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Key to the Triggerplants of the Northern Territory (*Stylidium*: Stylidiaceae)

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Abstract

Wege, J.A. & Brennan, K.G., Key to the Triggerplants of the Northern Territory (*Stylidium*: Stylidiaceae). *Nuytsia* 35: 199–216 (2024). An annotated dichotomous key and photographic guide to *Stylidium* Sw. ex Willd. in the Northern Territory is provided. *Stylidium gemmatum* Wege & Brennan is formally described and *S. stenophyllum* A.R.Bean placed into synonymy under a broadly circumscribed *S. pachyrrhizum* F.Muell.

Introduction

Recent taxonomic research on *Stylidium* Sw. ex Willd. in northern Australia and the adjacent arid zone has led to a suite of novel discoveries as well as significant range extensions and nomenclatural changes (Wege *et al.* 2024). This identification guide to the 50 named species found in the Northern Territory has been crafted to accommodate these taxonomic updates and includes the novel species *S. gemmatum* Wege & Brennan (described herein) as well as putative novelties that are currently under study. Notes have been provided in some instances to detail taxonomic concepts and highlight ongoing research or atypical variation.

Key to *Stylidium* in the Northern Territory

This key is accompanied by a photographic guide (Figures 1–5) that includes one or more floral photographs of each taxon arranged in the order they appear in the key. Figure numbers are indicated in the key in square brackets after the taxon name and an index to the images is provided. Superscript numbers associated with a subset of the taxa refer to taxonomic commentary provided at the end of the key, including the formal description of *S. gemmatum*.

The anterior corolla lobes are those positioned either side of the labellum (the small, highly modified corolla lobe that accommodates movement of the floral column). The term ‘throat appendages’ refers to the protuberances or ridge of tissue that can be present at the base of the corolla lobes, while the term ‘callosity’ refers to the hardened yellow, orange or red tissue that may be present in the corolla lobe sinuses; these terms are equivalent to the ‘paracorolla’ and ‘paracorolla gland’ of Bean (1999, 2000, 2010), Bean and Mathieson (2012) and Barrett *et al.* (2015). Care should be taken when measuring column length, which is often taxonomically informative yet difficult to measure in pressed material: it is usually more reliably measured when extended, i.e. in flowers that have been triggered (note the base of the column aligns with the base of the calyx lobes). To facilitate identification, collectors and iNaturalist users are encouraged to take photographs of the face of the flower (showing the corolla and throat appendage morphology), a side view of the flower (to show the calyces, corolla tube and column), and the leaves and base of the plant.

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1. Corolla spur present (at the base of the corolla tube on the opposite side of the labellum); hypanthium and capsules ± globose; stigma brush-tipped (stipitate) **2**

1: Corolla spur absent; hypanthium and capsules ± ellipsoid, obovoid or obconical, or oblong to linear in outline; stigma sessile **3**

2. Corolla lobes orange or salmon-pink (rarely pink) with conspicuous yellow (rarely pink) ridges radiating from throat, rotated 180° (column dorsal); lower (posterior) corolla lobes strongly bilobed (with 4 segments divided to near base); stigma obdeltoid ..... **S. ceratophorum** [1A]

2: Corolla lobes mauve-pink or pale pink to magenta with a white throat, sometimes all white or with the upper lobes white, not rotated (column ventral); lower (anterior) corolla lobes emarginate to weakly asymmetrically bilobed; stigma obloid ..... **S. longicornu** [1B, C]

3. Hypanthium and capsules ellipsoid to obovoid or obconical; glandular hairs with an ellipsoid head **4**

3: Hypanthium and capsules ± linear or sometimes oblong in outline; glandular hairs with a discoid or globose head **15**

4. Leaves linear **5**

4: Leaves oblanceolate or spathulate **9**

5. Corolla lobes paired laterally (column lateral), tube ≥ 4 mm long; column lacking glandular hairs; throat appendages absent **6**

5: Corolla lobes paired vertically (column dorsal), tube < 3.5 mm long; column glandular-hairy; throat appendages present **7**

6. Column 10–13.5 mm long; stem usually contracted or to *c.* 5 cm long (rarely to *c.* 10 cm long), leaves often basal or sometimes terminal and scattered on stem below ..... **S. desertorum** (typical form) [1D]

6: Column 15–20 mm long; stem (1–) 5–23 cm long, leaves usually terminal and scattered on stem below, rarely strictly basal ..... **S. desertorum** (atypical form)[1] [1E]

7. Hypanthium and capsules with prominent longitudinal ribs; throat appendages glandular-hairy ..... **S. turbinatum** [1F]

7: Hypanthium and capsules without prominent ribs; throat appendages glabrous or papillose, lacking glandular hairs **8**

8. Leaves glabrous; stem pale straw-brown; throat appendages basally connate, somewhat irregularly lobed, *c.* 0.2–0.5 mm high; column with glandular hairs but no simple hairs above main bend, corona (hairs around anthers) present; seed surface ± smooth (areolate) ..... **S. floodii** [1G]

8: Leaves glandular-hairy, sometimes hairs sparse near apex or occasionally absent; stem pale to dark red (rarely straw-brown); throat appendages free, the upper (anterior) pair tapered, angled inwards and 0.5–1.2 mm high; column with glandular and simple hairs above main bend, corona absent; seed surface wrinkled and papillose ..... **S. adenophorum** [1H]

9. Leaves glandular-hairy ..... **S. semipartitum** [1I]

9: Leaves glabrous **10**

10. Scape with long simple hairs below inflorescence or with both simple and glandular hairs; capsules usually obconical (sometimes narrowly obovoid) **11**

10: Scape strictly glandular-hairy below inflorescence; capsules ellipsoid to obovoid **12**

11. Scape with strictly simple hairs below inflorescence; glandular hairs on inflorescence of ± equal length, 0.2–0.3 mm long; column 4.5–6.5 mm long; seed surface colliculate ..... **S. floribundum** [1J]

11: Scape with both simple and glandular hairs below inflorescence; glandular hairs of unequal length, 0.1–1.2 mm long; column 6–10 mm long; seed surface finely reticulate ..... **S. inaequipetalum**[2] [1K]

12. Corolla lobes ± paired vertically (column dorsal), tube 4–5 mm long (exserted well beyond calyx); column with both glandular and short simple hairs above main bend; throat appendages prominent, the upper (anterior) ones broad and wing-like ..... **S. leptorrhizum** [1L]

12: Corolla lobes paired laterally (column lateral), tube 1.2–2.7 mm long; column glabrous above main bend; throat appendages absent, slender or inconspicuous **13**

13. Flowers with a golden yellow throat, lacking throat appendages; corona (hairs around anthers) absent ..... **S. incognitum** [2A]

13: Flowers with a white throat, throat appendages present; corona present **14**

14. Seed surface colliculate; throat appendages conspicuous at base of all corolla lobes; leaf margin sometimes finely hyaline; associated with catchments that discharge to the coast ..... **S. multiscapum** [2B]

14: Seed surface reticulate; throat appendages present on anterior lobes but absent or rudimentary on posterior lobes; leaf margin prominently hyaline; associated with catchments that discharge inland ..... **S. pezidium** [2C]

15. Plants without a leaf rosette, scape absent (stem often scapiform); leaves cauline, evenly scattered or more densely arranged towards base of plant **16**

15: Plants with a leaf rosette from which a scape arises (scape sometimes with scattered bracts); leaf rosette either basal (stem contracted) or terminal (usually also with scattered stem leaves) **29**

16. Corolla lobes paired vertically (column dorsal), free to top of tube or with the larger (posterior) pair basally connate, tube ≥ calyx lobes; throat appendages usually present (sometimes absent in *S. prophyllum*); seeds 0.15–0.25 mm long, without a pale nipple **17**

16: Corolla lobes paired laterally (column lateral) with each pair connate for 1/3–3/4 of length, tube < calyx lobes; throat appendages absent; seeds 0.25–0.5 mm long, with a pale nipple **26**

17. Corolla lobes obtuse or rounded; labellum at base of anterior corolla sinus **18**

17: Corolla lobes emarginate or bilobed (the larger, lower pair always bilobed); labellum on outside of corolla tube below anterior sinus **19**

18. Calyx lobes 1–1.5 mm long; lower (larger, posterior) corolla lobes 1.5–2.7 mm long; column 3–4.8 mm long ..... **S. elachophyllum** [2D]

18: Calyx lobes 1.8–3.7 mm long; lower corolla lobes 4–9.5 mm long; column 5.5–9.5 mm long ..... **S. prophyllum** [2E]

19. Leaves more closely spaced toward base of plant **20**

19: Leaves ± evenly spaced along stem **23**

20. Column 7.5–9 mm long; leaves 1–4 mm long; corolla lobes deep pink to mauve-pink (rarely with the upper lobes white or tinged white) ..... **S. fissilobum** [2F]

20: Column 3–6.7 mm long; leaves 2–12 mm long; corolla lobes white or pale pink to pale mauve-pink (or a combination of the two) **21**

21. Flowers lacking orange-yellow callosities; leaves 0.4–2.5 mm wide; corona (hairs around anthers) absent ..... **S. diffusum** [2G]

21: Flowers with prominent orange-yellow callosities; leaves 0.2–0.5 mm wide; corona present **22**

22. Column with small lateral lobes above main bend; throat appendages on lower corolla lobes pale; known from the Victoria Bonaparte bioregion ..... **S. aquaticum** (typical form) [2H]

22: Column with raised margins above main bend; throat appendages on lower corolla lobes red-tipped; known from the Pine Creek bioregion (Nitmiluk NP) ..... **S. aquaticum** (atypical form)[3] [2I]

23. Upper (smaller, anterior) corolla lobes strongly bilobed (divided *c.* 1/2 or > 1/2 their length) **24**

23: Upper corolla lobes emarginate or shallowly bilobed (divided < 1/3 their length) **25**

24. Corolla lobes pure white, the upper (smaller, anterior) ones with ± equal, spreading segments; column 4.8–7 mm long; known from the Tanami and Gulf Coastal bioregions ..... **S. brennanianum** [2J]

24: Corolla lobes pink, mauve-pink, or sometimes pink and white, the upper ones with unequal segments; column 7–9.5 mm long; known from the Darwin Coastal and Pine Creek bioregions ..... **S. gemmatum**[4] [2K]

25. Flowers with a prominent orange or yellow callosity in sinus between upper and lower corolla lobes and sometimes between the lower lobes; column with small lateral lobes above main bend; seed surface ± smooth (areolate) ..... **S. fissilobum** [2F]

25: Flowers with a dark pink- or purple-tipped throat appendages, lacking orange or yellow callosities; column with raised margins above main bend; seed surface colliculate ..... **S. torquatum** [2L]

26. Hypanthium glabrous; pedicels distinct, 1–6 mm long: stem delicate, 0.2–0.5 mm wide; corolla lobes with a discrete colour blotch towards base ..... **S. tenerrimum** [3A]

26: Hypanthium sparsely glandular-hairy; pedicels indistinct or to *c.* 1 (rarely 2) mm long; stem (0.3–)0.5–1.8 mm wide; corolla lobes with a broad colour band towards base (markings rarely absent) **27**

27. Leaf base cordate or rounded; each pair of corolla lobes connate for 1/3–1/2 of length, with a thin, red, medial stripe on undersurface of each lobe ..... **S. cordifolium** [3B]

27: Leaf base attenuate or cuneate; each pair of corolla lobes connate for ≥ 1/2 of length, undersurface pale or flushed pink **28**

28. Corolla lobes very unequal (the upper pair much smaller than the lower ones), white or dusky pink with dark markings; leaves mostly linear-lanceolate (ovate or elliptic and smaller near stem base) ..... **S. evolutum** [3C]

28: Corolla lobes of ± equal length, pink or mauve-pink (rarely white) with dark markings; leaves mostly lanceolate or broadly elliptic (becoming narrower distally) ..... **S. fluminense** [3D]

29. Inflorescences consistently 1-flowered (although numerous scapes produced/plant); leaves at base of inflorescences with a fibrous projection or tuft of hairs at the tip **30**

29: Inflorescences usually 2 to many-flowered (although solitary-flowered individuals sometimes occur); leaf apex obtuse or rounded **32**

30. Corolla minute, the lower (larger, posterior) lobes < 1 mm long; column 2.2–4 mm long ..... **S. pedunculatum** [3E]

30: Lower (larger, posterior) corolla lobes 1.3–3.7 mm long; column > 5 mm long **31**

31. Column 5.2–8 mm long ..... **S. ericksoniae** [3F]

31: Column 11–14 mm long ..... **S. contrarium** [3G]

32. Calyx 2-lipped or with lobes arranged in 2 partly connate groups **33**

32: Calyx with 3 free and 2 partly connate lobes **40**

33. Calyx lobes glabrous or with sparse glandular hairs near base; column slender above main bend **34**

33: Calyx lobes sparsely glandular-hairy on margins and usually near base; column dilated distally or with lateral lobes **37**

34. Leaves in a loose terminal rosette and scattered below on an elongated stem, rarely appearing ± basal through contraction of stem but if so then not spreading against substrate, 2.5–22 mm long including a conspicuous, slender petiole **35**

34: Leaves in a small basal rosette (stem contracted), spreading against soil surface, 1.5–8 mm long, ± sessile or inconspicuously petiolate **36**

35. Corolla with prominent red-pink markings towards base of lobes on upper surface; upper (smaller, anterior) corolla lobes obovate and bilobed (each segment usually with additional lobing); grows in shallow sand amongst boulders and in rock crevices on sandstone pavements, ridges and plateaus ..... **S. candelabrum** (typical form) [3H]

35: Corolla lacking markings on upper surface (occasionally with a red-pink stripe abaxially along midvein near base of lobes and on tube); upper corolla lobes ± narrowly elliptic with a rounded, obtuse or subacute apex; usually grows in heavy soils with lateritic and quartzite gravels, rarely on sandstone ..... **S. candelabrum** (atypical form)[5] [3I]

36. Upper (anterior) corolla lobes much smaller than the lower ones, the latter bilobed; throat appendages 2 or 4, not connected across the lower corolla lobes (corolla with a sinus on posterior side); seed surface scarcely and somewhat irregularly colliculate ..... **S. synaptum** [3J]

36: Corolla lobes *c.* equal in length or with the upper pair a little shorter than the lower ones, the latter emarginate; throat appendages 6, basally connate (corolla lacking a sinus on posterior side); seed surface ± smooth (areolate) ..... **S.** sp. **Twin Falls** (L.A. Craven 5870)[6]

37. Labellum on outside of corolla tube below anterior sinus; corolla lobes unequal, the lower (larger, posterior) ones emarginate or bilobed; throat appendages yellow, v-shaped, glabrous ..... **S. osculum** [3K]

37: Labellum at base of anterior sinus; corolla lobes ± equal or with the upper (anterior) pair a little shorter than the lower ones, lower lobes obtuse, rounded or scarcely emarginate; flowers with faint ridges and glandular hairs in throat **38**

38. Corolla tube 4–5 mm long, much longer than the calyx lobes; column 8–10.5 mm long ..... **S. dunlopianum**[7] [3L]

38: Corolla tube to 3 mm long, a little longer than the calyx lobes; column 4–7 mm long **39**

39. Seed surface colliculate; rosette leaves with an oblanceolate, spathulate or obovate lamina, usually widely spreading ..... **S. rotundifolium** [4A]

39: Seed surface ± smooth (areolate); rosette leaves with a narrowly oblanceolate or elliptic lamina, usually erect to suberect ..... **S. irriguum** [4B]

40. Column exceptionally long, 15–19 mm ..... **S. notabile** [4C]

40: Column 2.5–10 mm long **41**

41. Scape glabrous below inflorescence or glandular hairs very sparse and not extending to base **42**

41: Scape glandular-hairy throughout **47**

42. Basal leaves 1.8–8 mm long; scape with scattered sterile bracts below inflorescence; lower (larger, posterior) corolla lobes free to top of tube; capsules without longitudinal ribs **43**

42: Basal leaves 5–70 mm long; scape without sterile bracts below inflorescence (sometimes with 1 or 2 bracts with growth buds in axils); lower corolla lobes connate basally or for > 1/2 their length; capsules with longitudinal ribs **46**

43. Column 2.5–3.7 mm long; throat appendages confined to lower (posterior) corolla lobes; lower corolla lobes 1.2–2 mm long; capsules 3–6 mm long excluding calyx lobes ..... **S. tantillum** [4D]

43: Column 4.2–9 mm long; throat appendages present on both the upper and lower corolla lobes; lower corolla lobes 2.5–5 mm long; capsules 7–22 mm long excluding calyx lobes **44**

44. Corolla lobes ± equal; throat appendages 1.2–1.4 mm high, golden yellow, forming a prominent eye; column 6.8–9 mm long ..... **S. nominatum** [4E, F]

44: Upper (anterior) corolla lobes much smaller than the lower ones; throat appendages 0.3–0.5 mm high, white with a pink, red or yellow tip; column 4.2–7 mm long **45**

45. Sterile scape bracts 0.7–1.6 mm long; throat appendages yellow-tipped; capsules 11–22 mm long excluding calyx lobes, with halves coherent distally ..... **S. capillare**[8] [4G]

45: Sterile scape bracts (2–)3–6 mm long; throat appendages red- or pink-tipped; capsules 7–13 mm long excluding calyx lobes, with halves detaching distally ..... **S. exiguum** [4H]

46. Corolla without an orange or yellow callosity in sinus between each upper and lower lobe (but with prominent yellow or white throat appendages at base of lobes); column slender below anthers, lacking membranous appendages at tip; seed surface colliculate ..... **S. divergens** [4I]

46: Corolla with a prominent yellow or orange callosity in sinus between upper and lower lobes; column dilated below anthers, with 2 membranous appendages at tip (more readily observed before stigma develops); seed surface ± smooth (areolate) ..... **S. pachyrrhizum**[9] [4J–L]

47. Corolla with an orange, yellow or red callosity near sinus between upper and lower lobes **48**

47: Corolla without a coloured callosity near sinus between upper and lower lobes **51**

48. Lower (larger, posterior) corolla lobes free to top of tube or basally connate; column slender between distal bend and anthers (anthers not resting against column when poised) **49**

48: Lower corolla lobes connate for just under to > 1/2 their length forming a 4-lobed lower lip; column scarcely but distinctly dilated above a strong distal hinge (anthers resting against dilated portion when poised, including in pressed material) **50**

49. Leaves in a basal rosette; glandular hairs on pressed material with a pale red, yellowish or translucent head (rarely darker near flowers); upper (smaller, anterior) corolla lobes held close to one another; column somewhat concave above main bend (without lateral lobes), with tissue extending above anthers ..... **S. lobuliflorum** [5A]

49: Leaves in a terminal rosette and scattered on stem below (rarely basal through contraction of stem); glandular hairs on pressed material with a red to red-black head; upper corolla lobes somewhat spreading; column with lateral lobes above main bend, without tissue above anthers ..... **S. ensatum** [5B]

50. Glandular hairs absent from corolla lobe margins and throat of flower; lower (larger, posterior) corolla lobes bilobed with ± incurved outer segments; leaves oblanceolate, spathulate or with an elliptic, oblong, obovate or orbicular lamina, 1.8–15 mm wide ..... **S. schizanthum**[10] [5C–F]

50: Glandular hairs present on corolla lobe margins and in throat of flower (below the throat appendages); lower corolla lobes bilobed with widely spreading outer segments; leaves narrowly oblanceolate to ± linear, 0.4–1.8 mm wide ..... **S. aliforme** [5G]

51. Lower (larger, posterior) corolla lobes connate basally or for up to *c.* 1/2 their length, strongly bilobed with 4 ± equal segments; column scarcely but distinctly dilated above a strong distal hinge (anthers resting against dilated portion when poised, including in pressed material) **52**

51: Lower corolla lobes free to top of tube, emarginate or bilobed; column slender above a distal bend (anthers not resting against length of column) **53**

52. Upper (anterior) corolla lobes < 1/2 the length of the lower pair; seed surface colliculate; corona (hairs around anthers) absent; plants (8–)12–32 cm high ..... **S. brachyotis** [5H]

52: Upper corolla lobes > 1/2 the length of the lower pair; seed surface ± smooth (areolate); corona present at column tip (best viewed before stigma develops); plants 5–13 cm high ..... **S. simulans** [5I]

53. Column 5.5–8.5 mm long, broadened or with raised margins or lateral lobes above main bend; capsules 8–25 mm long excluding calyx lobes; seed surface ± smooth (areolate) **54**

53: Column 2.5–4 mm long, slender above main bend; capsules 3–9 mm long excluding calyx lobes; seed surface colliculate (sometimes scarcely so) **55**

54. Leaves petiolate; labellum at base of anterior corolla sinus; throat appendages yellow, ± uniform; occurs in sheltered, rocky sandstone habitats ..... **S. muscicola** [5J]

54: Leaves ± sessile; labellum on outside of corolla tube; throat appendages dark red-pink or dark mauve (rarely white), with a small yellow callosity in the sinus between the corolla lobes (callosities often obscure in pressed material); occurs in seasonally inundated lowlands ..... **S. ensatum**[11] [5B]

55. Glandular hairs on scape and inflorescence with a translucent to yellowish or pale red head in pressed material; corolla with a sinus on the anterior side, upper lobes bilobed; seed surface colliculate ..... **S. accedens** [5K]

55: Glandular hairs on scape and inflorescence with a dark red to red-black head in pressed material; corolla with a sinus on both the anterior and posterior sides, upper lobes obtuse, truncate or emarginate; seed surface scarcely and somewhat irregularly colliculate ..... **S. uliginosum** [5L]

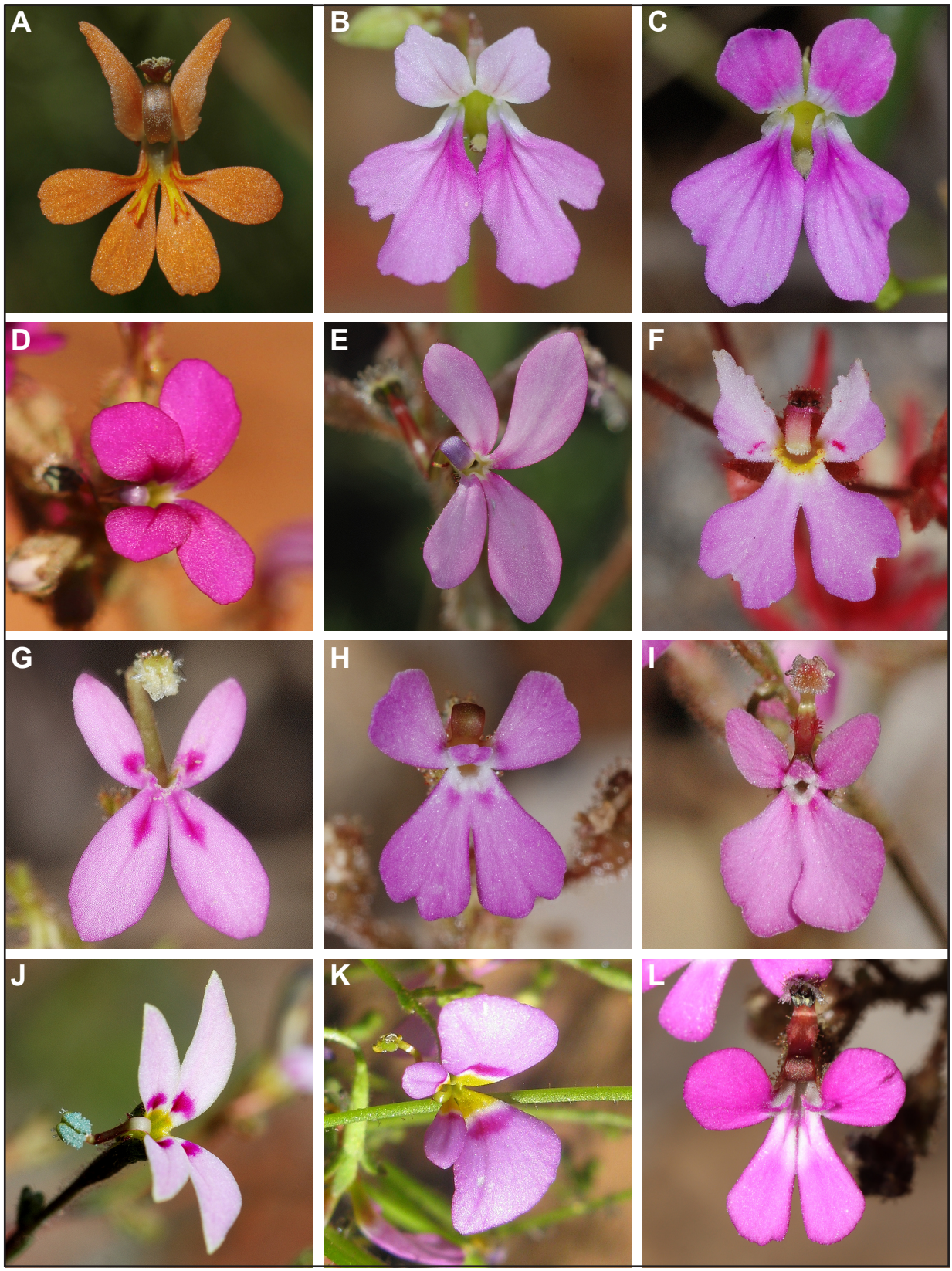

Figure 1. A floral guide to *Stylidium* in the Northern Territory. A – *S. ceratophorum*; B, C – *S. longicornu*; D – *S. desertorum* (typical form); E – *S. desertorum* (atypical form with long column); F – *S. turbinatum*; G – *S. floodii*; H – *S. adenophorum*; I – *S. semipartitum*; J – *S. floribundum*; K – *S. inaequipetalum*; L – *S. leptorrhizum*. Refer to index for voucher details and photographic credits.

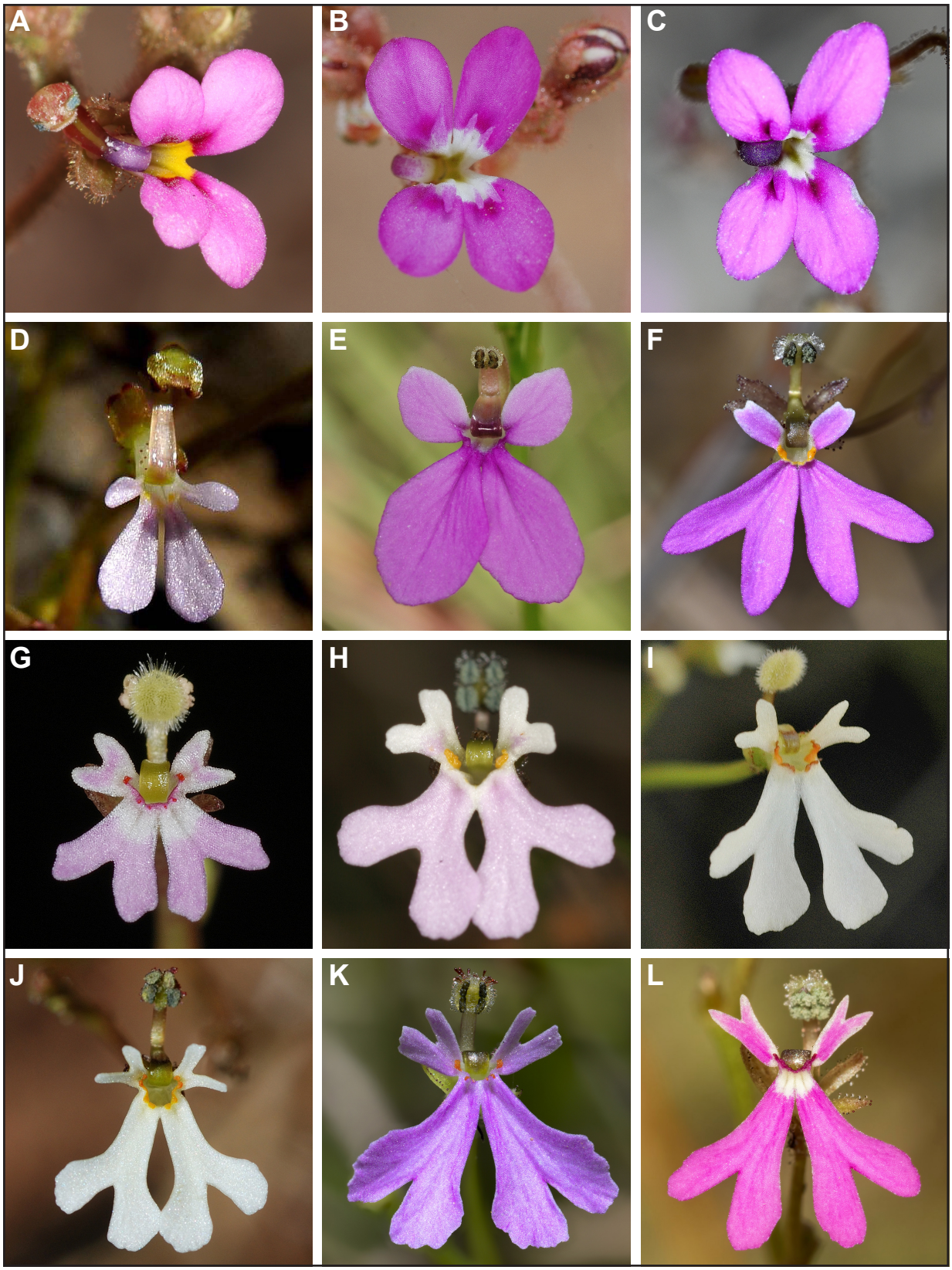

Figure 2. A floral guide to *Stylidium* in the Northern Territory (cont'd). A – *S. incognitum*; B – *S. multiscapum*; C – *S. pezidium*; D – *S. elachophyllum*; E – *S. prophyllum*; F – *S. fissilobum*; G – *S. diffusum*; H – *S. aquaticum* (typical form); I – *S. aquaticum* (atypical form); J – *S. brennanianum*; K – *S. gemmatum*; L – *S. torquatum*. Refer to index for voucher details and photographic credits.

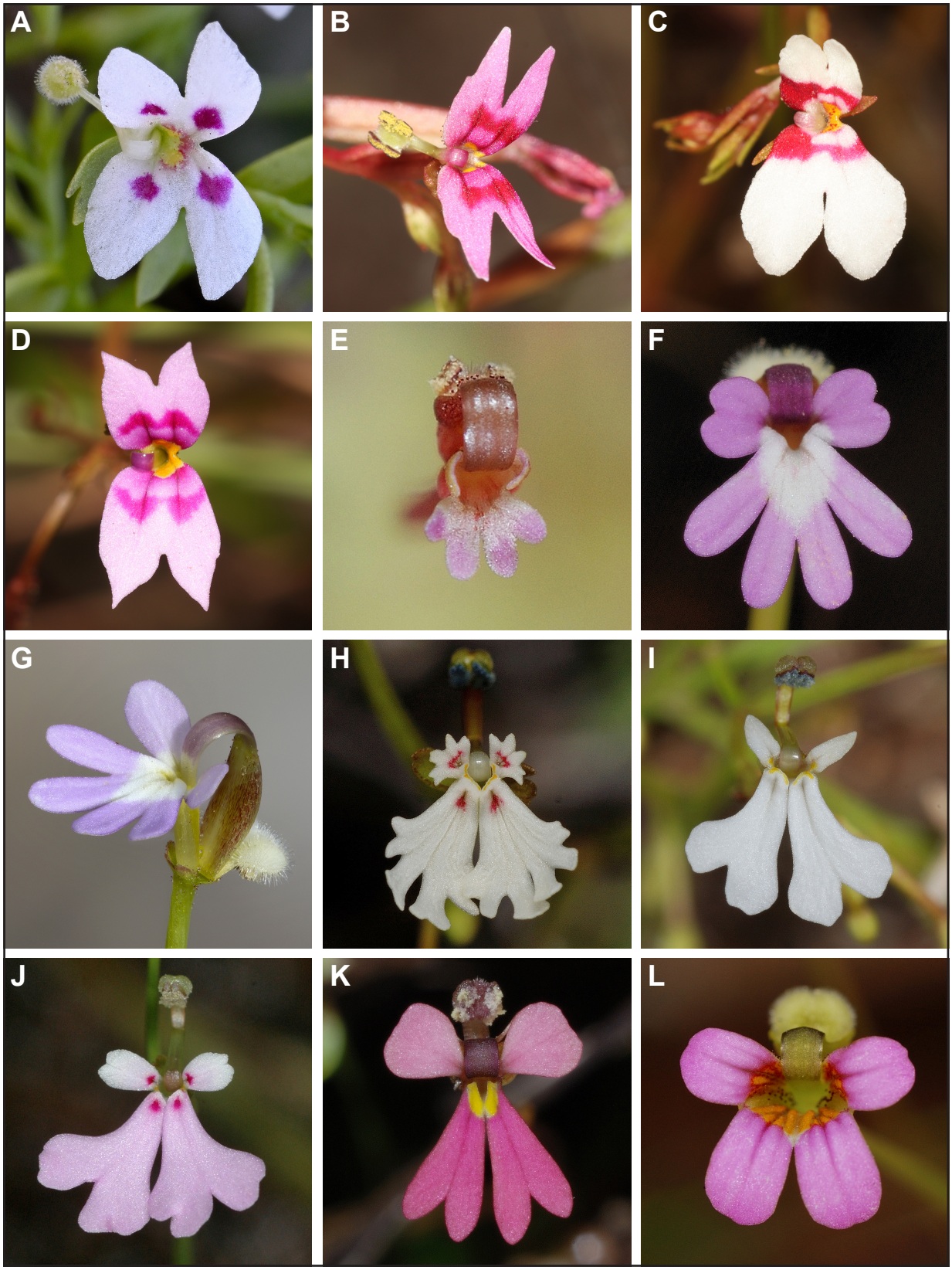

Figure 3. A floral guide to *Stylidium* in the Northern Territory (cont'd). A – *S. tenerrimum*; B – *S. cordifolium*; C – *S. evolutum*; D – *S. fluminense*; E – *S. pedunculatum*; F – *S. ericksoniae*; G – *S. contrarium*; H – *S. candelabrum* (typical form); I – *S. candelabrum* (atypical form); J – *S. synaptum*; K – *S. osculum*; L – *S. dunlopianum*. Refer to index for voucher details and photographic credits.

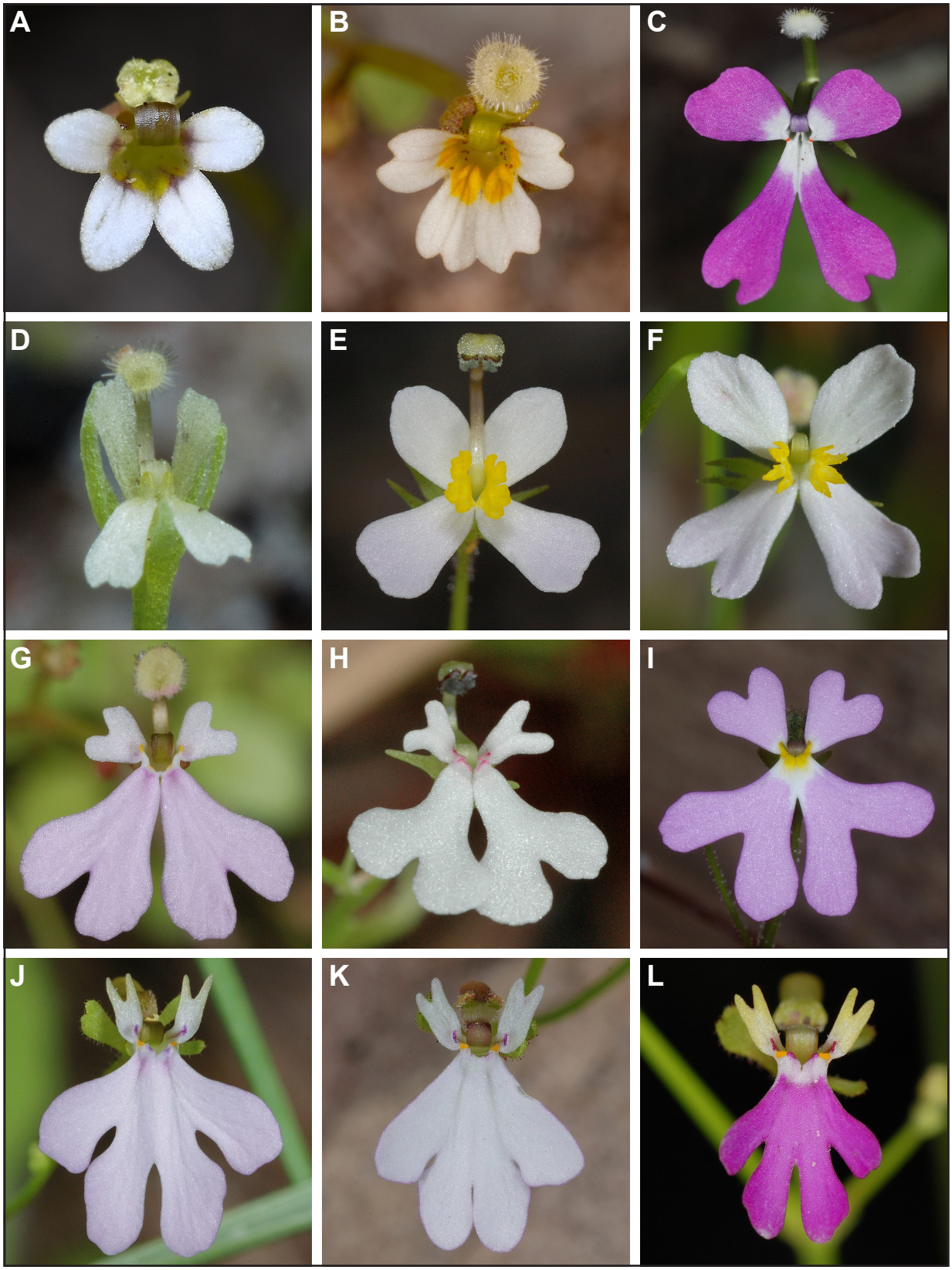

Figure 4. A floral guide to *Stylidium* in the Northern Territory (cont'd). A – *S. rotundifolium*; B – *S. irriguum*; C – *S. notabile*; D – *S. tantillum*; E, F – *S. nominatum*; G – *S. capillare*; H – *S. exiguum*; I – *S. divergens*; J–L – *S. pachyrrhizum*. Refer to index for voucher details and photographic credits.

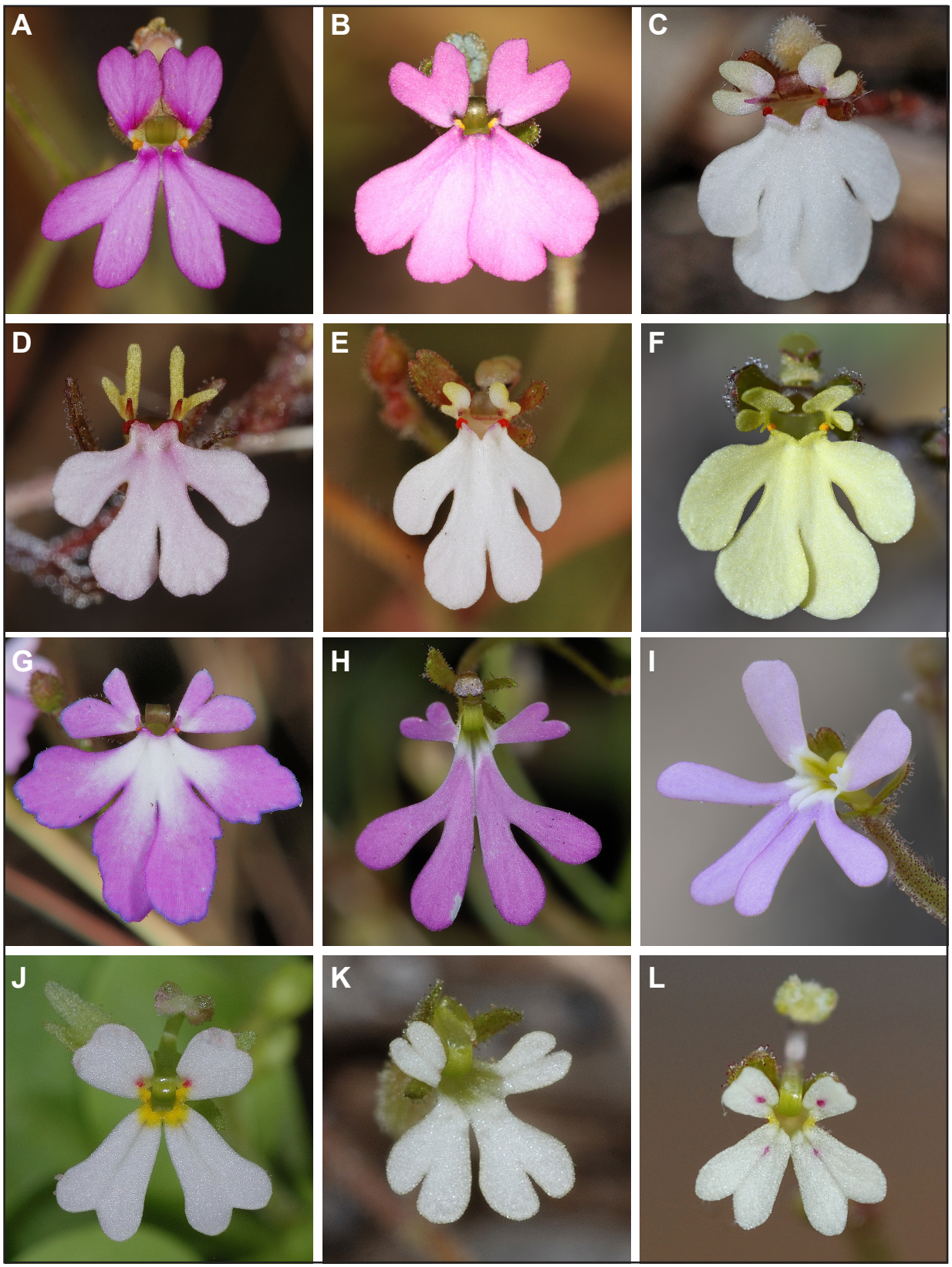

Figure 5. A floral guide to *Stylidium* in the Northern Territory (cont'd). A – *S. lobuliflorum*; B – *S. ensatum*; C–F – *S. schizanthum*; G – *S. aliforme*; H – *S. brachyotis*; I – *S. simulans*; J – *S. muscicola*; K – *S. accedens*; L – *S. uliginosum*. Refer to index for voucher details and photographic credits.

1. Stylidium desertorum Carlquist (atypical form). Some populations of *S. desertorum* have a longer column than the typical form (15–20 mm long *cf.* 10–13.5 mm) and a generally more robust habit with elongated, leafy stems and a terminal tuft of leaves (*cf.* stem usually contracted or shortly elongated with leaves usually appearing basal, although more robust individuals are sometimes evident). This form is recorded from the Northern Territory, South Australia and Queensland, with the typical form apparently restricted to the Northern Territory and Western Australia. A collection from the northern Tanami Desert (*P. Latz* 19249: NT) comprises two individuals of the typical form and four individuals with a long column, suggesting that the two forms may co-occur; however, field observations are required to establish whether column length is taxonomically informative and to determine if there are additional differences between the two forms.

2. Stylidium inaequipetalum J.M.Black. Simple hairs can be absent from the scape (below the inflorescence) in some Western Australian material.

3. Stylidium aquaticum A.R.Bean (atypical form). Populations from Nitmiluk National Park differ in column morphology and throat appendage colour (and potentially throat appendage morphology) to the typical form and may represent a distinct taxon (see Wege *et al.* 2024).

4. Stylidium gemmatum Wege & Brennan, *sp. nov.*

Type: Kakadu National Park, *c.* 50 m east of Malabanbandju Camping Area, south of billabong, Northern Territory, 27 April 2024, *K. Brennan* 13480 *& O. Scheibe* (*holo*: DNA D0291599; *iso*: BRI, CANB, PERTH, MEL).

Weak-stemmed *annual herb* 8–23 cm high. *Glandular hairs* 0.1–0.2 mm long, with a red or red-black, discoid or globose head. *Stem* scapiform, sometimes a little fleshy towards base, 8–23 cm long including inflorescence, 0.5–2 mm wide, greenish or reddish brown towards base, glabrous. *Leaves* bract-like, ± evenly scattered on stem, adpressed to porrect or sometimes spreading, ± *linear or* narrowly ovate to narrowly lanceolate, 1–5 mm long, 0.3–0.6 mm wide, glabrous; apex obtuse to somewhat truncate; margins entire. *Scape* absent. *Inflorescence* determinate, monochasially cymose, (2–)5–*c.* 60-flowered, flowers rotated 180°; branches glabrous; bracts 1.5–3.5 mm long, glabrous; pedicels ± indistinct. *Hypanthium* ± linear in outline, 7–18 mm long, 0.4–0.8 mm wide, glandular-hairy in upper half or distally. *Calyx* lobes with 3 free and 2 connate for more than half their length, 1.8–3 mm long, glandular-hairy on margins and usually near base, apex obtuse. *Corolla* mauve-pink or pink, sometimes with the upper lobes partly to mostly white (rarely mottled pink and white), white abaxially; lobes paired vertically, sparsely glandular-hairy abaxially (mostly on anterior lobes); anterior (upper) lobes obovate with a strongly bilobed apex (divided for ± half of length, with the outer segment a little broader than the inner one), smaller than the posterior pair, 1.5–2.5 mm long, 0.9–2.5 mm wide; posterior lobes basally connate for *c.* 0.5–1 mm, obovate with a bilobed and sometimes flared apex (segments ± equal or with the outermost one a little smaller), 3.5–7 mm long, 2–5 mm wide; tube 2–3 mm long, *c.* equal to or just longer than the calyx lobes, sparsely glandular-hairy near anterior sinus. *Labellum* on outside of corolla tube, elliptic to narrowly ovate, 0.5–0.7 mm long with a terminal appendage 0.2–0.6 mm long, glabrous or with a few glandular hairs. *Throat appendages* 8 (2 on each corolla lobe), arranged in 2 basally connate groups, orange, orange with a pink base or dark orange-pink, 0.2–0.5 mm high, glabrous, apex obtuse or rounded. *Column* 7–9.5 mm long, straight when extended, slightly broadened and with raised margins above the main bend and with a second bend well below the anthers, glabrous; anther locules 0.6–0.8 mm long, corona present (hairs translucent or red, the latter prominent at column tip); stigma sessile, entire. *Capsules* ± linear in outline, 12–20 mm long excluding calyx lobes (few seen), without ribs, halves coherent distally. *Seeds* brown, ± ellipsoid, *c.* 0.2 mm long, colliculate. (Figures 2K, 6)

Diagnostic features. A weak-stemmed annual herb with the following key features: bract-like leaves 1–5 mm long, ± evenly scattered along a scape-like stem; a ± linear hypanthium with glandular hairs in the upper half or distally; 3 free and 2 part-connate calyx lobes with glandular-hairy margins; pink or mauve-pink (sometimes part-white), vertically paired corolla lobes, the upper (smaller, anterior) lobes

dissected for *c.* half their length (the outer segment a little broader than the inner one), the lower lobes bilobed and basally connate; 8 orange or orange-pink throat appendages arranged in 2 basally connate groups, with an obtuse or rounded apex; a 7–9.5 mm long column with raised margins above the main bend; a prominent red corona (hairs) at the tip of the column; and colliculate seeds.

Specimens examined. NORTHERN TERRITORY: Kakadu National Park, Magela Creek, 18 Apr. 1995, *K. Brennan* 3147 (DNA); 10 km E Nourlangie Ranger Station, Malabanbandjii Swamp, 15 May 1980, *L. Craven* 5484 (CANB, DNA); near mouth of Sawcut Gorge, 3 June 1980, *L.A. Craven* 6284 (CANB); *c.* 50 m E of the Kakadu Hwy, *c.* 0.5 km N of the turnoff to Nourlangie Rock, *c.* 16 km due SWS of Jabiru, Kakadu National Park, 18 Apr. 2012, *R.P. Gibson* 425 *& K.S. Hirsch* (NSW); Anbangbang Lagoon, SE of Darwin, May 1994, *M. Hancock s.n.* (NSW); 5 km NNW of Koongarra, 18 May 1980, *M. Lazarides* 8805 (CANB); Dundee Beach, Maritana Rd off Koonakarra Rd, 5 Apr. 2009, *D.E. Murfet* 6443 *& A. Lowrie* (AD); Burdulba campground, Kakadu National Park, 7 Apr. 2009, *D.E. Murfet* 6477 *& A. Lowrie* (AD, NT); near Malabanjbanjdju Campground, 13 May 2012, *D.E. Murfet* 7487 *& A. Lowrie* (AD, DNA); Nourlangie Creek, 21 May 1974, *J. Must* 1211 (BRI, CANB, DNA); Nourlangie Rock area, 23 May 1973, *J. Must* 1125 (BRI, DNA).

Spirit material examined. *K. Brennan* 3147 (DNA); *K. Brennan* 13480 & *O. Scheibe* (DNA).

Flowering period. April–June.

Distribution and habitat. Endemic to the Northern Territory where it is mostly known from Kakadu National Park, with an outlying record near Dundee Beach. Found in damp sand or sandy clay on seasonally flooded plains on the fringes of rivers, swamps and billabongs. Grows in herbfields and amongst grasses, rushes and sedges, including beneath *Lophostemon lactifluus*, *Asteromyrtus symphyocarpa* and *Melaleuca nervosa*.

Conservation status. Data Deficient according to IUCN criteria due to inadequate survey (N. Cuff pers. comm.).

Etymology. From the Latin *gemmatus* (jewelled), a reference to the jewel-like corona at the tip of the column and the decorative throat appendages.

Vernacular name. Jewelled Triggerplant.

Affinities. *Stylidium gemmatum* is akin to *S. brennanianum* Wege, M.D.Barrett & A.R.Bean and *S. torquatum* Wege & Brennan, two species recently segregated from *S. fissilobum* F.Muell. (Wege *et al.* 2024). Unlike *S. fissilobum*, all three species have lower corolla lobes that are basally connate (*cf.* ± free to the top of the tube in *S. fissilobum*), prominent throat appendages at the base of each corolla lobe (*cf.* with an orange or yellow callosity in the corolla lobe sinuses), colliculate rather than ± smooth (areolate) seeds, and lack lateral lobes above the main bend of the column.

Stylidium gemmatum differs from *S. brennanianum* in having a mostly longer column (7–9.5 mm long *cf.* 4.8–7 mm) and predominantly pink or mauve-pink corolla lobes (*cf.* white in *S. brennanianum*) with a distinct shape. Most notably, the anterior (upper) lobes are less strongly dissected (divided for about half their length rather than more than half their length) and each outer segment is a little larger than the inner one (*cf.* ± equal and divergent; compare Figures 2K and 2J). The two species have similar throat appendages suggesting they are closely allied, and both have a combination of translucent and red hairs around the anthers, although the latter appear to be more pronounced in *S. gemmatum* (see Figure 6A). The two species are geographically separated in the Northern Territory: *S. gemmatum* occurs in the Pine Creek and Darwin Coastal bioregions whereas *S. brennanianum* has only been recorded from the Tanami and Gulf Coastal bioregions, although is more broadly distributed in Western Australia and Queensland (see Wege *et al.* 2024).

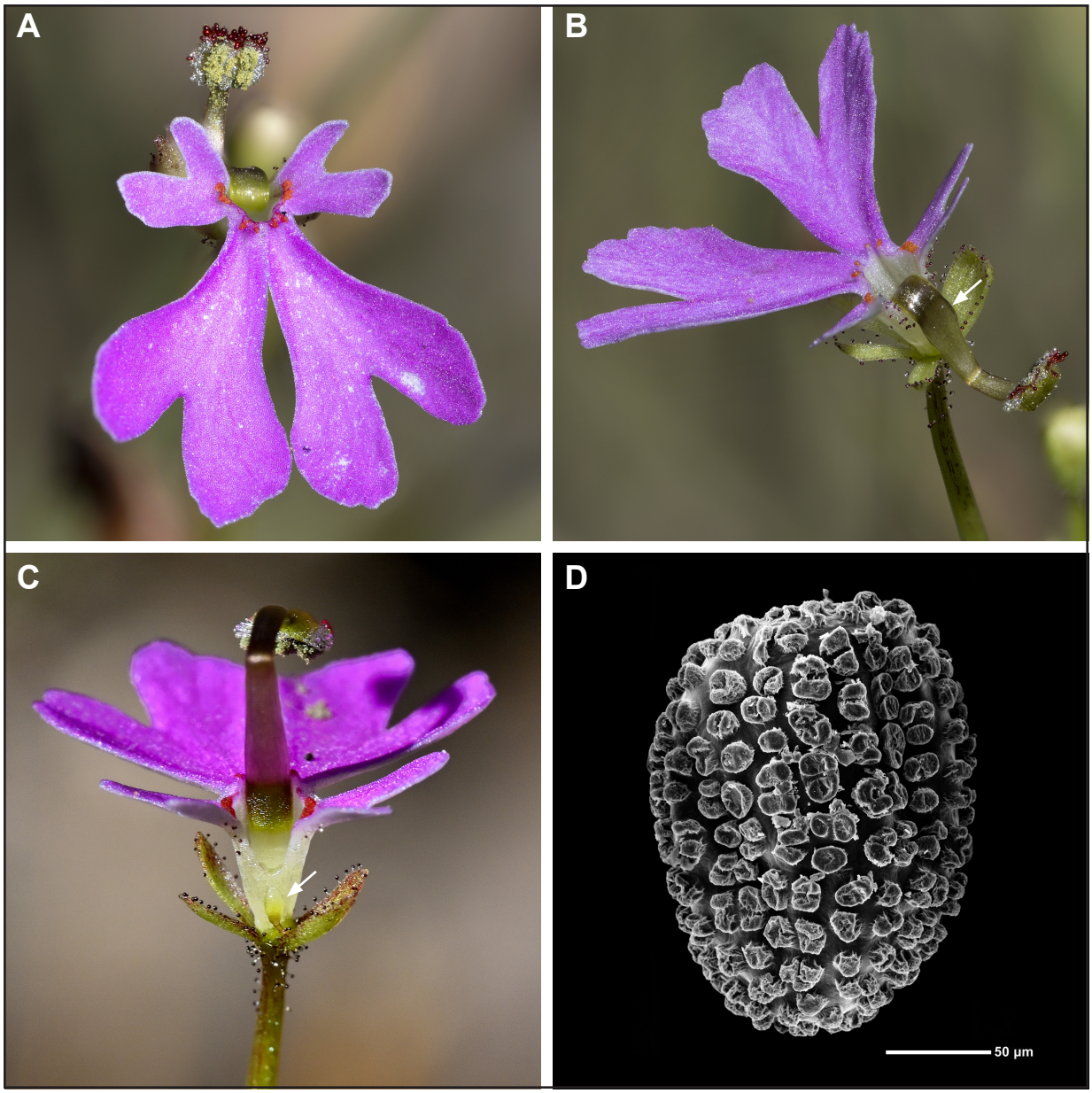

Figure 6. *Stylidium gemmatum*. A – flower showing the bilobed corolla lobes, the upper (anterior) ones with unequal segments, the lower (posterior) ones basally connate. Note the prominent red hairs at the tip of the column; B – anterior view of flower with poised column, showing the slight broadening of the column (raised margins) above the main bend (white arrow) and a second bend well below the anthers; C – anterior view of flower with triggered column, showing the position of the labellum (white arrow) below the anterior sinus; D – colliculate seed. Photos by K. Brennan from *K. Brennan* 13480 *& O. Scheibe* (A–C) and S. Dillon from *J. Must* 1211 (D: DNA).

Stylidium gemmatum can be separated from *S. torquatum* by its strongly bilobed upper corolla lobes with unequal segments (*cf.* emarginate to shallowly and evenly bilobed in *S. torquatum*), the absence of white markings at the base of the lower corolla lobes (present in *S. torquatum*), and its orange or orange-pink throat appendages arranged in two basally connate groups (*cf.* dark purple or dark purple-pink, somewhat irregular lobes arranged in a basally connate semicircle). The two species have a similar column structure, although the hairs around the anthers are strictly translucent in *S. torquatum* rather than red at the tip of the column. They have overlapping distributions but have not been observed growing together.

Notes. This taxon is noted as *S. aff. torquatum* in Wege *et al.* (2024). Its strongly dissected upper corolla lobes and basally connate lower lobes agree with the protologue of *S. pseudotenellum* O.Schwarz (Schwarz 1927), a name of uncertain application (Wege *et al.* 2024); however, Schwarz's description of the throat appendages (appendages minute, four (the middle ones bifid), and glandular) cannot be matched to *S. gemmatum*. In the absence of type material, the identity of *S. pseudotenellum* remains a mystery.

5. Stylidium candelabrum Lowrie & Kenneally (atypical form). The typical form of *S. candelabrum* has ornate corolla lobes with strong red markings towards the base, with the upper (anterior) lobes obovate, bilobed and often with additional lobing (Figure 3H). In contrast, atypical populations lack prominent coloured markings on the upper surface of the corolla (although markings can be present abaxially along the midvein towards the base of the lobes and on the tube) and the upper lobes are narrowly elliptic and undivided (Figure 3I). Both forms were cited in the protologue of *S. candelabrum* (Lowrie & Kenneally 1999). The two forms have not been observed growing together and intermediates are not known, although variation in the presence of markings in noted in one collection of the typical form (*J.A. Wege* 483: BRI, K, PERTH). Research to establish whether the atypical form warrants taxonomic recognition is ongoing.

6. Stylidium sp. **Twin Falls** (L.A. Craven 5870). This putative novel species is known from a spirit collection obtained by Lyn Craven in late May 1980 from 9.5 km south of Twin Falls in Kakadu National Park (CANB 316170). It has affinity to *S. capillare* R.Br. and allies on account of its habit, sterile scape bracts and ± smooth seed, although keys with *S. candelabrum* and *S. synaptum* Wege, Brennan & A.R.Bean due to its calyx lobe arrangement. Additional material and photographs are needed to resolve its taxonomic status. Diagnostic information and habitat details are provided below to facilitate its recollection.

Diagnostic features. A basally-rosetted annual with the following key features: a diminutive stature (2–4.5 cm high), with spreading, narrowly oblanceolate to ± oblong-spathulate leaves to *c.* 2 mm long; a glabrous scape with scattered bracts 1–2.2 mm long; an oblong to linear hypanthium 3.5–7 mm long, with a few glandular hairs distally; calyx lobes arranged in 2 groups, with 2 connate for *c.* half their length and 3 basally connate (or with 1 of these free); white or pink, vertically paired and emarginate corolla lobes, the upper and lower lobes *c.* equal in length or with the lower lobes slightly longer; 6 obtuse and basally connate throat appendages; a slender column 4.5–6 mm long; and ± smooth (areolate) seed.

Distribution and habitat. Known from a sandstone plateau in Kakadu National Park where it grows amongst other herbs (including the typical form of *S. candelabrum*) near a perennial creek in shrubby woodland with *Eucalyptus phoenicea*, *Terminalia*, *Petalostigma*, *Gardenia*, *Grevillea* and spinifex.

Conservation status. Data Deficient according to IUCN criteria due to inadequate survey (N. Cuff pers. comm.).

7. Stylidium dunlopianum Carquist. Specimens from Western Australia currently assigned to *S. dunlopianum* can have a column up to 15 mm long (*cf.* 8–10.5 mm long in material from the Northern Territory). The circumscription of this species is the subject of ongoing taxonomic assessment as part of a review of species with bilobed calyces.

8. Stylidium capillare R.Br. Some collections from Western Australia have capsules that separate distally (see Wege *et al.* 2024).

9. Stylidium pachyrrhizum F.Muell., *Fragm.* 1(6): 152 (1859); *Candollea pachyrrhiza* (F.Muell.) F.Muell., *Syst. Census Austral. Pl.*: 86 (1882), *nom. illeg. non* Benth., *Fl. Austral.* 1: 44 (1863) [Dilleniaceae]. *Type*: Between M'Adam [Macadam] Range and Providence Hill, Northern Territory, October 1855, *F. Mueller s.n.* (*lecto*, inadvertently designated by A.R. Bean*, Austrobaileya* 5(4): 611 (2000): MEL 1061539!; *isolecto*: BM 000645708!, K 000741777!).

Stylidium stenophyllum A.R.Bean, *Austrobaileya* 5(4): 612–613, fig. 4E–G (2000), *syn. nov. Type*: Caranbirini Conservation Park, SW of Borroloola, Northern Territory, 7 June 1999, *A.R. Bean* 15066 (*holo*: BRI-AQ0679158!; *iso*: CANB 483062 image!, DNA D0147345!, MEL 2295045 image!, NSW 840802 image!, PERTH 05897750!).

Diagnostic features. An annual or perennial herb with the following key features: stem contracted and leaves basal or with a somewhat woody stem elongated below the rosette and bearing scattered leaves; a

glabrous or mostly glabrous scape (i.e. glandular hairs absent below the inflorescence or sometimes very sparse just below the inflorescence) and glabrous or very sparsely glandular-hairy inflorescence branches; calyx with 3 free lobes and 2 connate for most of their length; unequal corolla lobes, the upper (anterior) pair much smaller than the lower ones and bilobed with ± equal segments, the lower (posterior) pair strongly bilobed and basally connate forming a 4-lobed lower lip (the outer segments smaller than the inner ones; Figure 4J–L); 4 dimorphic throat appendages as well as a prominent yellow or orange callosity in the sinus between each upper and lower corolla lobe; a 6.8–10 mm column that is dilated below the anthers above a strong distal hinge and has two hyaline appendages at the tip (most readily observed before the stigma develops); linear capsules with longitudinal ribs; and ± smooth (areolate) seeds.

Notes. Many specimens formerly assigned to the widespread and morphologically variable *S. schizanthum*[10] have been recently redetermined as *S. pachyrrhizum* due to the presence of two hyaline appendages at the tip of the column (most readily observed when the flowers are in their male phase, i.e. before the stigma develops; see Wege *et al.* 2024: Figure 1D) and their sparse indumentum (scape glabrous or mostly glabrous below the inflorescence, and inflorescence branches glabrous or very sparsely glandular-hairy). *Stylidium schizanthum* lacks these membranous appendages and the scape is glandular-hairy throughout. Thus defined, *S. pachyrrhizum* is highly variable with respect to plant height (3–70 cm high) and leaf size and shape, with both perennial and annual habit forms represented. The full extent of corolla and throat appendage variation within *S. pachyrrhizum* remains to be assessed; however, it tends to have bilobed upper (anterior) corolla lobes with ± equal segments (*cf.* usually unequal in *S. schizanthum* although emarginate forms are known; compare Figures 4J–L and 5C–F). The indumentum on the undersurface of the corolla is somewhat variable in *S. pachyrrhizum*, with glandular hairs present on both the upper and lower lobes, restricted to the upper lobes (sometimes confined to near the base), or apparently absent altogether.

Stylidium stenophyllum is not supported as taxonomically distinct from *S. pachyrrhizum* and is synonymised herein. Leaf shape and width was a key feature used to separate the two species (linear and 1.4–2.6 mm wide in *S. stenophyllum cf.* oblanceolate or obovate and 3.5–18(–24) mm wide in *S. pachyrrhizum* (Bean 2000); however, an intermediate collection from McArthur River Station (*C.R. Michell & J. Risler* 1688: DNA), not far from the type locality of *S. stenophyllum*, has linear, narrowly oblanceolate or oblanceolate leaves 1–7 mm wide. Variation is also evident at the type locality (e.g. *L.A. Craven* 4678 has leaves 1–5 mm wide). Other features used to support a distinction between *S. stenophyllum* and *S. pachyrrhizum* do not hold upon examination of currently available material: both have ribbed capsules and can have a thickened stem base, glandular hairs can be variously present on the undersurface of the corolla lobe (including on the type of *S. stenophyllum*), and seed shape is variable in *S. pachyrrhizum*. A broadly defined *S. pachyrrhizum* will be adopted for the *Flora of Australia*, with molecular work needed to support further taxonomic work.

10. Stylidium schizanthum F.Muell. This widespread and morphologically variable species exhibits considerable (and often subtle) floral variation, especially with regards to corolla colour (white or various shades of mauve, pink or yellow, or a combination of colours), corolla shape (e.g. the degree of division of each lobe and relative size of the secondary lobes (segments), and the degree to which the posterior (lower) lobes are fused), and the colour and shape of the throat appendages (Figure 5C–F). Specimens at DNA have undergone a preliminary sort to correct obvious misidentifications, i.e. mainly removing material of *S. lobuliflorum* F.Muell., *S. pachyrrhizum* and *S. brachyotis* Wege & Brennan (and vice versa in the case of *S. lobuliflorum* and *S. pachyrrhizum*). Specimens have also recently been examined and annotated at AD, BRI, CANB, NSW and PERTH.

Diagnostic features. A rosulate annual herb with the following key features: stem contracted and leaves basal, or more rarely with the stem elongated below the rosette and bearing scattered leaves; a glandular-hairy scape and inflorescence (including the branches, hypanthium and calyx lobes); calyx with 3 free lobes and 2 connate for most of their length; unequal corolla lobes, the upper (anterior) pair much smaller than the lower ones and usually bilobed with unequal segments (or more rarely broad and emarginate), the lower (posterior) pair strongly bilobed and basally connate forming a 4-lobed lower lip (the outer

segments smaller than the inner ones and usually inwardly curved; Figure 5C–F); 4 dimorphic throat appendages as well as a prominent red or orange callosity near the sinus of each upper and lower corolla lobe; a 6–9 mm column that is dilated below the anthers above a strong distal hinge and scarcely apiculate above each terminal anther locule (but lacking hyaline appendages); linear capsules with longitudinal ribs; and ± smooth (areolate) seeds.

Notes. A spirit collection from Naberlek (*K. Brennan* 7574, DNA) is notable for its short column (*c.* 4.3–4.5 mm long). Additional material is required to aid further taxonomic assessment as part of a broader revision of this species complex.

Specimens from Queensland with a glabrous scape and colliculate seeds represent a novel species that is in the process of being formally described. A second putative novelty from the northern Cape York Peninsula with a glabrous scape and ± smooth seed is also under taxonomic investigation.

11. Stylidium ensatum A.R.Bean. In addition to the pairs of red-pink or mauve-pink (rarely white) appendages at the base of each corolla lobe, this species has a small, yellow callosity in the sinus between each upper and lower corolla lobe (Figure 5B) and often also between the lower lobes. These callosities are sometimes less well-developed than those found in other species and as such can be readily overlooked, especially in pressed material. We have therefore keyed this species twice, to allow for misinterpretation of this feature at couplet 47.

Acknowledgements

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