arisen more than once in the evolution of the genus. As yet, there is no robust phylogeny of *Stylidium* to investigate how many times this may have happened. Clearly there is much scope for integrated studies of phylogeny, pollination and breeding systems in this remarkable genus.

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