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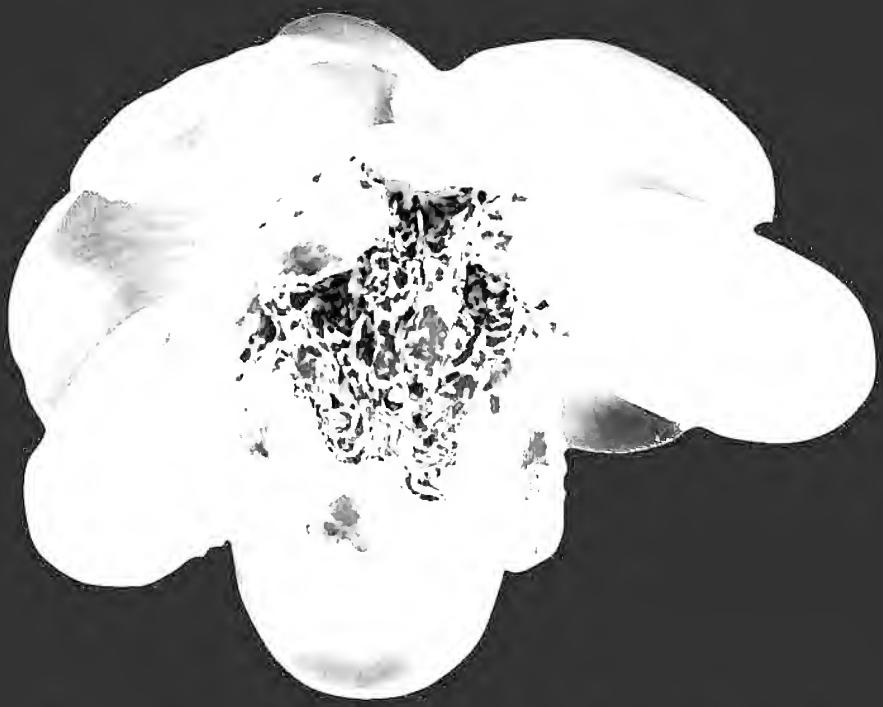

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A revision of *Stylidium* subg. *Andersonia* (R.Br. ex G. Don) Mildbr. (Stylidiaceae)

A.R. Bean

Summary

Bean, A.R. (2000). A revision of *Stylidium* subg. *Andersonia* (R.Br. ex G.Don) Mildbr. (Stylidiaceae). *Austrobaileya* 5(4):589–649. Descriptions, distribution maps and notes on habitat, conservation status and taxonomic affinities are provided for the 37 species of *Stylidium* subg. *Andersonia* which are indigenous to mainland south-east Asia (China, Vietnam, Malaya, Cambodia, Laos, Thailand, Burma, Bangladesh, India), Sri Lanka, Malesia (Sumatra, Philippines, Sulawesi, Java, New Guinea, Aru Islands) and northern Australia (Western Australia, Northern Territory, Queensland, New South Wales). A key to the subgenera of *Stylidium* occurring in these areas is provided as well as keys to the sections and species of *S.* subg. *Andersonia*. Eight new species; namely *S. confertum, S. longissimum, S. aquaticum, S. oviflorum, S. stenophyllum, S. accedens*, *S. divergens* and *S. ensatum* are described and illustrated. A cladistic analysis of the group is provided. Five taxonomic sections are proposed of which two are new. *S.* subg. *Alsinoida* Mildbr. is reduced to sectional rank. The name *Stylidium tenerum* Spreng. is resurrected for the taxon formerly known in Australia as *S. uliginosum* Sw. ex Willd. *S. dunlopianum* Carlquist is newly recorded for Western Australia. *S. prophyllum* Lowrie & Kenneally, *S. fluminense* F.L.Erickson & J.H.Willis and *S. diffusum* R.Br. are newly recorded for the Northern Territory. *S. cordifolium* W.Fitzg. is newly recorded for Queensland.

Keywords: *Stylidium*, taxonomy, Stylidiaceae, Australia, Malesia, south-east Asia, trigger-plants, keys, new species, *Stylidium* subg. *Andersonia, Stylidium* subg. *Alsinoida*

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Introduction

The genus *Stylidium* is characterised by flowers having a column bearing both anthers and stigma which moves rapidly in response to physical stimulus, usually provided by an alighting insect. This feature has given rise to the common name of trigger-plant. The genus as a whole reaches its greatest diversity in south-western Western Australia. Comprehensive taxonomic accounts of the genus have been provided by Brown (1810), DeCandolle (1839), Mildbraed (1908) and Erickson (1958).

The group of species treated here was first named (as *Andersonia*) by Brown (1810), but he did not specify the rank of this taxon. G. Don in 1834 treated the *Andersonia* group as a section of *Stylidium*. Mueller (1859) and Bentham (1868) included some of the species treated here within *S.* sect. *Nitrangium* (Endl.) Sonder. Mildbraed (1908) raised *S.* sect. *Nitrangium* and *S.* sect. *Andersonia* to subgeneric level. The former was confined to south-western Western Australia, the latter to tropical Australia and south-east Asia.

Mildbraed (loc.cit.) established *S.* subg. *Alsinoida* for *S. alsinoides* and its allies. While this is a distinctive group because of the laterally fused petals, it does not otherwise differ greatly from groups in *S.* subg. *Andersonia* and is, therefore reduced here to sectional rank. Cladistic analysis has been used to place the species in phylogenetic context and to provide justification for the sectional classification used.

S. subgenus *Andersonia* is distinguished by its linear capsules which are sessile or almost so, labellum without basal appendages, sepals which are never all free, brown seeds and mostly annual habit.

Accepted for publication 14 April 2000

Terminology

The terms scapose and scapiform are used when the inflorescence is borne on a leafless scape. The scape is recognisable as it is distinctly different from the leaf-bearing stem in texture, shape, diameter, and often its indumentum. In a scapose inflorescence, the scapes arise from ground level, and the leaves are in a basal rosette (e.g. Fig. 3E). In a scapiform inflorescence, the scapes arise from the apex of the leafy stem (e.g. Fig. 3A), where there is often a terminal rosette of leaves. In some species, there is no discernable scape; there is no discontinuity in the stem tissue between the lower (vegetative) part and the upper (fertile) part (e.g. Fig. 7D).

The flowers of all *Stylidium* species are, strictly speaking, gamopetalous, as they possess a corolla tube, albeit usually rather short and inconspicuous. However, the 4 largest corolla lobes (as they should strictly be called) are termed petals in this paper, while the fifth, always much smaller, has for many years been called the labellum (see Fig. 3C, 6C,6F). The four large corolla lobes are said to be "free" if they are not united beyond the distal end (or "throat") of the corolla tube. This interpretation was also used by Erickson (1958) and avoids confusion when referring to the apical ornamentation of the corolla parts, which would otherwise be known as "lobes of the corolla lobes". Because the pattern of petal fusion is very valuable in diagnosing *Stylidium* species, a further special terminology is used here. A1 and A2 refer to the anterior petals (on either side of the labellum); P1 and P2 refer to the posterior petals, with A1 being adjacent to P1. The '+' operator indicates that the petals indicated are free (sensu Erickson), while a '&' operator indicates that the petals indicated are fused e.g. A1 + A2 + (P1&P2) means that the anterior petals are free from the posterior petals and from each other, but that the posterior petals are fused to each other (e.g. Fig. 3C).

The reduced fifth corolla lobe in *Stylidium* is called the labellum. It is found between the anterior petals, and is attached either at the top of the corolla tube (Fig. 8B, 8F), or on the outside of the tube (Fig. 5B).

The term paracorolla, used here, was introduced by Slooten (1954), and refers to small lobes or flanges of tissue attached to the corolla at the throat (e.g. Fig. 5C). This term is roughly equivalent to the more commonly used term "throat appendages", but is more comprehensive, as it covers situations where there is a continuous raised ring of tissue.

The "paracorolla glands" referred to in the key and descriptions are conspicuous globular to ellipsoidal glands, commonly orange or golden in colour, attached to the paracorolla between the anterior and posterior petals (e.g. Fig. 4G). They occur in only a few species, most notably in *S. schizanthum* and its allies, and can usually be readily seen even on dried herbarium specimens.

Corolla colour in this paper refers to the adaxial surface only, the surface which is most readily seen from above. While the other surface may often be a different colour, this is rarely recorded.

The term "corona" is used here for the cluster of white hair-like structures radiating from the anthers of some *Stylidium* species (see Erickson (1958: plate 53, no. 2)). A corona is not often found amongst species belonging to *S.* subg. *Andersonia*, but occurs commonly in some other groups within *Stylidium*.

Materials and methods

This revision is based on the examination of herbarium material from AAU, BM, BRI, CANB, DNA, L, K, MEL, MO, NSW, P, QRS and RSA, and was supplemented by field work by the author throughout Queensland and in north-eastern Northern Territory.

Floral measurements were based on material preserved in spirit, or where this was not available, on herbarium material reconstituted by boiling in water. Details of the collections used for these measurements are given in each species treatment. Leaves, stems, scapes, capsules and seeds were measured from dried material. Sepal dimensions are taken from flowering material; it is apparent that the sepals lengthen after flowering in some species.

Morphological data for all taxa have been recorded as a DELTA dataset (Dallwitz et al. 1993), and species descriptions have been generated by DELTA from these data. 102 morphological characters were measured for each species, with detailed measurements of several flowers.

The accuracy of dimensions given for various plant parts are: glandular hairs and seeds, ±0.05 mm; scape diameters, sepals, corolla, petals, labellum, paracorolla and capsule width, ±0.1 mm; bracts, capsule length and column, ±0.5 mm; larger leaves and petioles, ±1 mm; smaller leaves ±0.2 mm. Measurements are given as *circa* only when there was difficulty in providing accurate measurements e.g. petiole length for some species, or when less than 3 measurements are possible for the character, because of lack of available material.

Details of the type localities of species described by Robert Brown have been gleaned from Vallance (1990).

Distribution maps are provided for all species. Symbols indicate that the taxon has been recorded within that 1° × 1° square. Solid (or filled) symbols indicate that there is at least one recent collection (1960-present). Outline (or unfilled) symbols indicate that the most recent collection for that 1°×1° square was before 1960. The vast majority of records were from herbarium specimens seen by the present author, but a few additional reliable locational records have been added to the maps from Lowrie and Kenneally (1997) for *S. perizostera* and *S. prophyllum*; from Haridasan et al. (1983), Huq (1986), Barua & Gogoi (1995) for *S. kunthii*; and from Bhaskar & Kushalappa (1992) for *S. tenellum*. Latitudes and longitudes for the non-Australian specimens were determined only after considerable effort by the present author, and hence in the specimen citations they have been retained, to assist readers to pinpoint the localities.

Phylogenetic relationships were examined with the cladistic program PAUP (Version 3.1.1) (Swofford 1993). The most parsimonious interpretation of the data was sought (Farris 1983). Heuristic searches were used, with the following options: Addition sequence = Random, number of replications = 10, Mulpars in effect; TBR Branch swapping. A subset of the 37 taxa was chosen for the cladistic analyses, because using the full set of taxa made analyses extremely slow and did not improve resolution. Other preliminary analyses were rejected because of errors detected in the dataset or because some characters included in them were found to be unsuitable for this type of analysis. For example, leaf shape was used in initial analyses, but later deleted because it displays continuous variation for the taxa involved. Morphological data from 19 ingroup taxa (+ 1 outgroup taxon) and 22 characters were used for the final cladistic analysis. All distinctive or unusual taxa were included, and where there were groups containing two or more obviously related species, a selection of these were made. The characters used for the analysis are given in Table 1. All characters used were unweighted and their states unordered (Table 2). Bootstrap analysis (Felsenstein 1985) with 100 replicates (heuristic, 10 random addition relicates, Mulpars in effect, and Steepest descent on) was used to assess the relative support for various branches of the tree. *Forstera bellidifolia* Hook. (Stylidiaceae) was selected as the outgroup, as it displays many unspecialised character states and probably belongs to a sister group of *Stylidium*.

Results of Cladistic Analysis

The unweighted analysis resulted in 156 most parsimonious trees each of 47 steps; ci= 0.708, ri= 0.684, rc= 0.484. The strict consensus tree showing bootstrap values, 50% majority rule consensus tree and one of the most-parsimonious trees are shown (Fig. 1, 2). Various tree topologies and the cost of modifying topologies were investigated using MacClade vers. 3.07 (Maddison and Maddison 1992). Five clades are considered sufficiently distinct for their recognition as taxonomic sections. *S.* subg. *Alsinoida* Mildbr. is reduced in this paper to sectional rank. *S.* sect. *Tenella* is recognised on the basis of its strong support on the majority rule tree. Some of its distinctive features (the largely bare stems, the small bract-like leaves and the very short glandular hairs) were not included in the analysis as the

characters are continuously variable in the subgenus. The residual section, *S.* sect. *Andersonia* may be paraphyletic, based on the majority rule tree, but further study is desirable.

Table 1. Characters and character states used for the cladistic analysis

1. Leaf arrangement (#11): basal rosette (0); mostly in terminal rosette (1); scattered along stem (2).

2. Leaf base (#17): truncate (0); cuneate, obtuse or cordate (1).

3. Scapes (#21): present (0); absent (1). All species can be classified unambiguously for this character.

4. Inflorence type #27): determinate, monochasially cymose (0); 1-flowered (1); umbellate (2). This character is assessed on reasonably mature individuals. Very young plants will all be 1–flowered for a time.

5. Hypanthium indumentum (#39): glandular-hairy throughout (0); glabrous (1); glandular-hairy at distal end only (2).

6. Fusion pattern of sepals (#41): fused into 2 entire obtuse lips (0); all free (1); with 3 free and 2 fused for more than half their length (2); fused into 2 emarginate lips (3). These patterns are constant within each species.

7. Sepal indumentum (#44): glandular-hairy (0); glabrous (1). Specimens are coded as glandular-hairy even when there are just a few scattered glands on the margin.

8. Sepal apex (#45): acute (0); obtuse (1).

9. Corolla indumentum (#47): glandular-hairy on petals only (0); glabrous (1); glandular-hairy on tube only (2); glandular-hairy on tube and petals (3).

10. Corolla tube incision (#49): with sinus on anterior and posterior sides (0); without sinus (1); with sinus on anterior side only (2).

11. Paracorolla presence (#50): present, continuous (0); absent (1); present, discontinuous (2).

12. Paracorolla glands presence (#60): present (0); absent (1).

13. Labellum position (#63): sheathing the column (0); attached to outside of corolla tube (1); attached at base of anterior sinus of corolla tube (2).

14. Fusion pattern of petals (#74): laterally fused (0); petals all free (1); petals with posterior ones fused (2).

15. Anterior petals lobing (#77): entire (0); bilobed (1).

16. Lobing of posterior petals (#81): entire (0); bilobed (1).

17. Column dilation (#84): conspicuously dilated near distal end forming pouch for the stigma and anthers (0); of uniform width throughout (1); slightly dilated near distal end (2).

18. Column indumentum (#85): glandular-hairy only (0); glabrous (1).

19. Capsule ribbing (#93): with raised longitudinal ribs (0); without raised longitudinal ribs (1).

20. Capsule dehiscence (#96): halves coherent distally (0); halves detaching distally (1). This character applies to mature, but relatively fresh capsules. All capsule-halves will eventually detach distally, through weathering.

21. Seed shape (#98): ellipsoidal (0); globose (1).

22. Seed surface micro-features (#102): colliculate (0); smooth (1).

Ecology and Distribution

Most species belonging to *Stylidium* subg. *Andersonia* occur in tropical areas with a monsoonal climate, where the rainfall is strongly seasonal. Most species are annuals, and typically germinate on recently receded waters in swampy habitats dominated (in Australia at least) by *Melaleuca* spp., but also on creekbanks, in seepage areas in ranges or on sandstone plateaux on damp sand. Sites are typically open and sunny.

The subgenus has no representatives in south-western Western Australia, and instead has its stronghold in tropical Australia, especially the Northern Territory. 24 species are recorded from the Northern Territory (12 spp. endemic); 13 species are recorded from Queensland (4 spp. endemic); 11 species are recorded from Western Australia (3 spp. endemic); 9 species are recorded from outside Australia (5 species not occurring in Australia)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		11	17	21	27	39	41	44	45	47	49	50	60	63	74	77	81	84	85	93	96	98	102
1	Forstera bellidifolia	2	1	0	1	1	1	1	1	1	1	1	?	?	1	?	0	1	1	1	1	?	?
2	capillare	0	0	0	0	2	2	1	0	2	2	0	1	1	1	1	1	1	1	1	0	0	1
3	schizanthum	0	1	0	0	0&2	2	0	1	2	2	0	0	1	2	1	1	2	1	0&1	1	0&1	0&1
4	rotundifolium	0	1	0	0	2	0	0&1	1	3	2	1	?	2	1	0	0&1	0	1	1	1	0	0
5	diffusum	2	0	1	0	1&2	2	0&1	0&1	3	2	0&2	1	1	1	0&1	1	1	1	1	0	0	0
6	candelabrum	2	1	0	0	1&2	3	1	0&1	3	0	2	1	1	1	0&1	1	1	1	1	1	1	1
7	pedunculatum	1	0	0	1	1	2	0&1	0&1	1&2	1&2	1	?	1	2	0	1	0	0	0	1	0&1	1
8	cordifolium	2	1	1	0	1&2	2	0&1	0	0&3	1	1	?	2	0	0	0	1	1	1	0	0	0
9	longissimum	2	1	1	0	2	2	0	0	3	2	0	1	2	1	1	1	2	1	1	1	0	0
10	trichopodum	2	0	0	1	0	2	0	1	2	2	1&2	1	1	2	0&1	1	0	0	1	1	0	1
11	confertum	2	0	1	0	2	2	0&1	0	3	2	2	1	1	1	1	1	1	0&1	1	0	0	0&1
12	lobuliflorum	0	1	0	0	0	2	0	1	3	2	0	0	1&2	1&2	0&1	1	1	1	1	1	0	1
13	fissilobum	2	0	1	0	2	2	0	0&1	2&3	2	0	0&1	1	1&2	1	1	1	1	1	0	0&1	0&1
14	simulans	0	1	0	0	0	2	0	0&1	1	2	2	1	1	2	0&1	1	1	1	1	1	0	1
15	muscicola	1	1	0	0	0	2	0	1	1	2	1&2	1	2	1	1	1	1	1	1	1	0	1
16	fluminense	2	1	1	0	0	2	1	0	3	1	1	?	2	0	0	0	1	1	1	0	0&1	0
17	alsinoides	2	1	1	0	1&2	2	1	1	1&3	1	1	?	2	0	0	0	1	1	1	0	0	0
18	claytonioides	1	0	0	1	1	0	0	1	3	2	1	?	2	2	0	1	0	1	?	?	?	?
19	tenerum	0	1	0	0	0	2	0	1	1	0	2	1	1&2	1	0	1	1	1	1	1	0	1
20	dunlopianum	2	1	0	0	2	0	0	1	3	2	1	?	2	1	0	0	0	1	1	1	0	0

Table 2 - Matrix of character states. Characters are numbered according to Table 1

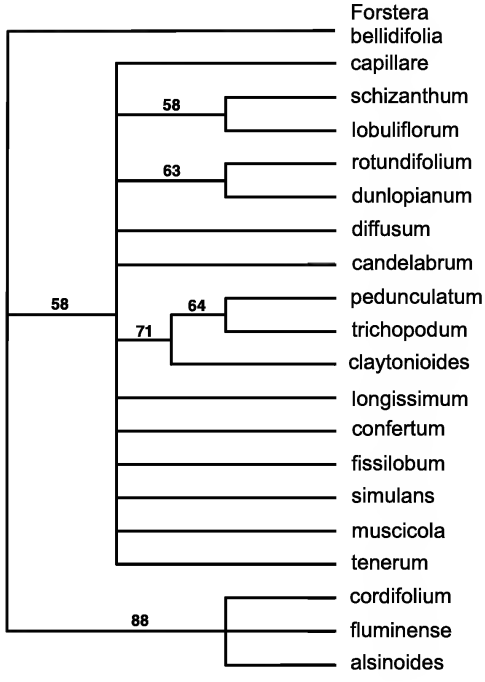

Fig. 1a. Strict Consensus Tree, showing Bootstrap values.

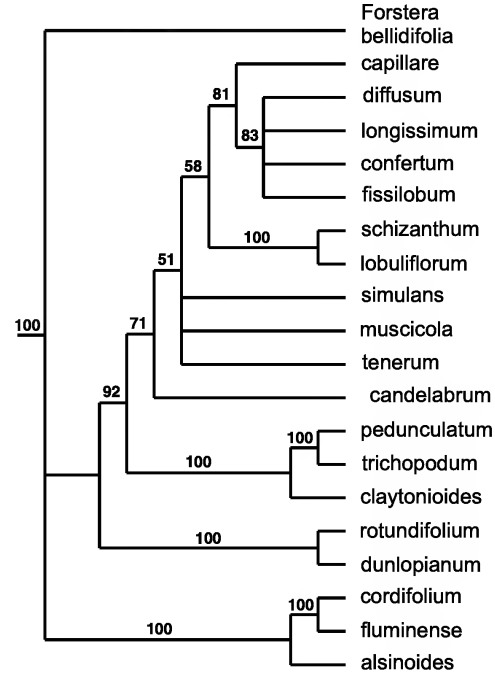

Fig. 1b. 50% Majority-rule Consensus Tree

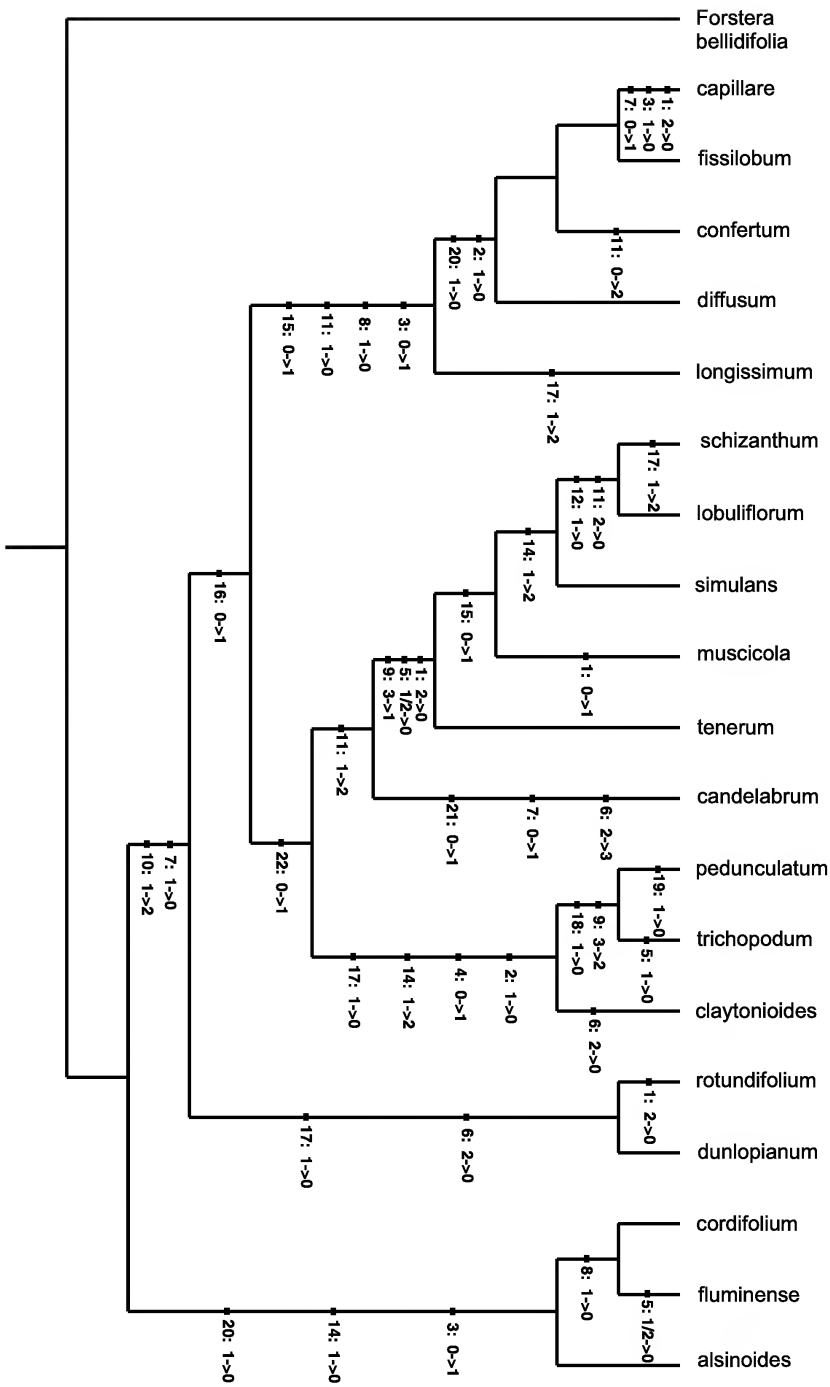

Fig. 2. One of 156 most parsimonius trees, showing character numbers and their state changes at each branch

and one species is recorded from New South Wales. All extra-Australian species of *Stylidium* belong to *S.* subg. *Andersonia*. None of the 37 species in the subgenus is endemic outside the tropics. Only three species (*S. tenerum, S. diffusum* and *S. rotundifolium*) extend south of the Tropic of Capricorn, while two (*S. kunthii* and *S. tenellum*) extend north of the Tropic of Cancer.

Taxonomy

Key to the subgenera of *Stylidium* occurring in northern and north-eastern Australia, Malesia and south-east Asia

1. Hypanthia and capsules linear, 8–20 times longer than wide ..... **S.** subg. **Andersonia**
   Hypanthia and capsules globose to ellipsoidal, 1–4 times longer than wide 2

2. Hypanthia and capsules globose; stigma stipitate ..... **S.** subg. **Centridium**
   Hypanthia and capsules ellipsoidal to obconical; stigma sessile .... **S.** subg. **Tolypangium**

Key to the species of *Stylidium* subg. *Andersonia*

1. Inflorescence borne on leafless scape(s), generally arising from a cluster of leaves, either basal or cauline; leaves not resembling floral bracts 2
   Inflorescences not borne on leafless scape(s); leaves always cauline, tending to grade into floral bracts 26

2. Scapes bearing 1 flower only 3
   Scapes bearing cymose inflorescence, 2–many-flowered 7

3. Calyx fused into two obtuse lips 4
   Calyx consisting of 5 lobes, some partly fused 5

4. Scapes and hypanthia glandular-hairy ..... **17. S. perizostera**
   Scapes and hypanthia glabrous ..... **18. S. claytonioides**

5. Leaves glabrous; corolla yellow ..... **14. S. trichopodum**
   Leaves with eglandular hairs; corolla pink 6

6. Scapes 0.15–0.2 mm wide; posterior petals 2.4–3.1 mm long; capsules 7–9.5 mm long; sepals partly fused, forming two emarginate lips ..... **15. S. ericksoniae**
   Scapes 0.1–0.15 mm wide; posterior petals 0.5–0.7 mm long; capsules 5–6.5 mm long; 2 sepals fused for more than half their length, 3 free ..... **16. S. pedunculatum**

7. Sepals fused into two obtuse lips 8
   Sepals consisting of 5 lobes, some or all partly fused 10

8. Paracorolla present, lobes acute; posterior petals c. 5.5 mm long ..... **32. S. fimbriatum**
   Paracorolla absent; posterior petals 1.3–2.1 mm long 9

9. Corolla tube 2–3 mm long; column 3.5–5 mm long; leaves in basal rosette ..... **30. S. rotundifolium**
   Corolla tube 4.5–6 mm long; column 7–8.5 mm long; leaves mostly cauline ..... **31. S. dunlopianum**

10. Sepals in two basally fused groups (one 2-lobed, the other 3-lobed) .... **9. S. candelabrum**
Three sepals free to base, two fused for more than half their length 11

11. Leaves linear, 20–35 times longer than wide ..... **13. S. stenophyllum**
Leaves obovate to orbicular, 1–3 times longer than wide 12

12. Leaves in basal rosette 13
Leaves scattered along a substantial stem 14

13. Two orange paracorolla glands present 18
Paracorolla glands absent 20

14. Leaves sessile, orbicular; paracorolla lobes 6–9, linear, acute ..... **5. S. ensatum**
Leaves petiolate, oblanceolate to orbicular; paracorolla lobes 0–4, broad, obtuse 15

15. Orange paracorolla glands present ..... **12. S. pachyrrhizum**
Paracorolla glands absent 16

16. Scapes glabrous; corolla glandular-hairy;
posterior petals fused; capsules ribbed ..... **7. S. divergens**
Scapes glandular-hairy; corolla glabrous; all petals free; capsules not ribbed 17

17. Capsules 6.5–11 mm long; native of Asia ..... **1. S. kunthii**
Capsules (10–)13–24 mm long; native of N.T. and W.A. ..... **4. S. muscicola**

18. Hypanthia densely glandular-hairy; glands pale ..... **10. S. lobuliflorum**
Hypanthia sparsely glandular-hairy or glabrous; glands dark 19

19. Stem base thickened; petals glandular-hairy;
column 7.5–8.5 mm long ..... **12. S. pachyrrhizum**
Stem base not thickened; petals glabrous;
column 5–7.5 mm long ..... **11. S. schizanthum**

20. Sepals glabrous, acute 21
Sepals sparsely glandular-hairy, obtuse 22

21 Bracts 2–4.7 mm long; corolla tube 0.5–1.6 mm long;
corolla glandular-hairy on tube and petals;
leaves with petioles 1–4.5 mm long ..... **19. S. nominatum**
Bracts 1–2 mm long; corolla tube 1.6–2 mm long;
corolla glandular-hairy on tube only; leaves sessile ..... **20. S. capillare**

22. Petals all free [A1+A2+P1+P2] 23
Posterior petals fused [A1+A2+(P1&P2)] 24

23. Corolla tube with sinus on anterior and posterior sides;
paracorolla present; labellum usually attached to the
outside of the corolla tube; Aust. & N.G. ..... **3. S. tenerum**
Corolla tube with sinus on anterior side only; paracorolla
absent; labellum attached at base of anterior sinus of
corolla tube; Sri Lanka to China ..... **2. S. uliginosum**

24. Corolla tube glabrous ..... **6. S. simulans**
Corolla tube glandular-hairy 25

25. Column 2.5–3 mm long; capsule 4–8 mm long; sepals 0.1–0.25 mm wide ..... **8. S. accedens**
Column 5.5–7 mm long; capsule 10–17 mm long; sepals 0.25–0.4 mm wide .. **7. S. divergens**

26. Leaves 0.1–1.7 mm wide 27
Leaves 1.7–8 mm wide 35

27. Leaf base cuneate 28
Leaf base truncate 29

28. Petals laterally fused (A1&PI +A2&P2); sepals glabrous ..... **36. S. javanicum**
Petals all free (A1+A2+P1+P2); sepals glandular-hairy ..... **27. S. tenellum**

29. Leaves clustered near base of stem 30
Leaves ±evenly scattered along stem 31

30. Sepals oblanceolate; paracorolla continuous;
posterior petals 3–4.1 mm long ..... **22. S. aquaticum**
Sepals deltate; paracorolla discontinuous;
posterior petals 1.5–3.3 mm long ..... **25. S. confertum**

31. Capsules 1.0–1.6 mm wide, pedicels absent or up to 5 mm long ..... **35. S. tenerrimum**
Capsules 0.4–1.0 mm wide, pedicels absent or rudimentary 32

32. Posterior petals entire; labellum attached at base of anterior sinus ..... **21. S. prophyllum**
Posterior petals bilobed; labellum attached to outside of corolla tube 33

33. Anterior petals 0.5–1.0 mm long ..... **26. S. diffusum**
Anterior petals 1.3–2.2 mm long 34

34. Corolla yellow and white; 4–6 paracorolla lobes opposite posterior petals . **24. S. oviflorum**
Corolla white or pink; 2–4 paracorolla lobes opposite posterior petals .... **23. S. fissilobum**

35. Leaf base cordate ..... **37. S. cordifolium**
Leaf base cuneate 36

36. Sepals 1.0–2.0 mm long at anthesis 37
Sepals 2.0–4.1 mm long at anthesis 39

37. Petals laterally fused (A1&P1 +A2&P2); column 2.5–3 mm long ..... **33. S. alsinoides**
Petals all free (A1+A2+P1+P2); column 3–5 mm long 38

38. Leaf apex acute; corolla glabrous; column 3–3.5 mm long ..... **29. S. inconspicuum**
Leaf apex obtuse; corolla glandular-hairy; column 4–5 mm long ..... **27. S. tenellum**

39. Sepals glandular; capsules 26–48 mm long;
corolla tube 2–2.3 mm long ..... **28. S. longissimum**
Sepals glabrous; capsules 11–16 mm long;
corolla tube 1.1–1.5 mm long ..... **34. S. fluminense**

Stylidium subg. Andersonia (R.Br. ex G.Don) Mildbr. in Engl., Pflanzenr. 35: 31, 34 (1908); *S.* sect. *Andersonia* R.Br. ex G.Don, Gen. hist. 3: 721 (1834). **Type**: *S. tenellum* R.Br. (= *S. tenerum* Spreng.) (lecto, here chosen).

Annual or perennial herbs. Stem base unthickened, or rarely thickened. Glandular hairs present, but often on one or two plant parts only. Glands globose. Leaves entire; in basal rosette, terminal rosette, or spirally arranged along elongate stems. Inflorescence

scapose or scapiform, 1-flowered or cymose; or borne on upper part of stem, cymose. Bracts opposite, sometimes leaf-like and then inflorescence appearing to be solitary, axillary. Labellum glabrous, attached at base of anterior sinus or on outer wall of corolla tube; labellum basal appendages absent. Sepals never all free; often with 2 sepals fused for over half their length and 3 free, but sometimes fused into two entire or emarginate lips. Stigma sessile, cushion-shaped. Column lacking eglandular hairs, spur absent. Anther loculi 4. Capsules linear or linear-lanceolate, pedicels absent or rudimentary (except *S. tenerrimum*). Ovules numerous. Seeds brown.

37 species, occurring from far northern New South Wales to tropical Western Australia, and into Malesia and south-east Asia.

The subgenus is here divided into 5 sections; *S.* sect. *Andersonia, S.* sect. *Uniflora, S.* sect. *Tenella, S.* sect. *Biloba* and *S.* sect. *Alsinoida.*

Key to the Sections of *Stylidium* subg. *Andersonia*

1. Inflorescences 1-flowered ..... **S.** sect. **Uniflora**
   Inflorescences cymose, 2-many flowered 2

2. Calyx fused into 2 obtuse lips ..... **S.** sect. **Biloba**
   Calyx consisting of 5 lobes, some partly fused 3

3 Petals laterally fused (A1&P1 + A2&P2) ..... **S.** sect. **Alsinoida**
   Petals all free (A1+A2+P1+P2) or posteriors fused (A1+A2+(P1&P2)) 4

4 Inflorescences borne on leafless scape(s), generally arising from a cluster of leaves (either basal or cauline). Leaves not resembling floral bracts ..... **S.** sect. **Andersonia**
   Inflorescences not borne on leafless scape(s). Leaves always cauline, tending to grade into floral bracts ..... **S.** sect. **Tenella**

A. **Stylidium** sect. **Andersonia** R.Br ex G.Don, Gen. hist. 3: 721 (1834).

Leaves broad, in basal rosette or scattered on short stem. Scapes present. 2 sepals fused for more than half their length and 3 free. Corolla white, pink or mauve; petals all free or posterior ones fused to each other. Paracorolla usually present; orange paracorolla glands present or absent. Labellum usually attached to outside of corolla tube. Column of uniform width throughout, glabrous. Capsules sometimes ribbed; seeds smooth.

13 species, SE Asia, Malesia, tropical Australia, southern Queensland, northern New South Wales.

1. Stylidium kunthii Wall. ex DC., Prodr. 7: 335 (1839). **Type:** [Bangladesh] Sylhet, [24°—' N 91°—' E], undated, *N. Wallich* herb. no. 3759 (holo: K, microfiche BRI; iso: BM).

Stylidium brunonis Griff., Not. pl. asiat. 4: 275–276 (1854). **Type:** Burma. Mergui, [12°—' N 98°—' E], undated, *W. Griffith* 577 (holo: ?K *n.v.*; iso: BM).

Annual, 8–20 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 5–15 per plant, mostly in terminal rosette, with some scattered along stems, oblanceolate or obovate or orbicular, 4–15 mm long including petiole, 2–9 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles 1–6 mm long. Scapes 1–5 per plant, 0.4–0.7 mm in diameter, glandular-hairy; sterile bracts absent or present. Inflorescences 5–14 cm long, determinate, monochasially cymose; branches glandular-hairy. Bracts deltate or lanceolate, 1.5–3.5 mm long, glabrous or glandular-hairy, obtuse. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glabrous throughout or glandular-hairy throughout.

Sepals oblanceolate or elliptical, with 3 free and 2 fused for more than half their length, 1.3–2.5 mm long, 0.3–0.5 mm wide, glandular-hairy, obtuse. Corolla white or pink, glabrous; tube 1.2–1.6 mm long, with sinus on anterior side only. Paracorolla discontinuous, thin, glabrous, 0.1–0.2 mm high. Paracorolla lobes or appendages 2, both similar, acute, none opposite the anterior petals, 2 opposite the posterior petals. Paracorolla glands absent. Labellum attached at base of anterior sinus of corolla tube, lanceolate, 0.6–0.7 mm long, thick, glabrous, acute or acuminate, terminal appendage absent. Petals all free, A1+A2+P1+P2. Anterior petals 0.7–1.2 mm long, 0.4–0.8 mm wide, bilobed or entire, obtuse. Posterior petals 1–2 mm long, 0.6–1.3 mm wide, bilobed, obtuse. Column 4–5 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 6.5–11 mm long excluding sepals, 0.6–0.9 mm wide, without raised longitudinal ribs; halves detaching distally, strongly recurved or not recurved. Seeds ellipsoidal, c. 0.2 mm long, brown; surface convex, smooth.

Specimens examined: **India.** Motijharan hill, Sambalpur, [21°N 84°E], Nov 1948, *Mooney* 3139 (K); Siliguri, North Bengal, [26°N 88°E], Dec 1875, *Clarke* 26567 (BM). **Bangladesh.** Chittagong, [22°N 91°E], undated, *Thomson* (L, P). **Thailand.** Poo Kradeng, [16°N 101°E], Nov 1958, *Sorensen* et al. 6181 (L). **Burma.** Pegu, [17°N 96°E], Dec 1957, *McKee* 5837 (NSW, P). **Vietnam.** Phuc Yen, [21°N 105°E], Nov 1935, *Petelot* 5517 (P); Ben Cat, [11°N 106°E], Dec 1865, *Pierre* 4533 (AAU, P). **Unplaced.** Cochinchine, 1862–66, *Thorel* 916 (P).

Reconstituted material examined: *Petelot* 5517 (6 fls); *Sorensen* et al. 6181 (1 fl).

Distribution and habitat: *Stylidium kunthii* is endemic to south-east Asia, extending from eastern India to Vietnam (Map 1). From the localities recorded, it appears to be confined to altitudes of less than 200 metres. *S. kunthii* is recorded from moist road cuttings in forests, and on open wet soil in rice fields and natural grassland.

Phenology: Flowers and capsules have been recorded for November and December.

Affinities: *S. kunthii* is closely related to *S. uliginosum*, but differs by the cauline leaves (confined to basal rosette for *S. uliginosum*), labellum 0.6–0.7 mm long (0.4–0.5 mm for *S. uliginosum*), column 4–5 mm long (3–3.5 mm long for *S. uliginosum*), presence of a paracorolla, and corolla tube 1.2–1.6 mm long (0.9–1.3 mm for *S. uliginosum*).

At L, there is a mixed collection of *S. kunthii* and *S. uliginosum* from Phu Kradung in northern Thailand, which indicates that these species, at least occasionally, grow together.

Typification: The holotype of *S. brunonis* is presumably at K. One of the sheets received on loan to BRI had the note "specimen from Mergui - Griffith - Herb. Hook. - removed from here 8 iii 1933". However the latter was not received.

Conservation status: Not evaluated.

2. Stylidium uliginosum Sw. ex Willd., Sp. Pl. 4: 147 (1805); Swartz, Ges. Naturf. Freunde Berl. Mag. Neuesten Entdeck. Gesammten Naturk. 1: 52 (1807); *Candollea uliginosa* (Sw. ex Willd.) F.Muell., Syst. Census Aust. Pl. 86 (1883). **Type:** Ceylon, undated, *J.G. Koenig* (holo: B, microfiche BRI; iso: BM).

Stylidium sinicum Hance in Walp., Ann. Bot. Syst. 2: 1030 (1852). **Type:** Hong Kong, [22°—' N 114°—'] E, undated, collector unknown (syn: BM).

Annual, 4–15 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems compressed (with leaves in basal rosette). Leaves 7–16 per plant, elliptical or obovate, 4.5–11 mm long including petiole, 2.0–4.5 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles 0.5–4 mm long. Scapes 1–7 per plant, 0.4–0.5 mm in diameter, glabrous or glandular-hairy; sterile bracts absent or present. Inflorescences 4–15 cm long, determinate, monochasially cymose; branches glandular-hairy. Bracts deltate or lanceolate or ovate, 1.5–2 mm long, glabrous or glandular-hairy, obtuse. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy throughout. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 1.2–2 mm long, 0.3–0.4 mm wide, glandular-hairy, obtuse. Corolla white,

glabrous; tube 0.9–1.3 mm long, with sinus on anterior side only. Paracorolla absent. Labellum attached at base of anterior sinus of corolla tube, lanceolate, 0.4–0.5 mm long, thin, glabrous, acute or acuminate, terminal appendage absent. Petals all free, A1+A2+P1+P2. Anterior petals 0.5–0.8 mm long, 0.3–0.5 mm wide, bilobed or entire, acute or obtuse. Posterior petals 0.8–1.6 mm long, 0.5–1.1 mm wide, bilobed or entire, obtuse. Column 3–3.5 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 6–8 mm long excluding sepals, 0.5–0.8 mm wide, without raised longitudinal ribs; halves detaching distally, strongly recurved or not recurved. Seeds ellipsoidal, c. 0.2 mm long, brown; surface convex, smooth.

Specimens examined: **China.** Shipai Farm near Guangzhou, Nov 1955, *Huang* 160717 (MO); Baiyun Mountain, near Guangzhou, Oct 1963, *Huang* 165266 (MO); White Cloud Hills, Canton, 23N 113E, Mar 1885, *Sampson* 368 (BM); Port Island, Hong Kong, Oct 1973, *Hu* 12255 (K); Hong Kong, 1850, *Champion* (BM, K); Hong Kong, [22°N 114°E], 1853–6, *Wright* (L, P). **Thailand.** Loei, Phu Krading, Nov 1958, *Smitinand* 4928 (K. L); Phu Kradung, S of Loi, [16° 53'N 101° 53'E], Nov 1970, *Chaoenphol* 4608 et al. (AAU); Loei, Phu Krading, Nov 1965, *Tagawa* 827 et al. (AAU, L); Phukradung, Loei, Dec 1971, *Beusekom* 4498 et al. (L, MO, P); Pak Thong Chai, Korat, [14°N 102°E], Dec 1923, *Kerr* 8112 (BM); Ubon at Kemarath, Me-Kong, [15°N 104°E], 1866–8, *Thorel* (P). **Vietnam**. near Kip, Bac Giang (Ha Bac) Province, [21°N 106°E], Jan 1936, *Petelot* 5662 (P); Hue, Annam, [16°N 107°E], Mar 1927, *Squires* 186 (P); Baie de Tourane, [16°N 108°E], Feb 1908, *d'Alleizette* 24 (P); Vinh-yen, Tonkin, [21°N 105°E], undated, *Eberhardt* 3808 (AAU, P); Nha-trang and vicinity, [12°N 109°E], Mar 1911, *Robinson* 1057 (P). **Cambodia.** Kep, Kampot, [10°N 104°E], Oct 1904, *Geoffray* 449 (P). **Sri Lanka.** [near Colombo] Ceylon, [6°N 80°E], 1868, *Thwaites* 3505 (BM, P); Ceylon, 1830–37, *Walker* (L, P). **Unplaced**. Cu Phap, Tonkin, Feb 1887, *Balansa* 3617 (P); Mat Lon, Tonkin, Feb 1892, *Bon* (P); Dai Khoi, Tonkin, Feb 1893, *Bon* (P); Ouonbi, Tonkin, Nov 1885, *Balansa* 1396 (P).

Reconstituted material examined: *Charoenphol* et al. 4608 (3 fls); *Petelot* 5662 (3 fls).

Distribution and habitat: *Stylidium uliginosum* is endemic to south-east Asia. The type was collected from Sri Lanka, but it may be extinct there now (Wadhwa 1997). It is otherwise found from Thailand to the Guangdong province of southern China (Map 2). From the localities recorded, it appears to be confined to altitudes of less than 200 metres. *S. uliginosum* has been recorded from sandy moist places in open savannah, beside a pool on a dried stream, and on sandy earth banks.

Phenology: Flowers and capsules have been recorded from October to March.

Notes: *S. uliginosum* is most closely related to *S. kunthii* and *S. tenerum*. See notes under those species. Only one type specimen for *S. sinicum* was seen, but others may exist. As this name is a synonym only, I have not attempted to designate a lectotype for it.

Conservation status: Not evaluated.

3. Stylidium tenerum Spreng., Syst. Veg. 3: 749 (1826)

Stylidium tenellum R.Br., Prodr. 570 (1810), *nom. illeg.*, non Sw. ex Willd. (1805). **Type:** East Coast Port 1 [Queensland. Port Curtis District: Curtis Island, 23°4–'S 151°1–'E], 6 August 1802, *R. Brown* (lecto: BM), here chosen.

Illustration: R. Erickson, Triggerplants, plates 51, 54 (1958), as *S. uliginosum*.

[*S. uliginosum* auct. Australiense non. Sw. ex Willd.]

Annual, 3–20 cm high. Glandular hairs 0.05–0.2 mm long; glands ellipsoidal or globose, dark. Stem base not thickened. Stems compressed (with leaves in basal rosette). Leaves 4–10 per plant, obovate or orbicular, 4–17.5 mm long including petiole, 3–8 mm wide, glabrous; apex obtuse; base obtuse, or cuneate; margins entire. Petioles 1.5–7 mm long. Scapes 1–7 per plant, 0.2–0.6 mm in diameter, glabrous or glandular-hairy; sterile bracts present. Inflorescences 3–20 cm long, determinate, monochasially cymose; branches glabrous, or glandular-hairy. Bracts deltate or lanceolate, 1–1.5 mm long, glabrous or glandular-hairy, obtuse or acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy throughout. Sepals oblanceolate, with 3 free and 2 fused for more

than half their length, 1–1.6 mm long, 0.3–0.5 mm wide, glandular-hairy, obtuse. Corolla white, glabrous; tube 1–1.6 mm long, with sinus on anterior and posterior sides. Paracorolla discontinuous, thin, glabrous, 0.1–0.3 mm high. Paracorolla lobes or appendages 4–8, all similar, obtuse, 2(–4) opposite the anterior petals, 2–4 opposite the posterior petals. Paracorolla glands absent. Labellum attached to outside of corolla tube or attached at base of anterior sinus of corolla tube, ovate, 0.3–0.5 mm long, thick, glabrous, acute or acuminate, terminal appendage absent. Petals all free, A1+A2+P1+P2. Anterior petals 0.3–1.1 mm long, 0.3–0.8 mm wide, entire, obtuse. Posterior petals 1.1–1.9 mm long, 0.8–1.5 mm wide, bilobed, obtuse. Column 2.5–3.5 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 5–8 mm long excluding sepals, 0.5–0.8 mm wide, without raised longitudinal ribs; halves detaching distally, strongly recurved. Seeds ellipsoidal, 0.2 mm long, brown; surface convex, smooth.

Selected specimens: **Papua New Guinea.** Wuroi, Oriomo River, [8°S 143°E], Jan-Mar 1934, *Brass* 5820 (BRI). **Northern Territory.** Wessel Islands, Oct 1972, *Latz* 3512 (DNA). **Queensland**. Cook District: Yeldham Creek, Etheridge River, undated, *Armit* 614 (MEL); Emu Creek, 10.2 km from Peninsula Development road, towards 'Dixie', Jul 1998, *Bean* 13549 (BRI, DNA); Browns Creek, Pascoe River, Jul 1948, *Brass* 19640 (BRI, L); Daintree N.P., Little Daintree River, May 1998, *Forster* PIF22800 et al. (BRI, QRS); Walsh River gorge, Sep 1985, *Godwin* C2866 (BRI). North Kennedy District: Alligator Creek, Bowling Green Bay N.P., Jun 1991, *Bean* 3276 (BRI); Ten Mile Creek, 22.5 km from Proserpine towards Bowen, Jul 1997, *Bean* 12088 (BRI); c. 8 km NE of "Wairuna", Aug 1997, *Bean* 12175 (BRI); Stony Creek, W of Ingham near Wallaman Falls, Aug 1951, *Blake* 18804 (BRI). South Kennedy District: Mount Mandurana N.P., 20 km NNW of Mackay, May 1991, *Bean* 3141 (BRI).Port Curtis District: 2 km from Tannum Sands, old Tannum road, Dec 1989, *Aspland* 1032 (BRI); between Pineapple Gap and Raspberry Creek HS, Shoalwater Bay Military Reserve, Jul 1977, *Clarkson* 746 & *Stanley* (BRI); Deepwater Creek N.P., about 3 km SW of campsite, Sep 1992, *Sharpe* 5374 & *Tan* (BRI). Burnett District: Mt Perry, Jun 1889, *Keys* (BRI). Wide Bay District: 1.5 km S of Kingfisher Bay, Fraser Island, Jul 1997, *Bean* 12055 (BRI, DNA, MEL); Granite Bay, Noosa N.P., Sep 1985, *Sharpe* 3909 & *Batianoff* (BRI); 2.3 km from Tewantin on road to Boreen Point, Oct 1988, *Wannan & Quinn* (BRI). Moreton District: Wappa Dam Pumping station, W of Yandina, Sep 1997, *Bean* 12406 (BRI); Caloundra, Aug 1932, *Blake* 4246 (BRI); Myora, North Stradbroke Island, Aug 1969, *Coveny* 2018 (BRI, MEL, NSW). **New South Wales.** Coolangatta Airport, Tweed Heads West, Jun 1999, *Bean* 15226 (BRI, NSW); Cudgen Creek, 1892, *Finselbach* 106 (MEL).

Reconstituted or spirit material examined: *Bean* 12055 (2 fls); *Bean* 12088 (2 fls); *Bean* 12175 (2 fls); *Bean* 12194 (2 fls); *Clarkson* 746 & *Stanley* (2 fls); *Forster* 5444 (2 fls).

Distribution and habitat: *Stylidium tenerum* is widespread in eastern Queensland, especially in the tropics. It is also known from Papua-New Guinea, the Wessel Islands in Northern Territory, and from the extreme north-east of New South Wales (Map 4). It grows on seepage areas or consolidated creekbanks, or sometimes on coastal lowlands in open *Melaleuca* woodland. It grows in sandy soils, and is often associated with species of *Drosera, Eriocaulon* and *Utricularia*.

Phenology: Flowers and capsules have been recorded mainly between April and October, but there are a few records from December and January.

Notes: *S. tenerum* is closely related to *S. uliginosum*. *S. tenerum* differs by having a sinus on both the anterior *and* posterior sides of the corolla tube, by the presence of a paracorolla, and by having the labellum usually attached to the outside of the corolla tube.

Two specimens were available to Brown when drawing up his description; his own, and one collected by Banks and Solander from Endeavour River. Brown's collection is selected as lectotype as he indicates it in his Prodromus as "(T.) v.v.", meaning "seen living from Tropical Australia". This infers that the description was based primarily on his own specimen.

Conservation status: The extent of occurrence of *S. tenerum* is very large. Within this area it is confined to relatively undisturbed creekbanks or open lowland communities on sand. All known stands are small and scattered, but *S. tenerum* is not considered to be rare or threatened.

4. Stylidium muscicola F.Muell., Fragm. 1: 153 (1859); *Candollea muscicola* (F.Muell.) F.Muell., Syst. census Austral. pl. 86 (1883). **Type:** [Northern Territory]. Cataracts, Victoria River, [15°—'S 131°—'E], 26 June 1856, *F. Mueller* (holo: MEL [MEL1061541]).

Illustrations: R. Erickson, Triggerplants Plates 51, 53 (1958); J.R. Wheeler (ed.), Fl. of Kimb. Region 882, t. 272B (1992).

Annual, 5–33 cm high. Glandular hairs 0.1–0.15 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 4–20 per plant, mostly in terminal rosette, with some scattered along stems, obovate or orbicular, (6–)10–33 mm long including petiole, (5–)9–28 mm wide, glabrous; apex obtuse; base obtuse, or cuneate; margins entire. Petioles 5–29 mm long. Scapes 1–8 per plant, 0.2–0.5 mm in diameter, glandular-hairy; sterile bracts present or absent. Inflorescences 3–17 cm long, determinate, monochasially cymose; branches glandular-hairy. Bracts linear or lanceolate, 0.5–2.0 mm long, glabrous or glandular-hairy, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy throughout. Sepals elliptical, with 3 free and 2 fused for more than half their length, 1.5–2 mm long, 0.3–0.7 mm wide, glandular-hairy, obtuse. Corolla white or pink or mauve, glabrous; tube 2.1–2.5 mm long, with sinus on anterior side only. Paracorolla absent or discontinuous, thin, glabrous, 0.1–0.15 mm high. Paracorolla lobes or appendages 0–4, all similar, obtuse, 0–2 opposite the anterior petals, 0–2 opposite the posterior petals. Paracorolla glands absent. Labellum attached at base of anterior sinus of corolla tube, lanceolate, 0.4–0.7 mm long, thick, glabrous, acute or acuminate, terminal appendage usually present; 0–0.4 mm long. Petals all free, A1+A2+P1+P2. Anterior petals 1.4–1.8 mm long, 0.8–1.6 mm wide, bilobed, obtuse. Posterior petals 2.3–3.5 mm long, 1.4–2.2 mm wide, bilobed, obtuse. Column 5–6.5 mm long, of uniform width throughout, glabrous; lateral lobes present, 0.1–0.2 mm wide. Corona absent. Capsule linear, (10–)13–24 mm long excluding sepals, 0.4–0.6 mm wide, without raised longitudinal ribs; halves detaching distally, strongly recurved. Seeds ellipsoidal, 0.15–0.2 mm long, brown; surface convex, smooth.

Selected specimens: **Western Australia.** Lennard River Gorge, King Leopold Range, Jun 1976, *Beauglehole* 52606 (DNA); The Grotto, c. 30 km SSE of Wyndham, Jun 1976, *Beauglehole* 54083 (DNA); King Edward River, Amax road crossing, Jun 1971, *Byrnes* 2327 (DNA); S side of Cockburn Range, c. 13 km W of King River, Jul 1974, *Carr* 3286 & *Beauglehole* 47064 (DNA); Galvins Gorge, c. 200 km E of Derby, Jul 1974, *Carr* 4141 & *Beauglehole* 47919 (DNA); Wonjarring Falls, Carson River escarpment, Jun 1984, *Chesterfield* 420 (MEL); Whale Mouth Cave, Osmond Range, Jul 1991, *Cowie* 1924 (DNA, PERTH). **Northern Territory.** Pinkerton Range, Auvergue Station, Mar 1989, *Brock* 566 & *Russell-Smith* (DNA); near Mt Gilruth, Mar 1984, *Craven* 8308 & *Wightman* (DNA, MEL); Little Nourlangie Rock, Mar 1978, *Dunlop* 4773 (CANB, DNA); Mt Boulder, Feb 1989, *Dunlop* 7999 & *Leach* (DNA); Macadam Range, Mar 1989, *Dunlop* 8073 & *Leach* (DNA); Angalarri River catchment, May 1994, *Dunlop* 10042 & *Latz* (DNA, MEL); 10 km SW of Redbank Mine, Wollogorang Station, Jun 1987, *Latz* 10505 (DNA, CANB, MEL, NSW); catchment of Hayward Creek, Mar 1989, *Leach* 2480 & *Dunlop* (DNA); tributary of Fitzmaurice River, Feb 1994, *Leach* 4202 (DNA); Katherine Gorge N.P., May 1977, *Parker* 799 (DNA, CANB); Victoria River area, Jasper Gorge, May 1988, *Smith* 1128 (DNA); South Bay, Bickerton Island, Jun 1948, *Specht* 554 (BRI, MEL); 2 km W of Victoria River bridge, Gregory N.P., Mar 1986, *Thomson* 1328 (DNA); Vanderlin Island, Sir Edward Pellew group, Jul 1988, *Thomson* 2456 (DNA); Yambarran Range, 19 km NE of Mt Milik Monmir, May 1994, *Walsh* 3819 & *Leach* (DNA, MEL).

Reconstituted or spirit material examined: *Parker* 799 (3 fls); *Smith* 1128 (2 fls).

Distribution and habitat: *Stylidium muscicola* extends from the western Kimberley of Western Australia to northern parts of the Northern Territory, eastward almost to the Queensland border (Map 5). It grows in sandy soil in sheltered places in sandstone ranges (e.g. base of cliffs), in places which receive seepage after the wet season.

Phenology: Flowers and capsules have been recorded between February and September.

Notes: *S. muscicola* is distinguished by the pale green petiolate cauline leaves, the white flowers with free posterior petals, and the relatively long capsules.

There is only one Mueller collection of this taxon at MEL, hence it is treated as the holotype.

Conservation status: *S. muscicola* is a widespread species and not considered to be rare or threatened.

5. Stylidium ensatum A.R.Bean **sp. nov.** affinis *S. muscicola*, sed differens foliis sessilibus, scapis latioribus, bracteis obtusis, corolla glandulosa et faucis appendicibus ensatis 6–9. **Typus:** Northern Territory. Shoal Bay, 12°22'S 130°57'E, 20 June 1974, *C.R. Dunlop* 4105 (holo: BRI; iso: CANB, DNA, K, L, NSW).

Annual, 14–22 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 6–17 per plant, scattered along stems, obovate or orbicular, 7–12 mm long, 5.5–12 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles absent. Scapes 1–3 per plant, 0.6–0.8 mm in diameter, glandular-hairy; sterile bracts absent. Inflorescences 8–16 cm long, determinate, monochasially cymose; branches glandular-hairy. Bracts lanceolate or ovate, 1–2.0 mm long, glandular-hairy, obtuse. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy throughout. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 1.8–2.1 mm long, 0.4–0.6 mm wide, glandular-hairy, obtuse. Corolla pink or mauve, glandular-hairy on tube and petals; tube 1.9–2.4 mm long, with sinus on anterior side only. Paracorolla continuous, thin, glabrous, 0.2–0.5 mm high. Paracorolla lobes or appendages 6–9, all similar, acute, 2–4 opposite the anterior petals, 4–5 opposite the posterior petals. Paracorolla glands absent. Labellum attached to outside of corolla tube, lanceolate, 0.4–0.5 mm long, thin, glabrous, acute or acuminate, terminal appendage usually present; 0–0.2 mm long. Petals all free, A1+A2+P1+P2. Anterior petals 1.8–2.5 mm long, 1.2–2 mm wide, bilobed, obtuse. Posterior petals 3–4.4 mm long, 1.8–3.3 mm wide, bilobed, obtuse. Column 5.5–7.5 mm long, of uniform width throughout, glabrous; lateral lobes present, 0.1–0.2 mm wide. Corona absent. Capsule linear, 8–12 mm long excluding sepals, 0.5–0.7 mm wide, without raised longitudinal ribs; halves detaching distally, strongly recurved. Seeds ellipsoidal, c. 0.2 mm long, brown; surface lacunose, smooth. Fig. 3A.

Specimens examined: **Northern Territory.** near Hayes Creek, Jul 1946, *Blake* 16409 (BRI, DNA); Port Darwin, 1885, *Holtze* 514 (MEL); Port Darwin, 1888, *Holtze* 827 (MEL); Port Darwin, 1888, *Holtze* 831 (MEL); Port Darwin, 1888, *Holtze* 865 (MEL); Lee Point road, 7.5 miles [12 km] N of Darwin, Jun 1964, *Nelson* 1159 (DNA); North Australia, 1886, *Tenison-Woods & Holtze* (MEL); edge of McMinns Lagoon, Jun 1968, *Wheelwright* DW44 (DNA).

Reconstituted or spirit material examined: *Dunlop* 4105 (3 fls); *Nelson* 1159 (1 fl); *Wheelwright* DW44 (1 fl).

Distribution and habitat: *Stylidium ensatum* is endemic to the Darwin area of the Northern Territory (Map 5). For one collection, the habitat is given as a *Melaleuca viridiflora-Lophostemon lactifluus* forest, with damp peaty soil.

Phenology: Flowers and capsules have been recorded from June and July.

Affinities: *S. ensatum* is most closely related to *S. muscicola*, but differs by the sessile leaves, scapes 0.6–0.8 mm wide (0.2–0.5 mm for *S. muscicola*), bracts obtuse (acute for *S. muscicola*), corolla glandular-hairy (glabrous for *S. muscicola*), paracorolla lobes acute (obtuse or absent for *S. muscicola*) and labellum attached to outside of corolla tube (attached at base of anterior sinus for *S. muscicola*).

Notes: This taxon was mentioned by Erickson (1958) in her discussion of the variation in *S. muscicola*.

Conservation status: Data deficient (IUCN 1994)

Etymology: The species epithet is from the Latin *ensatus*, meaning "sword-like". This is in reference to the slender sword-like throat appendages, which are a feature of this species.

6. Stylidium simulans Carlquist, Aliso 9: 426 (1979). **Type:** Northern Territory. Camp 2, Arnhem Land, 13°04'S 133°01'E, 8 June 1978, *S. Carlquist* 15435 (holo: RSA; iso: DNA).

Annual, 7–11 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, pale. Stem base not thickened. Stems compressed (with leaves in basal rosette). Leaves 4–10 per plant, orbicular, 3–5.5 mm long including petiole, 1.5–3.5 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles 1–2 mm long. Scapes 1 or 2 per plant, 0.2–0.3 mm in diameter, glandular-hairy; sterile bracts present. Inflorescences 7–11 cm long, determinate, monochasially cymose; branches glandular-hairy. Bracts deltate, 0.5–1 mm long, glandular-hairy, obtuse or acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy throughout. Sepals oblanceolate or elliptical, with 3 free and 2 fused for more than half their length, 1.4–1.6 mm long, 0.2–0.3 mm wide, glandular-hairy, obtuse or acute. Corolla mauve or pale pink, glabrous; tube 1.6–2 mm long, with sinus on anterior side only. Paracorolla discontinuous, thin, glabrous, 0.2–0.4 mm high. Paracorolla lobes or appendages 6–8, all similar, acute, 2–4 opposite the anterior petals, 4 opposite the posterior petals. Paracorolla glands absent. Labellum attached to outside of corolla tube, lanceolate, 0.3–0.4 mm long, thick, glabrous, acute or acuminate; 0.1–0.2 mm long. Petals with posterior ones fused, A1+A2+(P1&P2). Anterior petals 1.1–1.3 mm long, 0.4–0.7 mm wide, bilobed or entire, obtuse. Posterior petals 1.7–2.2 mm long, 0.7–1.2 mm wide, bilobed, obtuse. Column 3.5–4 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 5.5–8.5 mm long excluding sepals, 0.4–0.5 mm wide, without raised longitudinal ribs; halves detaching distally, strongly recurved or not recurved. Seeds ellipsoidal, 0.15–0.2 mm long, brown; surface convex, smooth.

Specimens examined: **Northern Territory.** Mt Gilruth area, Jun 1978, *Dunlop* 4910 (DNA); Arnhem Land, Mt Gilruth area, Jun 1978, *Henshall* 1887B (DNA); ditto, *Henshall* 1887A (DNA).

Reconstituted or spirit material examined: *Dunlop* 4910 (3 fls).

Distribution and habitat: *Stylidium simulans* is endemic to the Arnhem Land plateau, and is currently known only from around the type locality (Map 7), where it grows on a sandstone plateau in shallow sandy soil.

Phenology: Flowers and capsules have been recorded in June only.

Affinities: *S. simulans* is closely related to *S. accedens*. See notes under that species.

Typification: The type of *S. simulans* was incorrectly cited as Carlquist 15434 in the protologue (Carlquist, pers. comm.). The type collection for *S. simulans* is Carlquist 15435; this is the collection received and annotated as holotype from RSA.

Conservation status: Data deficient (IUCN 1994).

7. Stylidium divergens A.R.Bean **sp. nov.** affinis *S. accedenti* sed differens scapis glabris, sepalis latioribus longioribusque, labello ad sinum tubi corollae affixo, columna multo longiore et capsulis 10–17 mm longis. **Typus:** Northern Territory. Mt Brockman Outlier, 15 km SE of Jabiru, 12° 47'S 132° 57'E, 19 April 1989, *R.W. Johnson* 4635 (holo: BRI; iso: AD, DNA, CANB, RSA).

Annual, 7–27 cm high. Glandular hairs 0.05–0.15 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous or leaves in basal rosette. Leaves 2–6 per plant, elliptical, obovate or orbicular, 4–21 mm long including petiole, 3–5 mm wide, glabrous; apex obtuse; base obtuse or cuneate; margins entire. Petioles 0.5–8 mm long. Scapes 1–6 per plant, 0.3–0.6 mm in diameter, glabrous; sterile bracts absent. Inflorescences 4–24 cm long, determinate, monochasially cymose; branches glabrous or glandular-hairy. Bracts deltate or ovate, 0.5–1 mm long, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy throughout or at distal end only. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 1.2–1.7 mm long, 0.25–0.4 mm wide, glabrous or glandular-hairy, obtuse. Corolla white or mauve, glandular-hairy on tube and petals; tube 1.5–2.4 mm long, with sinus on anterior side only. Paracorolla discontinuous or continuous, thin, glabrous, 0.1–0.5 mm high. Paracorolla lobes or appendages 2–4, all similar, obtuse, 2 opposite the anterior petals, 0–2 opposite the posterior

petals. Paracorolla glands absent. Labellum attached at base of anterior sinus of corolla tube, ovate, 0.4–0.5 mm long, thick, glabrous, acute or acuminate, terminal appendage usually present; 0–0.5 mm long. Petals with posterior ones fused, A1+A2+(P1&P2). Anterior petals 1.3–2 mm long, 0.5–1.6 mm wide, bilobed, obtuse. Posterior petals 2.5–3.7 mm long, 2–3.5 mm wide, bilobed, obtuse. Column 5.5–7 mm long, of uniform width throughout, glabrous; lateral lobes absent or present, 0–0.2 mm wide. Corona absent. Capsule linear, 10–17 mm long excluding sepals, 0.5–0.6 mm wide, with raised longitudinal ribs; halves detaching distally, not recurved. Seeds ellipsoidal, 0.25–0.3 mm long, brown; surface convex, colliculate. Fig 3B-D.

Specimens examined: **Northern Territory.** near Kurundie Creek, Kakadu National Park, Apr. 1990, *Leach 2842 & Cowie* (DNA).

Reconstituted or spirit material examined: *Johnson* 4635 (2 fls); *Leach* 2842 & *Cowie* (3 fls).

Distribution and habitat: *Stylidium divergens* is endemic to the Kakadu National Park in Northern Territory (Map 4). It occurs on sandstone slopes or gullies.

Phenology: Flowers and capsules have been recorded only for April.

Affinities: *S. divergens* is closely related to *S. accedens*, but differs by the glabrous scapes (glandular-hairy for *S. accedens*); labellum attached to base of anterior sinus of corolla tube (attached to outside of tube for *S. accedens*); much larger posterior petals, column 5.5–7 mm long (2.5–3 mm long for *S. accedens*) and capsules 10–17 mm long (4–8 mm long for *S. accedens*).

Conservation status: Data deficient (IUCN 1994).

Etymology: From the Latin *divergens* meaning diverging or separating. This is in reference to the widely spreading posterior petals.

8. Stylidium accedens A.R.Bean **sp. nov.** affinis *S. simulanti*, sed differens tubo corollae glanduloso, paracorolla absens continuave, labello breviore, absentia appendicis terminalis in labello, petalis anticis et posticis brevioribus, columna 2.5–3 mm longa et seminibus colliculatis. **Typus:** Northern Territory. Katherine Gorge National Park, 14°19'S 132°25'E, 23 June 1975, *C.R. Dunlop* 3797 (holo: BRI; iso: CANB, DNA).

Annual, 4–15 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, pale. Stem base not thickened. Stems compressed (with leaves in basal rosette). Leaves 4–10 per plant, obovate, 5–12 mm long including petiole, 2.5–5.5 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles 1.5–3.5 mm long. Scapes 1–2 per plant, 0.2–0.4 mm in diameter, glandular-hairy; sterile bracts present. Inflorescences 4–15 cm long, determinate, monochasially cymose; branches glandular-hairy. Bracts linear or lanceolate, 0.5–1 mm long, glandular-hairy, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy throughout. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 1.2–1.4 mm long, 0.1–0.25 mm wide, glandular-hairy, obtuse. Corolla white, glandular-hairy on tube only; tube 1.2–1.7 mm long, with sinus on anterior side only. Paracorolla absent or continuous, thin, glabrous, 0.1 mm high. Paracorolla lobes (when present) 6, all similar, obtuse, 2 opposite the anterior petals, 4 opposite the posterior petals. Paracorolla glands absent. Labellum attached to outside of corolla tube, ovate or lanceolate, 0.3–0.4 mm long, thick, glabrous, acuminate, terminal appendage absent. Petals with posterior ones fused, A1+A2+(P1&P2). Anterior petals 0.5–0.7 mm long, 0.4–0.5 mm wide, bilobed, obtuse. Posterior petals 0.6–1 mm long, 0.5–0.8 mm wide, bilobed, obtuse. Column 2.5–3 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, (4–)6–8 mm long excluding sepals, 0.3–0.5 mm wide, without raised longitudinal ribs; halves detaching distally, not recurved. Seeds ellipsoidal, 0.2 mm long, brown; surface convex, colliculate. Fig. 3E–G.

Specimens examined: **Northern Territory.** Edith Falls, Edith River, 17 miles [27 km] by road E of Stuart Highway, Jul 1965, *Beauglehole* ACB10878 (DNA); Edith Falls, Jul 1965, *Beauglehole* ACB43215 (DNA); Arnhem Land plateau, Jun 1978, *Carlquist* 15445 (BRI); Katherine Gorge N.P., Jun 1975, *Dunlop* 3760 (CANB, DNA); upper Katherine River, Arnhem

Land, Jul 1996, *Dunlop* 10303 & *Mangion* (DNA); above UDP Falls, Jul 1971, *Gittins* 2637 (BRI); sources of Goomadeer R., Arnhem Land, Jun 1978, *Henshall* 1993 (DNA).

Reconstituted or spirit material examined: *Dunlop* 3760 (3 fls); *Dunlop* 10303 & *Mangion* (2 fls).

Distribution and habitat: *Stylidium accedens* occurs around and to the north-east of Katherine in Northern Territory (Map 6), where it grows on sandstone plateaux with shallow sandy soil.

Phenology: Flowers and capsules have been recorded for June and July.

Affinities: *S. accedens* is closely related to *S. simulans*, but differs by the obovate leaves (orbicular for *S. simulans*), corolla tube glandular-hairy (glabrous for *S. simulans*), paracorolla absent or continuous (discontinuous for *S. simulans*), the shorter labellum, the absence of a terminal appendage on the labellum, the shorter anterior and posterior petals, column 2.5–3 mm long (3.5–4 mm for *S. simulans*), and minutely colliculate seeds (smooth for *S. simulans*).

Conservation status: Data deficient (IUCN 1994).

Etymology: The specific epithet is from the Latin *accedens*, an indeclinable participle meaning "resembling". This is in reference to the superficial resemblance of this species to *S. uliginosum,* with which it was confused in the past.

9. Stylidium candelabrum Lowrie & Kenneally, Nuytsia 13: 251 (1999). **Type:** Northern Territory. Headwaters Katherine River, Arnhemland, 13°47'S 133°05'E, 11 July 1996, *C.P.Mangion* 245 & *C.R.Dunlop* (holo: DNA; iso: PERTH).

Annual, 6–20 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 11–100 per plant, scattered along stems, elliptical, 2.5–13(–18) mm long including petiole, 1.5–5(–9) mm wide, glabrous; apex obtuse; base obtuse, or cuneate; margins entire. Petioles 2–6(–8) mm long. Scapes 1–13 per plant, 0.2–0.7 mm in diameter, glabrous; sterile bracts absent. Inflorescences 3–16 cm long, determinate, monochasially cymose; branches glabrous, or glandular-hairy. Bracts deltate or lanceolate, 0.5–1.5 mm long, glabrous, obtuse or acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glabrous throughout or glandular-hairy at distal end only. Sepals deltate or ovate, fused into 2 emarginate lips, 0.8–1.4 mm long, 0.3–0.4 mm wide, glabrous, obtuse or acute. Corolla white, glandular-hairy on tube and petals; tube 1.2–1.8 mm long, with sinus on anterior and posterior sides. Paracorolla discontinuous, thin, glabrous, 0.2–0.4 mm high. Paracorolla lobes or appendages 4, all similar, obtuse, 2 opposite the anterior petals, 2 opposite the posterior petals. Paracorolla glands absent. Labellum attached to outside of corolla tube, ovate or lanceolate, 0.4–0.6 mm long, thick, glabrous, acute or acuminate, terminal appendage absent. Petals all free, A1+A2+P1+P2. Anterior petals 0.9–1.3 mm long, 0.6–1.1 mm wide, bilobed, trilobed or entire, obtuse. Posterior petals 1.6–2.3 mm long, 1.5–2.3 mm wide, bilobed, or 3 or 4-lobed, obtuse. Column 5.5–6.5 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 6–15 mm long excluding sepals, 0.4–0.7 mm wide, without raised longitudinal ribs; halves detaching distally, not recurved. Seeds globose, 0.2–0.25 mm long, brown; surface convex, smooth. Fig. 4A-D.

Selected specimens: **Northern Territory.** near Kub-O-Wer Hill, Arnhem Land reserve, Jun 1978, *Carlquist* 15408 (DNA, K); near Ranford Creek, Wandie Mine road, Mary River station, Jul 1987, *Clark* 807 (DNA); Melville Island, near Snake Bay airstrip plantation, Mar 1994, *Cowie* 4698 (DNA); Bathurst Island, Runka, Mar 1995, *Cowie* 5419 (DNA); Flinders Peninsula, east side opposite S end Probable Isle, Apr 1996, *Cowie* 6698 & *Bokarra* (DNA); 7.5 km S of Cooinda on Pine Creek road, May 1980, *Craven* 5656 (CANB, DNA); Mt Gilruth area, Jun 1978, *Dunlop* 4885 (DNA, MEL); Kakadu N.P., Apr 1990, *Dunlop* 8577 & *Munns* (CANB, DNA); Mt Brockman, Kakadu N.P., Mar 1995, *Egan* 4591 (DNA); road to Umbrawarra Gorge, Apr 1995, *Egan* 4643 (DNA); above U.D.P. Falls, May 1975, *Gittins* 2864 (BRI); Holmes Jungle, Apr 1995, *Harwood* 100 (DNA); Arnhem Land, 19 km E of Jabiru, Apr 1989, *Johnson* 4554 (BRI, DNA, NSW); above Twin Falls, Kakadu N.P., Jul 1983, *King* 324 (DNA); Rum Bottle Creek,

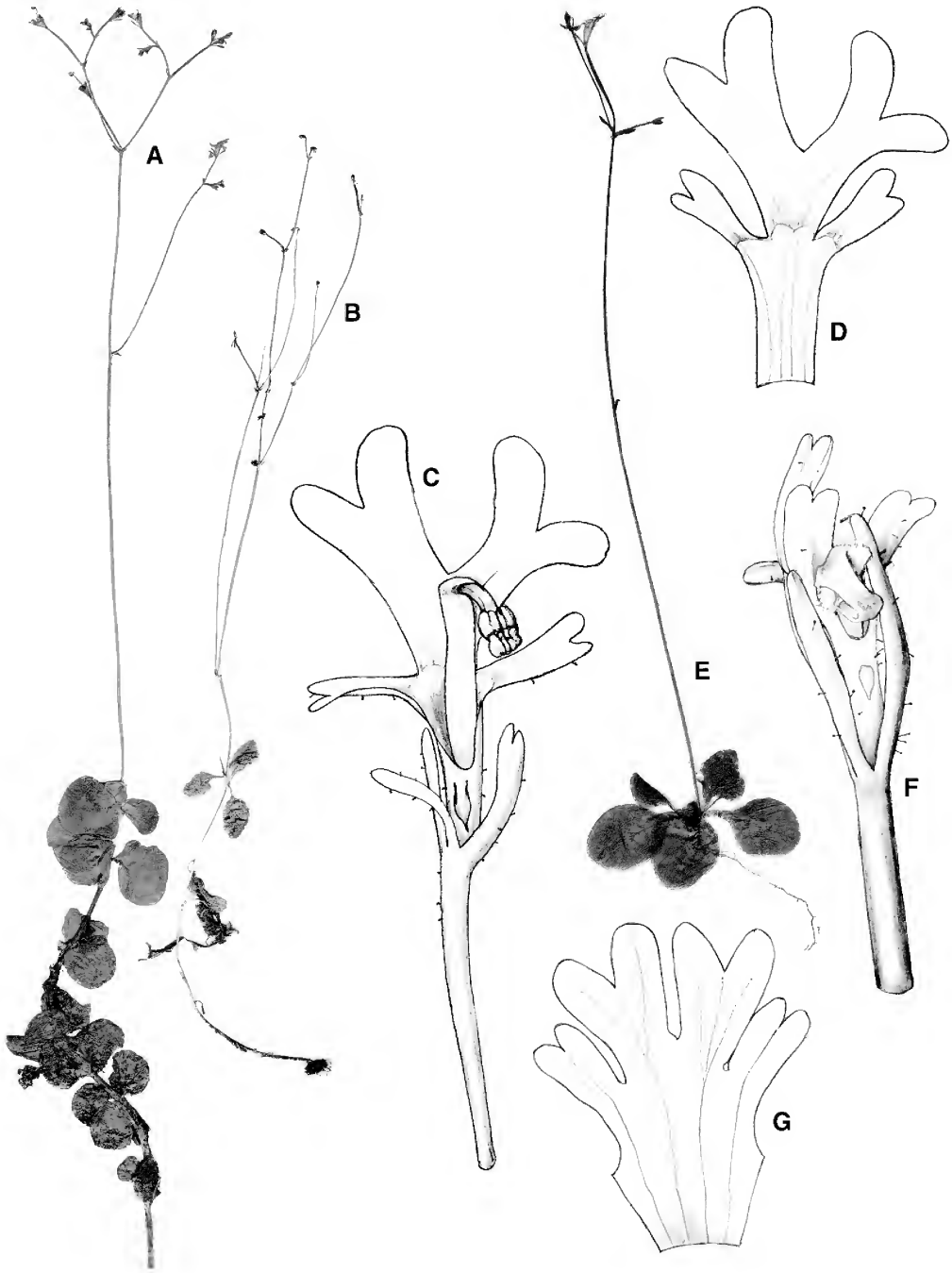

Fig. 3. A: *Stylidium ensatum*. A. habit×0.7. **B-D: *Stylidium divergens*.** B. habit×1; C. anterior view of flower×9; D. corolla, opened out×9. **E-G: *Stylidium accedens*.** E. habit×2; F. anterior view of flower×18; G. corolla, opened out×18. A: *Holtze* 514; B-D: *Johnson* 4635; E-G; *Dunlop* 3797.

Jun 1972, *Must* 1070 (BRI, CANB, DNA, K); Marrakai Station, Mar 1974, *Must* 1197 (BRI, DNA); 10 km SSW of ElSharana, Kakadu N.P., Apr 1990, *Orr* 354 (DNA); Koongarra area, 1 km S of jump-up, Apr 1979, *Rankin* 1979 (CANB, DNA, L); Upper Koolpin Creek, Kakadu N.P., Jun 1988, *Russell-Smith* 5488 & *Lucas* (DNA); Ngilipitji area, E Arnhem Land, Jul 1981, *Scarlett* 406 (DNA); 8 km E of Goyder River crossing, Jun 1972, *Symon* 7732 (DNA).

Reconstituted or spirit material examined: *Dunlop* 4885 (3 fls); *Egan* 4591 (2 fls); *Wightman* 3906 (2 fls).

Distribution and habitat: *Stylidium candelabrum* is endemic to the northernmost parts of the Northern Territory (Map 11). It often grows in shallow sand on sandstone pavements, but may occur on other substrates. It appears to be confined to the higher rainfall areas.

Phenology: Flowers and capsules have been recorded from March to July.

Affinities: *S. candelabrum* is a distinctive species readily identified by its petiolate, elliptical cauline leaves and sepals in 2 basally fused groups. It differs from *S. capillare* by its petiolate cauline leaves, sepals in 2 basally fused groups, glandular-hairy petals, sinus on both the anterior and posterior sides of the corolla, and the discontinuous paracorolla.

Conservation status: *S. candelabrum* is quite widely distributed in the north of the Northern Territory, and much of its occurrence is within National Park. It is not considered to be rare or threatened.

10. Stylidium lobuliflorum F.Muell., Fragm. 1: 153 (1859); *Candollea lobuliflora* (F.Muell.) F.Muell., Syst. census Austral. pl. 86 (1883). **Type:** [Northern Territory]. sandy flats near the Main Camp, Victoria River, [15° —'S 130° —'E], May 1856, *F. Mueller* (lecto: MEL [MEL242996]), here chosen.

Illustration: R. Erickson, Triggerplants, plate 54 (1958), as *S. lobuliferum*.

Annual, 12–20 cm high. Glandular hairs 0.1–0.2 mm long; glands globose, pale. Stem base not thickened. Stems compressed (with leaves in basal rosette). Leaves 4–15 per plant, obovate or orbicular, 6–9.5 mm long including petiole, 4–6.5 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles 1–4 mm long. Scapes 1–3 per plant, 0.4–0.7 mm in diameter, glandular-hairy; sterile bracts absent. Inflorescences 12–20 cm long, determinate, monochasially cymose; branches glandular-hairy. Bracts linear or lanceolate or ovate, 1–2 mm long, glandular-hairy, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy throughout. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 2.3–3 mm long, 0.4–0.5 mm wide, glandular-hairy, obtuse. Corolla pink or mauve, glandular-hairy on tube and petals; tube 2.1–3.3 mm long, with sinus on anterior side only. Paracorolla continuous, thin or thick, glabrous, 0.2–0.6 mm high. Paracorolla lobes or appendages 2–4, all similar, obtuse, 0–2 opposite the anterior petals, 2 opposite the posterior petals. Paracorolla glands 2. Labellum attached to outside of corolla tube or attached at base of anterior sinus of corolla tube, ovate or lanceolate, 0.4–0.6 mm long, thick, glabrous, acuminate or obtuse, terminal appendage usually present; c. 0.2 mm long. Petals all free, A1+A2+P1+P2 or with posterior ones fused, A1+A2+(P1&P2). Anterior petals 1.4–1.9 mm long, 0.7–1.1 mm wide, bilobed or entire, obtuse. Posterior petals 2.3–3.4 mm long, 1.2–2.2 mm wide, bilobed, obtuse. Column 6.5–7.5 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 10–12 mm long excluding sepals, 0.6–0.8 mm wide, without raised longitudinal ribs; halves detaching distally, not recurved. Seeds ellipsoidal, 0.15–0.2 mm long, brown; surface convex, smooth.

Specimens examined: **Western Australia.** c. 32 km WSW of Kununurra, Jul 1976, *Beauglehole* 54297 (DNA); 59 km by road N of Gibb River road, Meda-Oobagooma road, Jun 1976, *Beauglehole* 52687 (DNA). **Northern Territory.** 8 km west of Koongarra, May 1978, *Carlquist* 15392 (DNA); Wilderness Trail, Katherine Gorge N.P., 8 km from Park Headquarters, Jun 1978, *Carlquist* 15470 (BRI, DNA); Plot 426, Arnhem Land, [12° 09'S 133° 55'E], Jul 1987, *Clark* 1327 (DNA, NSW); tributary of Barramundie Ck, 33 km WSW of Twin Falls, Jun 1980, *Craven* 6419 (CANB, DNA); Kakadu N.P., Apr 1990, *Dunlop* 8560 & *Munns* (DNA); Fitzmaurice River basin, May 1994, *Dunlop* 9950 & *Latz* (DNA, NSW); Fitzmaurice River, upper catchment, May 1994, *Dunlop* 10084 & *Barritt*

(BRI, DNA, MEL); Arnhem Land, Mt Gilruth area, Jun 1978, *Henshall* 1878 (DNA, MEL); headwaters of Baroalba Creek, Kakadu Park, May 1981, *Henshall* 3604 (DNA); 12.5 km SW of Jabiru on Pine Creek road, Jun 1980, *Lazarides* 9177 (BRI, CANB, DNA, MEL); Mt Bundey Training area, Jul 1992, *Leach* 2972 (BRI, CANB, DNA); Yamburran Range, 19 km NE Mt Millikmonmir, May 1994, *Leach* 4514 & *Walsh* (DNA, MEL); Litchfield Park, road to Lost City, Jun 1998, *Michell* 1583 & *Risler* (DNA); Magela Creek, May 1978, *Rice* 2641 (DNA); Arnhem Land, 13.1 km E of Murgenella Settlement along road to Brogden Point, Aug 1987, *Ross* 3273 (MEL); Bamboo Ck, tribuatry of McKinley, 1882, *Tate* (MEL).

Reconstituted or spirit material examined: *Dunlop* 10084 & *Barritt* (2 fls); *Leach* 2972 (2 fls); *Michell* 1583 & *Risler* (2 fls).

Distribution and habitat: *Stylidium lobuliflorum* is found in the Kimberley region of Western Australia and adjacent areas of Northern Territory (Map 8). It inhabits sandstone pavement, sandy depressions, seepage areas or streamlines. It may be associated with *Pandanus* spp., *Triodia* sp., *Melaleuca viridiflora* or various *Eucalyptus* spp.

Phenology: Flowers and capsules have been recorded from April to August.

Typification: There are two collections of *S. lobuliflorum* at MEL which were made by Mueller from the vicinity of the Victoria River. One collection has several relatively intact plants (chosen here as lectotype) while in the other, only fragments remain.

Affinities: *S. lobuliflorum* is most closely related to *S. schizanthum*, but differs by densely glandular hypanthia with pale glands (glabrous or sparsely glandular with dark glands for *S. schizanthum*), absence of sterile bracts on scapes, petals glandular-hairy (glabrous for *S. schizanthum*), column of uniform width throughout (slightly dilated for *S. schizanthum*), corolla tube 2.1–3.3 mm long (1.3–2.2 mm for *S. schizanthum*) and 2–4 paracorolla lobes (4–6 for *S. schizanthum*).

Conservation status: *S. lobuliflorum* is a widespread species, and not considered to be rare or threatened.

11. Stylidium schizanthum F.Muell., Fragm. 1: 152 (1859); *Candollea schizantha* (F.Muell.) F.Muell., Syst. census Austral. pl. 86 (1883). **Type:** Victoria River [Northern Territory, 15° —'S 130° —'E], May 1856, *F. Mueller* (holo: MEL [MEL1061485]).

Illustration: R. Erickson, Triggerplants, plates 51, 54 (1958); J.R. Wheeler (ed.), Fl. of Kimb. Region 882, t. 272E (1992).

Annual, 9–30 cm high. Glandular hairs 0.05–0.2 mm long; glands globose, dark. Stem base not thickened. Stems compressed (with leaves in basal rosette). Leaves 3–13 per plant, oblanceolate or obovate or orbicular, 3.5–23 mm long including petiole, 1.5–12 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles 0.5–3(–6) mm long. Scapes 1–2(–4) per plant, 0.3–0.8 mm in diameter, glabrous or glandular-hairy; sterile bracts present. Inflorescences 9–30 cm long, determinate, monochasially cymose; branches glabrous, or glandular-hairy. Bracts deltate or lanceolate or ovate, 1–2.5 mm long, glabrous or glandular-hairy, obtuse or acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only or glandular-hairy throughout. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 1.5–2.7 mm long, 0.4–0.7 mm wide, glandular-hairy, obtuse. Corolla white or pink or mauve or yellow, glandular-hairy on tube only; tube 1.3–2.2 mm long, with sinus on anterior side only. Paracorolla continuous, thin, glabrous, 0.3–1 mm high. Paracorolla lobes or appendages 4–6, dimorphic or all similar, acute or obtuse, 2 opposite the anterior petals, 2–4 opposite the posterior petals. Paracorolla glands 2. Labellum attached to outside of corolla tube, ovate or orbicular, 0.3–0.6 mm long, thick, glabrous, acuminate; 0.1–0.2 mm long. Petals with posterior ones fused, A1+A2+(P1&P2). Anterior petals 0.7–2.7 mm long, 0.5–1.4 mm wide, bilobed, acute or obtuse. Posterior petals 2.1–4.9 mm long, 1.6–3.1 mm wide, bilobed, obtuse. Column 5–7.5 mm long, slightly dilated near distal end, glabrous; lateral lobes absent. Corona absent. Capsule linear, 8–15 mm long excluding sepals, 0.5–0.8 mm wide, without raised longitudinal ribs or with raised longitudinal ribs; halves detaching

distally, strongly recurved or not recurved. Seeds globose or ellipsoidal, 0.15–0.25 mm long, brown; surface convex, smooth or colliculate.

Selected specimens: **Irian Jaya.** c. 15 km NE of Koembe village on N bank of Koembe River, Merauke district, [8°S 140°E], Sep 1954, *van Royen* 4854 (L). **New Guinea.** Wuroi, Oriomo River, Western Division, [8°S 143°E], Jan-Mar 1934, *Brass* 5796, 5797 (BRI); Lake Daviumbu, Middle Fly River, [7°S 141°E], Sep 1936, *Brass* 7825 (L); c. 1 mile [1.6 km] S of Morehead Patrol Post, WESTERN DISTRICT, [9°S 141°E], Aug 1967, *Pullen* 7159 (L); near Weam, Western District, [8°S 141°E], Aug 1967, *Ridsdale* NGF33681 (L). **Western Australia.** Mitchell Plateau, near mining camp, Aug 1978, *Beauglehole* 59004 & *Errey* 2704 (DNA); King Edward River, c. 50 km NE of Mitchell River HS, Aug 1978, *Beauglehole* 58879 & *Errey* 2579 (DNA); Gibb River-Kalumburu Mission road, 11.3 km NNW of Drysdale River crossing, May 1976, *Beauglehole* 51707 (DNA); Gibb River road, 1.5 km W of Lennard River Gorge turnoff, Jul 1974, *Carr* 4063 & *Beauglehole* 47841 (DNA); Mount Parker plateau, Jul 1991, *Cowie* 1933 (DNA); 6 km W of Mitchell River Falls, Apr 1993, *Cowie* 4343 & *Brubaker* (CANB, DNA); Camp Ck, next to Amax campsite, Mitchell Plateau, May 1978, *Kenneally* 6638 (L); Flying Fox Creek, SW of Lake Argyle, May 1980, *Weston* 12215 (DNA). **Northern Territory.** Malabanbandju camping ground, Kakadu N.P., May 1995, *Booth* 902 (DNA); McArthur River area, c. 15 km N of Borroloola, Jun 1976, *Craven* 4228 (L); Katherine Gorge N.P., Jun 1975, *Dunlop* 3788 (DNA, NSW); Fitzmaurice River basin, May 1994, *Dunlop* 9940 & *Latz* (DNA, MEL); Winchelsea Island, May 1993, *Egan* 2461 (DNA); Vanderlin Island, Jul 1988, *Latz* 10820 (DNA); on Oenpelli road, c. 10.5 miles [16.8 km] from Mudginbarry HS, Jul 1972, *Lazarides* 7591 (BRI, DNA); Bickerton Island, South Bay, May 1993, *Leach* 3723 & *Cowie* (DNA); Deaf Adder Basin, Jun 1972, *Schodde* AE97 (BRI, CANB, DNA, K, L); Magela Creek, Mudginberri Stn, May 1982, *Wightman* 48 (CANB, DNA). **Queensland.** BURKE DISTRICT: "Esmeralda" about SSE of Croydon, Jul 1954, *Blake* 19651 (BRI); 12 miles [19 km] N of Esmeralda station, Jul 1954, *Speck* 4732 (BRI). COOK DISTRICT: One Hundred Mile swamp, near Undara resort, E of Mt Surprise, Jul 1998, *Bean* 13762 & *Fox* (BRI); Pascoe River crossing, Iron Range-Wenlock road, Jul 1948, *Brass* 19663 (BRI, L); Archer River, Wenlock-Coen road, Jul 1948, *Brass* 19736 (BRI, L); Moa Island, Aug 1985, *Budworth* 178 (BRI); 1.8 km N of the track from Agnew to Bertiehaugh, Aug 1983, *Clarkson* 5000 (BRI, K, NSW, PERTH, QRS); 33 km from Wakooka on the track to Bathurst Bay and Cape Melville N.P., Jun 1984, *Clarkson* 5379 (BRI, DNA, L, QRS); Cowal Creek crossing on the Bamaga to Mutee Head road, Sep 1985, *Clarkson* 6209 (BRI, DNA, MBA, PERTH, QRS); 9.7 km N of Morehead River, Jun 1989, *Clarkson* 8077 (BRI); Pascoe River at Wattle Hills, Aug 1991, *Clarkson* 9087 & *Neldner* (BRI, MBA, PERTH); c. 5 km ENE of the mouth of MacDonald River, c. 68 km WNW of Heathlands, Apr 1993, *Clarkson* 9875 & *Neldner* (BRI, DNA, MBA, PERTH); 6 km N of Lilyvale on the track to Running Creek, Jun 1993, *Clarkson* 10095 & *Neldner* (BRI, MBA, PERTH); 29.3 km E by road of Maloneys Springs, Jun 1989, *Forster* 5448 (BRI); 2 km N of Mt Tozer, Jul 1991, *Forster* PIF9007 (BRI); 4 miles [6 km] N of Hopevale mission, Sep 1970, *Gittins* 2183 (BRI); along Kennedy road, c. 2 km S of Moreton Telegraph station, Aug 1978, *Kanis* 2036 (BRI, CANB, L); 23 km NE of "Violet Vale" HS, Aug 1978, *Paijmans* 2912 (BRI); c. 60 miles [97 km] W of Musgrave Telegraph Office, Jun 1968, *Pedley* 2679 (BRI).

Reconstituted or spirit material examined: *Booth* 902 (2 fls); *Clarkson* 5379 (2 fls); *Clarkson* 8077 (2 fls); *Clarkson* 9087 & *Neldner* (2 fls); *Clarkson* 9875 & *Neldner* (2 fls); *Clarkson* 10095 & *Neldner* (2 fls); *Egan* 2461 (2 fls); *Forster* 5448 (2 fls); *Wightman* 48 (3 fls).

Distribution and habitat: *Stylidium schizanthum* is a very widespread species, extending from the Kimberley region of Western Australia to eastern Northern Territory, and then in north Queensland, as far south as Mt Surprise, and in southern New Guinea (Map 9). It grows in damp sand in *Eucalyptus* or *Melaleuca* dominated communities, along creekbanks, on sandstone escarpments and amongst sandstone boulders.

Phenology: Flowers and capsules have been recorded from February to October.

Affinities: It is closely related to *S. pachyrrhizum* and *S. lobuliflorum*. See notes under those species.

Notes: *S. schizanthum* as currently circumscribed, is a very variable taxon, and detailed field studies may reveal that more than one species is involved.

There is only one Mueller collection at MEL, hence this collection is treated as a holotype.

Conservation status: *S. schizanthum* is a widespread species, and not considered to be rare or threatened.

12. Stylidium pachyrrhizum F.Muell., Fragm. 1: 152 (1859); *Candollea pachyrrhiza* (F.Muell.) F.Muell., Syst. census Austral. pl. 86 (1883), *nom. illeg., non* (Steud.) Benth. (1863). **Type:** [Northern Territory]. between Macadam Range and Providence Hill, [14° —'S 129° —'E], October 1855, *F. Mueller* (holo: MEL [MEL1061539]).

Illustration: R. Erickson, Triggerplants, plate 55 (1958); J.R. Wheeler (ed.), Fl. of Kimb. Region 882, t. 272C (1992).

Perennial, 15–40 cm high. Glandular hairs 0.05–0.15 mm long; glands globose, dark. Stem base thickened. Stems elongate, glabrous. Leaves 5–30 per plant, scattered along stems, oblanceolate or obovate, 13–55(–100) mm long including petiole, 3.5–18(–24) mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles 3–13(–35) mm long. Scapes 1–6 per plant, 0.3–1 mm in diameter, glabrous; sterile bracts absent or present. Inflorescences 13–33 cm long, determinate, monochasially cymose; branches glabrous, or glandular-hairy. Bracts deltate or ovate, 1–1.5 mm long, glabrous or glandular-hairy, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glabrous throughout or glandular-hairy throughout. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 2–2.5 mm long, 0.5 mm wide, glandular-hairy, obtuse. Corolla white or pink, glandular-hairy on tube and petals; tube 1.8–2 mm long, with sinus on anterior side only. Paracorolla continuous, thin, glabrous, 0.2–0.5 mm high. Paracorolla lobes or appendages 4, all similar, obtuse, 2 opposite the anterior petals, 2 opposite the posterior petals. Paracorolla glands 2. Labellum attached to outside of corolla tube, ovate, 0.5–0.6 mm long, thick, glabrous, acute or acuminate, terminal appendage usually present; 0–0.2 mm long. Petals with posterior ones fused, A1+A2+(P1&P2). Anterior petals 1.2–1.3 mm long, 0.6–0.8 mm wide, bilobed, acute or obtuse. Posterior petals 2.5–3.5 mm long, 1.7–2.2 mm wide, bilobed, obtuse. Column 7.5–8.5 mm long, slightly dilated near distal end, glabrous; lateral lobes absent; column extension present, c. 0.5 mm long. Corona absent. Capsule linear, 9–13 mm long excluding sepals, 0.4–0.7 mm wide, with raised longitudinal ribs; halves detaching distally, strongly recurved. Seeds globose, 0.2–0.25 mm long, brown; surface convex, smooth.

Specimens examined: **Western Australia.** 30 km W of Drysdale River crossing, Jun 1976, *Beauglehole* 52227 (DNA); Prince Regent River, 1891, *Bradshaw* (MEL); Hidden Island, Buccaneer Archipelago, Jun 1982, *Kenneally* 8372 (BRI). **Northern Territory.** E of Fogg Bay, Aug 1946, *Blake* 16796 (BRI); tributary of Allia Ck, May 1994, *Cowie* 4876 & *Albrecht* (DNA, MEL); Goose Creek road, Melville Island, Jun 1987, *Clark* 1252 (DNA); sandstone plateau, [12° 40'S 133° 15'E], Mar 1973, *Craven* 2467 (BRI, DNA); Keep River N.P., Feb 1981, *Dunlop* 5780 (DNA, MEL); Moyle River headwaters, May 1994, *Dunlop* 9826 & *Latz* (DNA); headwaters of Cui-eci Creek, May 1994, *Cowie* 4913 & *Albrecht* (DNA, MEL); Fitzmaurice River basin, May 1994, *Dunlop* 9983 & *Latz* (DNA, MEL); Eva Valley station, Mar 1991, *Evans* 3672 (BRI, DNA); Waterfall Creek Falls, Kakadu N.P., Apr 1992, *Halford* Q1167 (BRI); Melville Island, Apr 1986, *Johnson* 4143 (BRI); Sculthorpe Pound, Aug 1985, *Latz* 10172 (DNA); "The Pines", Douglas River, Oct 1974, *Parker* 517 (DNA); Kakadu N.P., 10.5 km NE of Mt Evelyn, Apr 1990, *Slee & Craven* 2575 (MEL); Oenpelli, Oct 1948, *Specht* 1313 (MEL); 35 km E of Goyder River crossing, Jun 1972, *Symon* 7733 (DNA, K, L); Wallaby Beach, Gove, Jun 1972, *Symon* 7779 (DNA); Angurugu River, Groote Eylandt, Oct 1976, *Waddy* 601 (DNA); beside Allia Creek, Daly River Aboriginal Reserve, May 1994, *Walsh* 3659 (DNA).

Reconstituted or spirit material examined: *Cowie* 4876 & *Albrecht* (2 fls); *Evans* 3672 (2 fls).

Distribution and habitat: *Stylidium pachyrrhizum* is found from the western Kimberley to Groote Eylandt off the east coast of Northern Territory (Map 10). It inhabits swamp edges, or seepage areas near sandy or rocky creeks. There is one record from a vertical sandstone rockface.

Phenology: Flowers and capsules have been recorded from February to October, with most records from March to June.

Notes: *S. pachyrrhizum* is very close to *S. schizanthum*, and some specimens are difficult to place. *S. pachyrrhizum* has a thickened stem base, glandular-hairy petals, column 7.5–8.5 mm long (5–7.5 mm for *S. schizanthum*) and spathulate leaves scattered along a considerable stem (obovate to orbicular leaves

in basal rosette for *S. schizanthum*). It is also close to *S. stenophyllum*; see notes under that species.

There is only one Mueller collection at MEL, hence this collection is treated as the holotype.

Conservation status: *S. pachyrrhizum* is a widespread species, and not considered to be rare or threatened.

13. Stylidium stenophyllum A.R.Bean **sp. nov.** affinis *Stylidio pachyrrhizo* sed differens caulorhiza non incrassata, foliis linearibus 1.4–2.6 mm latis, petalis glabris, anticis longioribus, columna ubique uniformiter lata, capsulis non costatis et seminibus ellipsoidalibus. **Typus:** Northern Territory. Caranbirini Conservation Park, SW of Borroloola, 7 June 1999, *A.R. Bean* 15066 (holo: BRI; iso: CANB, DNA, MEL, NSW, PERTH).

Annual, 30–40 cm high. Glandular hairs 0.05–0.2 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 7–25 per plant, scattered along stems, linear, 36–86 mm long including petiole, 1.5–2.5 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles 15–50 mm long. Scapes 3–4 per plant, 0.4–0.7 mm in diameter, glabrous; sterile bracts absent or present. Inflorescences 28–39 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear or deltate, 1–4 mm long, glandular-hairy or glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glabrous throughout or glandular-hairy throughout. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 2.2–3.3 mm long, 0.4–0.6 mm wide, glandular-hairy, obtuse. Corolla white or pink, glandular-hairy on tube only; tube 2–2.3 mm long, with sinus on anterior side only. Paracorolla continuous, thin, glabrous, 0.1–0.4 mm high. Paracorolla lobes or appendages 2–4, all similar, obtuse, 0–2 opposite the anterior petals, 2 opposite the posterior petals. Paracorolla glands 2. Labellum attached to outside of corolla tube, ovate, 0.5–0.7 mm long, thick, glabrous, obtuse or acute, terminal appendage absent. Petals with posterior ones fused, A1+A2+(P1&P2). Anterior petals 1.2–2.0 mm long, 0.6–1.1 mm wide, bilobed, acute. Posterior petals 2.9–4.3 mm long, 2–3.4 mm wide, bilobed, obtuse. Column 7–8 mm long, of uniform width throughout, glabrous; lateral lobes absent; column extension present, c. 0.5 mm long. Corona absent. Capsule linear, 9–13 mm long excluding sepals, 0.5–0.7 mm wide, without raised longitudinal ribs; halves detaching distally, not or strongly recurved. Seeds ellipsoidal, 0.15–0.25 mm long, brown; surface convex, smooth. Fig. 4E–G.

Specimens examined: **Northern Territory.** near Caranbirini waterhole, McArthur River area, Jul 1977, *Craven* 4678 (BRI, CANB, MEL).

Reconstituted or spirit material examined: *Bean* 15066 (2 fls); *Craven* 4678 (3 fls).

Distribution and habitat: *Stylidium stenophyllum* is known only from the type locality in far north-eastern Northern Territory (Map 10). It grows in crevices on a deeply dissected "beehive" sandstone formation.

Phenology: Flowers and capsules have been recorded for June and July.

Affinities: *S. stenophyllum* is most closely related to *S. pachyrrhizum*, but differs by the non-thickened stem base, linear leaves 1.4–2.6 mm wide, glabrous petals (glandular-hairy for *S. pachyrrhizum*), unribbed capsules (ribbed for *S. pachyrrhizum*) and ellipsoidal seeds (globose for *S. pachyrrhizum*).

Notes: The type locality of *S. stenophyllum* is home to another endemic plant, *Calytrix mimiana* Craven (Craven 1980). The latter, while similarly restricted in distribution, occurs on nearly all the beehive formations at the site.

Conservation status: The habitat of *S. stenophyllum* is very specialised, being eroded sandstone monoliths often known as "beehive" formations, because of their dome-like shape. *S. stenophyllum* is known from only one outcrop at the type locality, and the total number of plant clumps is less than 100. However, each clump may comprise up to 10 individual plants. A Conservation status of "Vulnerable" is recommended, based on the IUCN Criterion D.

Etymology: From the Greek *stenos-* narrow and *phyllon-* leaf, in reference to the very narrow leaves of this species compared to its closest relatives.

B. **Stylidium** sect. **Uniflora** A.R.Bean **sect. nov**. Folia linearia usque anguste deltata; flores in scapis solitarii; glandulae minutae globosae; bracteolae praesentes vel absentes; paracorolla pro parte maxima absens; petala postica coadunata, biloba, antica integra; columna dilatata marsupium formans ubi stigma et antherae requiescunt; semina laevia. **Typus**: *S. pedunculatum* R.Br.

Flowers solitary on scapes; glands tiny, globose; bracteoles present or absent; leaves linear to narrowly deltate; paracorolla mostly absent; posterior petals fused, bilobed; anterior petals entire; column dilated forming pouch where stigma and anthers rest, glandular-hairy or glabrous; seeds smooth.

5 species; tropical Australia and the Aru Islands.

14. Stylidium trichopodum F.Muell., Fragm. 10: 86 (1876); *Candollea trichopoda* (F.Muell.) F.Muell., Syst. census Austral. pl. 86 (1883). **Type:** Queensland. Cook District: Etheridge River, [18°—' S 143°—' E], undated, *W. Armit* 622 (syn: BM).

Annual, 6–20 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 20–200 per plant, scattered along stems, linear, 3–9 mm long, 0.2–0.7 mm wide, glabrous; apex obtuse, or acute; base truncate; margins entire, or crenulate. Petioles absent. Scapes 1–10 per plant, 0.15–0.2 mm in diameter, glandular-hairy; sterile bracts absent. Inflorescences 2.6–6 cm long, 1-flowered. Bracteoles present, 0.8–1.2 mm long. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy throughout. Sepals oblanceolate or ovate or elliptical, with 3 free and 2 fused for more than half their length, 1–2 mm long, 0.5–0.6 mm wide, glandular-hairy, obtuse. Corolla yellow or orange, glandular-hairy on tube only; tube 1.4–2.3 mm long, with sinus on anterior side only. Paracorolla absent or discontinuous, thin, glabrous, 0.2–0.4 mm high. Paracorolla lobes or appendages 0–2, all similar, obtuse, 0 opposite the anterior petals, 0–2 opposite the posterior petals. Paracorolla glands absent. Labellum attached to outside of corolla tube, ovate or lanceolate, 0.4–1 mm long, thick, glabrous, acute or acuminate, terminal appendage absent. Petals with posterior ones fused, A1+A2+(P1&P2). Anterior petals 1–1.7 mm long, 0.6–1 mm wide, bilobed or entire, obtuse. Posterior petals 2.7–3.9 mm long, 1.9–2.5 mm wide, bilobed, obtuse. Column 5–6 mm long, conspicuously dilated near distal end forming a pouch for the stigma and anthers, glandular-hairy; lateral lobes absent. Corona absent. Capsule linear, 10–15 mm long excluding sepals, 0.5 mm wide, without raised longitudinal ribs; halves detaching distally, not recurved. Seeds ellipsoidal, 0.2–0.25 mm long, brown; surface lacunose, smooth. Fig 5A-C.

Specimens examined: **Queensland.** Cook District: 3.4 km S of Musgrave, on road to Laura, Jul 1998, *Bean* 13564 (BRI, DNA, MEL, NSW); California Creek road, 10 km from gorge, Jul 1987, *Champion* 286 (BRI); 4.8 km N of Kennedy River crossing, on Peninsula Development road, Jun 1981, *Clarkson* 3683 (BRI); Bulleringa NP, 80 km NW of Mt Surprise, Red River track past Donkey Spring, Apr 1998, *Forster* 22617 & *Booth* (BRI, DNA, MEL).

Reconstituted or spirit material examined: *Bean* 13564 (2 fls); *Champion* 286 (2 fls); *Clarkson* 3683 (1 fl); *Forster* 22617 (2 fls).

Distribution and habitat: *Stylidium trichopodum* is known from a just a few small populations in northern Queensland (Map 14). It grows on gentle slopes or flats in moist sandy soil, sometimes in communities dominated by *Melaleuca* spp.

Phenology: Flowers have been recorded for June and July.

Notes: *S. trichopodum* is clearly related to *S. pedunculatum*, as both have solitary flowers on filiform peduncles and a pouched column which holds the resting anthers and stigma. It is readily distinguished however by the conspicuous stem and glabrous cauline leaves, and the much larger yellow corolla. There may be other type material to be found of this species and hence no lectotype has been chosen at this stage.

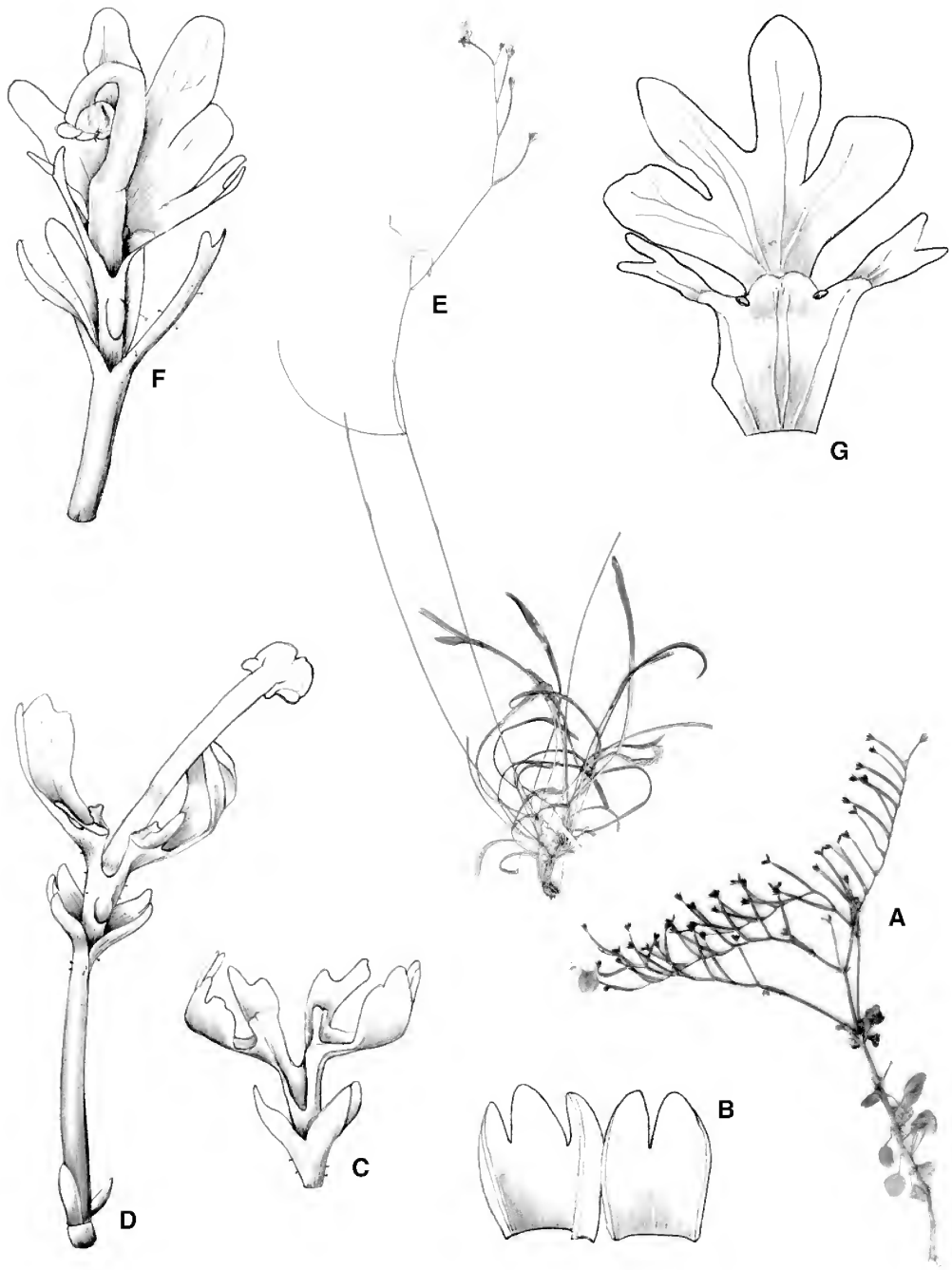

Fig. 4. A-D: ***Stylidium candelabrum***. A. habit×1; B. sepals removed from hypanthium, showing the 2 fused groups×18; C. posterior view of flower, with column removed×9; D. anterior view of flower and hypanthium×9. **E-G:** ***Stylidium stenophyllum***. E. habit, showing leaves and part of inflorescence×0.5; F. anterior view of flower×9; G. corolla, opened out×9. A-D: *Wightman* 3906; E-G: *Craven* 4678.

Conservation status: Data deficient (IUCN 1994). *S. trichopodum* appears to be quite rare. About 110 years elapsed between the type collection and the next known collection.

15. Stylidium ericksoniae J.H.Willis, Victorian Naturalist 73: 43 (1956), as '*ericksonae*'; *Stylidium pedunculatum* var. *ericksoniae* (J.H.Willis) Carlquist, Aliso 9: 322 (1979).

Stylidium androsaceum O.Schwarz, Repert. Spec. Nov. Regni Veg. 24: 105 (1927), *nom. illeg., non* Lindl. (1839) *nec* DC. (1839). **Type:** Northern Territory. Koolpinyah, 12° 2–'S 131° 1–'E, undated, *F.A.K. Bleeser* 411 (holo: B, destroyed); between RAAF emergency landing strip and creek, 40 km S of Darwin, [12° 4–'S 131° 0–'E], 18 June 1978, *S. Carlquist* 15145 (neo: DNA), here chosen.

Illustration: R. Erickson, Triggerplants, plates 51, 55 (1958), as *S. pedunculatum*.

Annual, 6–15 cm high. Glandular hairs 0.025–0.05 mm long; glands globose, dark. Stem base not thickened. Stems elongate, with simple hairs. Leaves 20–100 per plant, mostly in terminal rosette, with some scattered along stems, linear or deltate, 4.0–9.5 mm long, 0.6–1.1 mm wide, with eglandular hairs; apex acute, or mucronate; base truncate; margins entire. Petioles absent. Scapes 1–20 per plant, 0.15–0.2 mm in diameter, glabrous or glandular-hairy; sterile bracts absent. Inflorescences 5–11 cm long, 1-flowered. Bracteoles present, 0.3–1.2 mm long. Pedicels absent or rudimentary. Hypanthium linear, glabrous throughout or glandular-hairy at distal end only. Sepals oblanceolate or ovate, fused into 2 emarginate lips, 0.8–1.3 mm long, 0.3–0.5 mm wide, glandular-hairy, obtuse. Corolla pink or mauve, glandular-hairy on tube only; tube 2–2.5 mm long, with sinus on anterior side only. Paracorolla absent. Labellum attached to outside of corolla tube, ovate or lanceolate, 0.3–0.5 mm long, thick, glabrous, acute or acuminate, terminal appendage absent. Petals with posterior ones fused, A1+A2+(P1&P2). Anterior petals 1–1.7 mm long, 0.7–1.3 mm wide, bilobed or entire, obtuse. Posterior petals 2.4–3.1 mm long, 1.4–2.1 mm wide, bilobed, obtuse. Column 5.5–7 mm long, conspicuously dilated near distal end forming a pouch for the stigma and anthers, glandular-hairy; lateral lobes absent. Corona absent. Capsule linear, 7–9.5 mm long excluding sepals, 0.6–0.8 mm wide, with raised longitudinal ribs; halves detaching distally, not recurved. Seeds globose, 0.15–0.2 mm long, brown; surface lacunose, smooth.

Specimens examined: **Northern Territory:** near Grove Hill, about 13° 28'S and 131° 35'E, Jul 1946, *Blake* 16371 (BRI); between RAAF emergency landing strip and creek, 40 km S of Darwin, Jun 1978, *Carlquist* 15145 (DNA); road heading W off Stuart Highway, opposite juncture of Shoal Bay road and Stuart Highway, Jun 1977, *Carlquist* 15188 (DNA); 13 miles [21 km] SE of Darwin, May 1958, *Chippendale* 4433 (DNA, MEL); Arnhem Land, upper Magela Ck catchment, Apr 1995, *Cowie* 5601 & *Brennan* (DNA); 15 km NNE of Jabiru East, Mar 1981, *Craven* 6555 (DNA, MEL); Koongarra Jump-up, May 1978, *Dunlop* 4848 (DNA); Kakadu N.P., Apr 1990, *Dunlop* 8593 & *Munns* (DNA); Kakadu N.P., Mount Brockman, Mar 1995, *Egan* 4571 (DNA, MEL); Howard Springs, May 1995, *Egan* 4987 (DNA); 20 miles [32 km] from Darwin on Stuart Highway, Jul 1955, *Erickson* s.n. (MEL); Adelaide River, 1890, *Holtze* 1174 (MEL); Arnhem Land, 19 km E of Jabiru, Apr 1989, *Johnson* 4560 (BRI); near Koongarra Saddle, 1.5 km N of Koongarra, May 1980, *Lazarides* 8897 (DNA, MEL); 8 miles [13 km] NW of Humpty Doo, Jun 1972, *McKean* B569 (DNA); 1 mile [1.6 km] SE of McMinns Lagoon, Aug 1971, *Must* 761 (DNA); Koongarra area, 1 km S of jump-up, Apr 1979, *Rankin* 1992 (CANB, DNA, K); 1 km N of Elizabeth R., Stuart Hwy, May 1980, *Rankin* 2373 (DNA); Kakadu N.P., Upper Koolpin Creek, Jun 1988, *Russell-Smith* 5487 & *Lucas* (DNA).

Reconstituted or spirit material examined: *Blake* 16371 (2 fls); *Dunlop* 4848 (2 fls); *Egan* 4987 (3 fls).

Distribution and habitat: *Stylidium ericksoniae* is confined to northern parts of the Northern Territory (Map 13). It grows in damp sand amongst sandstone rocks (sometimes with *Micraira* spp.) or on broad flat swampy drainage channels with sandy soil frequently with *Pandanus* spp.

Phenology: Flowers and capsules have been recorded from March to August.

Affinities: *S. ericksoniae* may be distinguished from *S. pedunculatum* on dried material by its scapes 0.15–0.2 mm across (0.1–0.15 mm for *S. pedunculatum*), capsules 7–9.5 mm long (5–

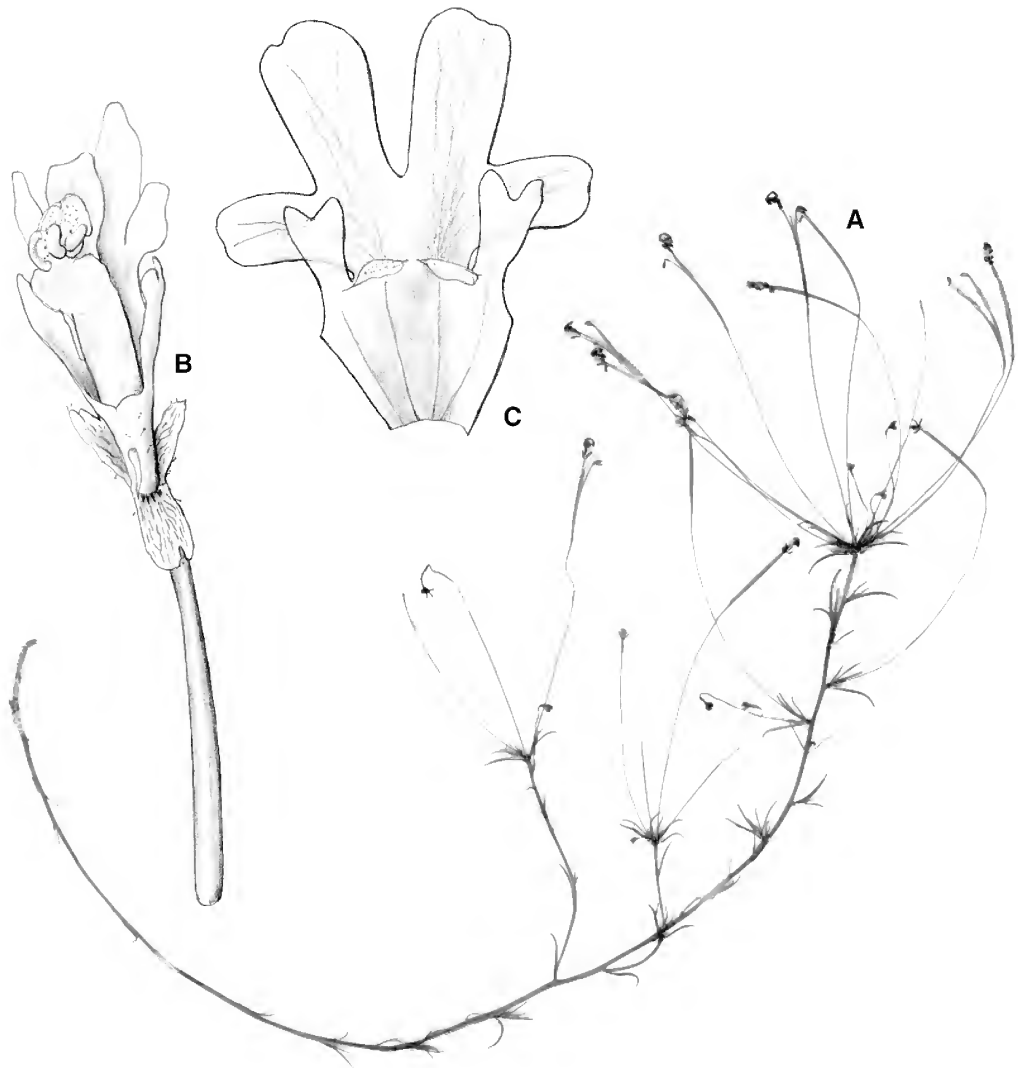

Fig. 5. A-C: *Stylidium trichopodum*. A. habit×0.9; B. anterior view of flower×9; C. corolla, opened out×9. A-B: *Clarkson* 3683; C: *Bean* 13564.

6.5 mm for *S. pedunculatum*), and the sepals fused into two emarginate lips (3 free and 2 fused for more than half their length for *S. pedunculatum*). Its floral details are markedly different from *S. pedunculatum*, with both the posterior and anterior petals being much larger and the column much longer in *S. ericksoniae*.

Notes: Two distinct forms of *S. ericksoniae* are recognisable: plants from the lowland habitats near Darwin have densely hairy leaves with acute apices, while plants from the sandstone escarpments of Kakadu N.P. have sparsely hairy leaves with mucronate apices. However the other characteristics appear to be identical, and hence no taxonomic distinction has been made. No isotypes of *S. androsaceum* O.Schwarz are known (McKee 1963), hence a neotype has been selected to fix the application of the name.

Conservation status: Data deficient (IUCN 1994).

16. Stylidium pedunculatum R.Br., Prodr. 571 (1810); *Candollea pedunculata* (R.Br.) F.Muell., Syst. census Austral. pl. 86 (1883), *nom. illeg., non* DC. (1817). **Type:** [Queensland. Cook District:] Endeavour River [15°2–'S 145°1–'E, June-July 1770], *J. Banks & D. Solander* (holo: ?BM *n.v.*; iso: L).

Stylidium bryoides F.Muell., Fragm. 6: 91 (1867). **Type:** Queensland. North Kennedy District: Rockingham Bay, [18°—'S 146°—'E], undated, *J. Dallachy, n.v.*

Stylidium curtum Carlquist, Aliso 9: 421 (1979), **syn. nov. Type:** Northern Territory. Wilderness trail, Katherine Gorge, 6.8 km from Park headquarters, [14°2–'S 132°2–'E], 24 June 1978, *S. Carlquist* 15473 (holo: RSA; iso: BRI).

Illustrations: Carlquist (1979: 422), as *S. curtum*; Britten (1901: 170C)

Annual, 5–10 cm high. Glandular hairs 0.025–0.05 mm long; glands globose, dark. Stem base not thickened. Stems elongate, with simple hairs. Leaves 20–200 per plant, mostly in terminal rosette, with some scattered along stems, linear or deltate, 4.5–8.5 mm long, 0.5–0.8 mm wide, with eglandular hairs; apex acuminate, or mucronate; base truncate; margins entire. Petioles absent. Scapes 2–14 per plant, 0.1–0.15 mm in diameter, glabrous; sterile bracts absent. Inflorescences 4–7 cm long, 1-flowered. Bracteoles present, 0.4–0.6 mm long. Pedicels absent or rudimentary. Hypanthium linear, glabrous throughout. Sepals oblanceolate or elliptical, with 3 free and 2 fused for more than half their length, 0.8–1 mm long, 0.2–0.4 mm wide, glabrous or glandular-hairy, obtuse or acute. Corolla white or pink, glabrous or glandular-hairy on tube only; tube 0.8–1 mm long, without sinus or with sinus on anterior side only. Paracorolla absent. Labellum attached to outside of corolla tube or attached at top of corolla tube, ovate or lanceolate, 0.3–0.4 mm long, thick, glabrous, acute or acuminate, terminal appendage absent. Petals with posterior ones fused, A1+A2+(P1&P2). Anterior petals 0.2–0.5 mm long, 0.2–0.4 mm wide, entire, obtuse. Posterior petals 0.5–0.7 mm long, 0.3–0.6 mm wide, bilobed, obtuse. Column 3–3.5 mm long, conspicuously dilated near distal end forming a pouch for the stigma and anthers, glandular-hairy; lateral lobes absent. Corona absent. Capsule linear, 5–6.5 mm long excluding sepals, 0.5–0.7 mm wide, with raised longitudinal ribs; halves detaching distally, strongly recurved or not recurved. Seeds globose or ellipsoidal, 0.15–0.2 mm long, brown; surface convex, smooth.

Specimens examined: **Moluccas.** between Kp. Meroor and Selarin, P. Trangan, Aru Islands, Jul 1938, *Buwalda* 5534 (L). **Northern Territory.** U.D.P. Falls, Arnhemland, Jul 1971, *van Balgooy* 1379 & *Byrnes* (L); south of mouth of Daly River, Jul 1946, *Blake* 16548A (BRI); between Lily Pond trail and Smith's Rock trail, Katherine Gorge N.P., Jun 1978, *Carlquist* 15473 (BRI); Little Nourlangie Rock, Mar 1978, *Dunlop* 4794 (DNA); 23 miles [37 km] from Darwin on Stuart Highway, Jul 1955, *Erickson* s.n. (MEL); Galiwinku, Elcho Island, Jul 1975, *Latz* 6185 (DNA); Banjo Beach, Melville Island, Jul 1967, *Stocker* 334 (BRI, DNA); 81 km NNW of turnoff junction to Maningreda, Jun 1972, *Symon* 7856 (DNA); Rum Bottle Creek, Jun 1972, *Symon* 7943 (DNA). **Queensland.** Cook District: Peninsula Development road, 3.3 km N of the Archer River, Jul 1998, *Bean* 13625 (BRI, DNA); 14.6 km N of 'Starcke', N of Cooktown, Jul 1998, *Bean* 13715 (BRI, DNA, MEL, NSW); 71.6 km by road NNW of Coen Post Office, Sep 1975, *Coveny* 7063 & *Hind* (BRI, NSW); c. 60 miles [100 km] W of Musgrave Telegraph Office, Jun

1968, *Pedley* 2678 (BRI); Cape York, 2.5 km S of lodge on Bamaga road, Jul 1985, *Thiele* 921 (CANB, MEL). NORTH KENNEDY DISTRICT: Rockingham Bay, 1869, *Dallachy* (MEL).

Reconstituted or spirit material examined: *Bean* 13625 (2 fls); *Bean* 13715 (2 fls); *Coveny* 7063 & *Hind* (2 fls).

Distribution and habitat: *Stylidium pedunculatum* is found in the scattered areas of tropical Queensland and Northern Territory, as well as in the Aru Islands west of New Guinea (Map 12). It grows in damp sand in open *Melaleuca viridiflora* communities with genera such as *Utricularia, Drosera* and *Schoenus*.

Phenology: Flowers and capsules have been recorded from March to September.

Affinities: *S. pedunculatum* is most closely related to *S. ericksoniae*. See affinities under that species.

Notes: The description and illustrations of '*S. pedunculatum*' provided by Erickson (1958) are referrable to *S. ericksoniae*. *S. pedunculatum*, as to type, was not described therein. No doubt this prompted Carlquist (1979) to describe *S. curtum* as a new species, when in fact specimens he identified as *S. curtum* match *S. pedunculatum* in every respect.

Typification: Only one gathering of *S. pedunculatum* was available to Brown when he drew up his description, that made by Banks and Solander. Hence the BM sheet, which was not sent on loan has been treated as the holotype, and the Leiden sheet is therefore an isotype.

No indisputable type of *S. bryoides* is present at MEL or K, but the detailed description allows its placement as a synonym of *S. pedunculatum*. Furthermore there are two 'topotypes' collected by Dallachy, and these are clearly *S. pedunculatum*.

The type of *S. curtum* was incorrectly cited as Carlquist 15467 in the protologue (Carlquist, pers. comm.). The type collection for *S. curtum* is Carlquist 15473; this is the collection received and annotated as type from RSA.

Conservation status: Data deficient (IUCN 1994).

17. Stylidium perizostera Lowrie & Kenneally, Nuytsia 11(2): 208 (1997). **Type:** Western Australia. near Roe River mouth, c. 4 km north-west of Mount Brookes, Mitchell Plateau, [15°10' S 125°22' E], 2 May 1996, *A. Lowrie* 1442 (holo: PERTH, *fide* Lowrie & Kenneally (1997), *n.v.*; iso: DNA, MEL, *fide* Lowrie & Kenneally (1997), *n.v.*).

Annual, 5–11 cm high. Glandular hairs 0.025–0.05 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 8–12 per plant, mostly in terminal rosette, with some scattered along stems, linear, c. 7.5 mm long, 0.4–0.7 mm wide, glabrous; apex mucronate; base cuneate, or truncate; margins entire. Petioles absent. Scapes 1–10 per plant, c. 0.7 mm in diameter, glandular-hairy; sterile bracts absent. Inflorescences c. 9 cm long, 1-flowered. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only or glandular-hairy throughout. Sepals ovate, fused into 2 entire lips, c. 1.5 mm long, c. 1.2 mm wide, glandular-hairy, obtuse. Corolla white, yellow, and orange, glandular-hairy on petals only; tube c. 3 mm long, with sinus on anterior side only. Paracorolla absent. Labellum attached at base of anterior sinus of corolla tube, lanceolate, c. 0.4 mm long, thick, glabrous, acuminate, terminal appendage usually present. Petals with posterior ones fused, A1+A2+(P1&P2). Anterior petals c. 3.5 mm long, c. 2.5 mm wide, bilobed, obtuse. Posterior petals c. 6 mm long, c. 3.5 mm wide, bilobed, obtuse. Column c. 8.5 mm long, conspicuously dilated near distal end forming a pouch for the stigma and anthers, glabrous; lateral lobes absent. Corona absent. Capsule linear, c. 27 mm long excluding sepals, c. 0.7 mm wide, without raised longitudinal ribs. Seeds c. 0.2 mm long, brown.

Distribution and habitat: *Stylidium perizostera* is endemic to the Kimberley region of Western Australia, where it is known from the Mitchell Plateau and Bigge Island (Map 12). It grows in drainage lines of sandstone outcrops (Lowrie & Kenneally 1997).

Note: Only an isotype was available for examination. The description above is based largely on Lowrie & Kenneally (1997).

18. Stylidium claytonioides W.Fitzg., J. & Proc. Roy. Soc. Western Australia 3: 219 (1918). **Type:** Western Australia. "between Isdell Range and Mt Bartlett" [Barnett?], [16° —'S 125° —'E], 1905–6, *W.V. Fitzgerald s.n.*, *n.v.*

Illustration: J.R. Wheeler (ed.), Fl. of Kimb. Region 876, t. 270B (1992).

Annual, 15–27 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 9–30 per plant, mostly in terminal rosette, with some scattered along stems, linear, 12–24 mm long, 0.7–1 mm wide, glabrous; apex acute; base truncate; margins entire. Petioles absent. Scapes 1–6 per plant, 0.3–0.6 mm in diameter, glabrous; sterile bracts absent. Inflorescences 10–18 cm long, 1-flowered. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glabrous throughout. Sepals ovate or orbicular, fused into 2 entire lips, 2.3–2.4 mm long, 1.5–2.7 mm wide, glandular-hairy, obtuse. Corolla pink and mauve, glandular-hairy on tube and petals; tube 2.6–3 mm long, with sinus on anterior side only. Paracorolla absent. Labellum attached at base of anterior sinus of corolla tube, lanceolate, 0.6–1 mm long, thick, glabrous or glandular-hairy, acute or acuminate, terminal appendage usually present; 0–0.5 mm long. Petals with posterior ones fused, A1+A2+(P1&P2). Anterior petals 2.4–3.5 mm long, 1.2–2.8 mm wide, entire, obtuse. Posterior petals 4.2–5.9 mm long, 1.7–3.5 mm wide, bilobed, obtuse. Column 7.5–9 mm long, conspicuously dilated near distal end forming a pouch for the stigma and anthers, glabrous; lateral lobes absent. Corona absent. Capsule not seen.

Specimens examined: **Western Australia.** Barnett Gorge, c. 250 km SW of Wyndham, Jun 1976, *Beaugehole* 52339 (DNA); Vansittart Bay, creek leading into Pauline Bay, May 1984, *Chesterfield* 354 (MEL); Wonjarring Falls, Carson River escarpment, Jun 1984, *Chesterfield* 425 (MEL); unnamed creek running into Pauline Bay, May 1984, *Forbes* 2164 (MEL); northern end of Airfield Swamp, Mitchell Plateau, Jun 1976, *Kenneally* 4843 (K); Kalumburu road, 40 km N from Drysdale River crossing, Jun 1984, *Willis* s.n. (MEL).

Reconstituted or spirit material examined: *Forbes* 2164 (2 fls); *Willis* s.n. (2 fls).

Distribution and habitat: *Stylidium claytonioides* is endemic to the Kimberley region of Western Australia (Map 11). It grows along creekbanks or in seasonal swamps near sandstone outcrops.

Phenology: Flowers have been recorded for May and June.

Conservation status: Data deficient (IUCN 1994).

C. **Stylidium** sect. **Tenella** (Benth.) A.R.Bean **comb.** et **stat. nov.**

S. ser. *Tenella* Benth. (as '*Tenellae*'), Fl. Austral. 4: 22 (1869). **Type**: *S. tenellum* Sw. ex Willd.

Leaves sessile, often minute, bract-like, rarely in rosettes. Scapes mostly absent. Petals all free from each other or with posterior ones fused, all petals bilobed (except *S. prophyllum*); plants glabrous except for hypanthium apex, sepals and corolla; paracorolla present; glandular hairs globose, < 0.2 mm long; labellum thick, glabrous, acuminate, attached to outside of corolla tube; column often bearing lateral lobes.

11 species; south-east Asia, Malesia, northern Australia.

19. Stylidium nominatum Carlquist, Aliso 10: 38 (1981)

Stylidium mitrasacmoides Carlquist, Aliso 9: 419 (1979), *nom. illeg.*, *non* F.Muell. (1859). **Type:** Northern Territory. c. 0.5 km NE of Camp 1, Arnhem Land, 12° 59'S 133° 09'E, 4 June 1978, *S. Carlquist* 15409 (holo: RSA; iso: DNA, K *n.v.*, PERTH *n.v.*).

Annual, 4–15 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves in basal rosette and scattered along stems. Rosette leaves 5–15, oblanceolate, 2.5–9 mm long including petiole, 0.5–1.5 mm wide, glabrous; apex obtuse; base cuneate; margins entire; petioles 1–4.5 mm long. Stem leaves 4–11, linear, 2.3–4.7 mm long, 0.3–0.5 mm wide, glabrous, apex acute, base truncate, sessile. Scapes absent. Inflorescences 2–6 cm long, determinate, monochasially cymose; branches

glabrous. Bracts linear, 2–3 mm long, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glabrous throughout or glandular-hairy at distal end only. Sepals deltate, all free or with 3 free and 2 fused for more than half their length, 1.2–2.1 mm long, 0.3–0.4 mm wide, glabrous or glandular-hairy, acute. Corolla white, glandular-hairy on tube and petals; tube 0.5–1.6 mm long, with sinus on anterior side only. Paracorolla continuous, thin, glabrous, 0.3–0.5 mm high. Paracorolla lobes or appendages 2, all similar, obtuse, none opposite the anterior petals, 2 opposite the posterior petals. Paracorolla glands absent. Labellum attached to outside of corolla tube or attached at base of anterior sinus of corolla tube, lanceolate, 0.3–0.5 mm long, thick, glabrous, acute, terminal appendage absent. Petals all free, A1+A2+P1+P2. Anterior petals 0.6–1.5 mm long, 0.6–1.5 mm wide, bilobed, obtuse. Posterior petals 1.3–3.3 mm long, 1.2–3.3 mm wide, bilobed, obtuse. Column 2.5–5 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 4.5–12 mm long excluding sepals, 0.3–0.5 mm wide, without raised longitudinal ribs; halves detaching distally, not recurved. Seeds ellipsoidal, 0.15–0.2 mm long, brown; surface convex, smooth.

Specimens examined: **Northern Territory.** Melville Island, Apr 1987, *Fensham* 481 (DNA); Arnhem Land, 19 km E of Jabiru, Apr 1989, *Johnson* 4557 (BRI); Cooper Creek area, Nabarlek, Apr 1979, *Rankin* 2213 (CANB, DNA, K); Nabarlek, Apr 1979, *Rice* 3204 (DNA); Rola Plains, Yapilika, Melville Island, Apr 1987, *Wilson* 62 (DNA).

Reconstituted or spirit material examined: *Rankin* 2213 (3 fls); *Wilson* 62 (3 fls).

Distribution and habitat: *Stylidium nominatum* is endemic to the Northern Territory where it is known from the northern parts of Kakadu National Park and also from Melville Island (Map 17). It has been recorded from a *Melaleuca viridiflora* woodland, from the base of a sandstone escarpment, and from a flat treeless area with gravelly yellow soil.

Phenology: Flowers and capsules have been recorded from April to June.

Affinities: *S. nominatum* is very close to *S. capillare*. See affinities section under that species.

Notes: There is large variation between the available specimens. For example, Rankin 2213 has short capsules, a short corolla tube and small petals. However, further collections are needed to determine whether more than one taxon is involved.

Conservation status: Data deficient (IUCN 1994).

20. Stylidium capillare R.Br., Prodr. 570 (1810); *Candollea capillaris* (R.Br.) F.Muell., Syst. census Austral. pl. 86 (1883). **Type:** [Queensland. Cook District:] Endeavour River [15°2–'S 145°1–'E, June-July 1770], *J. Banks & D. Solander* (holo: BM).

Stylidium quadrifurcatum F.L.Erickson & J.H.Willis, Victorian Naturalist 73: 5 (1956), **syn. nov**. **Type:** Northern Territory. Pine Creek, [13° 4–'S 131° 5–'E], April 1904, *J.H. Niemann* (holo: MEL).

Illustration: R. Erickson, Triggerplants, plate 54 (1958), as *S. quadrifurcatum*.

Annual, 6–13 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems compressed (with leaves in basal rosette). Leaves 4–7 per plant, obovate or orbicular, 1.5–5 mm long, 1–3 mm wide, glabrous; apex obtuse, or acute; base truncate; margins entire. Petioles absent. Scapes 1(–2) per plant, 0.3–0.8 mm in diameter, glabrous; sterile bracts present. Inflorescences 6–13 cm long, determinate, monochasially cymose; branches glabrous. Bracts lanceolate, 1–2 mm long, glabrous, obtuse or acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only. Sepals deltate, with 3 free and 2 fused for more than half their length, 1.1–1.6 mm long, 0.3–0.5 mm wide, glabrous, acute. Corolla white, glandular-hairy on tube only; tube 1.6–2 mm long, with sinus on anterior side only. Paracorolla continuous, thin, glabrous, 0.1–0.4 mm high. Paracorolla lobes or appendages 4, all similar, obtuse, 2 opposite the anterior petals, 2 opposite the posterior petals. Paracorolla

glands absent. Labellum attached to outside of corolla tube, ovate or lanceolate, 0.4–0.8 mm long, thick, glabrous, acute or acuminate, terminal appendage absent. Petals all free, A1+A2+P1+P2. Anterior petals 1.1–1.7 mm long, 1–2 mm wide, bilobed, obtuse. Posterior petals 2.8–4.2 mm long, 2.5–3.1 mm wide, bilobed, obtuse. Column 5–6 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 11–20 mm long excluding sepals, 0.4–0.8 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds ellipsoidal, 0.15–0.25 mm long, brown; surface lacunose, smooth.

Specimens examined: **Northern Territory**. 31 km W of "Wollogorang", Jun 1999, *Bean* 15141 (BRI); O.T. Station, May 1947, *Blake* 17644 (BRI); Litchfield N.P., catchment of Aida Ck, Mar 1995, *Cowie* 5200 & *Taylor* (DNA); Kakadu N.P., Mar 1982, *Dunlop* 6232 & *Taylor* (DNA); Berry Springs, May 1977, *Parker* 851 (DNA); Berry Springs, Apr 1978, *Rankin* 1216 (DNA, K); 150 km W of Borroloola, Apr 1979, *Rankin* 1880 (DNA); south to tributaries of McKinley R., Mar 1882, *Tate* s.n. (MEL). **Queensland.** Cook District: Tait and Lynd Rivers, c. 1877, *Armit* 556 (MEL); near Cooktown, May 1970, *Blake* 23355 (BRI); Douglas Creek, c. 7 miles [11 km] SE of Mareeba, Apr 1967, *Brass* 33528 (BRI); 14.3 km N of Batavia Downs on the Peninsula Development road, Apr 1990, *Clarkson* 8345 & *Neldner* (BRI, MBA, PERTH, QRS); off Peninsula road, 52.2 km along main Weipa road, Apr 1988, *Forster* PIF4101 & *Liddle* (BRI); Unigan Nature Reserve, Weipa, Mar 1990, *Forster* PIF6509 & *O'Reilly* (BRI); between Cobra & Levison Creeks, c. 4 miles [6 km] E of Mareeba, Apr 1953, *Melville* 3737 et al. (MEL); downstream from Hey Point, Franjum Point, on Embley River, S of Weipa, Mar 1981, *Morton* AM1164 (BRI, MEL); near Mareeba, Apr 1967, *Pedley* 2274 (BRI); near Ayton, Bloomfield, Mar 1978, *Scarth-Johnson* 730A (BRI); near CSIRO Tobacco Research Institute, 3 miles [5 km] E of Mareeba, May 1959, *Thorne* 20988 & *Jones* (BRI, RSA).

Reconstituted or spirit material examined: *Clarkson* 8345 & *Neldner* (3 fls); *Dunlop* 6232 & *Taylor* (2 fls); *Morton* AM1164 (2 fls); *Pedley* 2274 (1 fl).

Distribution and habitat: *Stylidium capillare* is widepread from Litchfield National Park in the Northern Territory to Cooktown and Mareeba in northern Queensland (Map 7). This ephemeral species grows in eucalypt woodland or on swamp margins with *Melaleuca* spp. The soils are generally sandy.

Phenology: Flowers and capsules have been recorded between March and June.

Affinities: *S. capillare* is closely related to *S. nominatum*, but differs by having leaves in basal rosette only (rosette and stem leaves for *S. nominatum*); bracts 1–2 mm long (2–3 mm for *S. nominatum*); corolla glandular-hairy on tube only (glandular-hairy on tube and petals for *S. nominatum*); corolla tube 1.6–2.0 mm long (0.5–1.6 mm long for *S. nominatum*); and capsules 11–20 mm long (4.5–12 mm for *S. nominatum*).

Note: It is remarkable that exactly 200 years elapsed between Banks and Solander's original collection and the next herbarium collection from the Cooktown area. This is indicative of the very thorough botanical collecting done by Banks and Solander during their enforced stay at Endeavour River.

Conservation status: *S. capillare* is not considered to be rare or threatened.

21. Stylidium prophyllum Lowrie & Kenneally, Nuytsia 11(2): 210–2 (1997). **Type:** Western Australia. On the road to Bell Gorge, 2 km west of Silent Grove camping area, [17°05'S 125°15'E], 5 June 1995, *A. Lowrie* 1180 (holo: PERTH, *fide* Lowrie & Kenneally (1997) *n.v.*; iso: DNA, MEL, *fide* Lowrie & Kenneally (1997) *n.v.*).

Annual, 8–30 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 4–10 per plant, scattered along stems, deltate, 0.7–1.5 mm long, 0.3–0.6 mm wide, glabrous; apex obtuse, or acute; base truncate; margins entire. Petioles absent. Scapes absent. Inflorescences 3–14 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear or deltate, 1–2 mm long, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 1.7–1.9 mm long, 0.4–0.5 mm wide, glabrous, acute. Corolla pink, glandular-hairy on tube and petals; tube 2–2.5 mm long, with sinus on anterior side only. Paracorolla discontinuous, thin, glabrous, 0.2–0.3 mm high.

Paracorolla lobes or appendages 4, all similar, acute or obtuse, 0 opposite the anterior petals, 4 opposite the posterior petals. Paracorolla glands absent. Labellum attached at base of anterior sinus of corolla tube, lanceolate, c. 0.5 mm long, thick, glabrous, acuminate; 0.3–0.7 mm long. Petals all free,A1+A2+P1+P2. Anterior petals 2.3–2.6 mm long, 1.3–1.6 mm wide, entire, obtuse. Posterior petals 4.1–4.5 mm long, 2–2.2 mm wide, entire, obtuse. Column 5–6 mm long, slightly dilated near distal end, glabrous; lateral lobes absent. Corona absent. Capsule linear, 11–17 mm long excluding sepals, 0.5–0.8 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds ellipsoidal, 0.25 mm long, brown; surface convex, colliculate.

Specimens examined: **Western Australia:** On the road to Bell Gorge, 2 km west of Silent Grove camping area, Jun 1995, *Lowrie* 1180 (DNA). **Northern Territory:** Fitzmaurice River, Macadam Range, Feb 1994, *Leach* 4126 (DNA).

Reconstituted or spirit material examined: *Leach* 4126 (2 fls).

Distribution and habitat: *Stylidium prophyllum* occurs in the Kimberley region of Western Australia and adjacent areas of Northern Territory (Map 16). It grows on grassy floodplains, seepage areas and waterways.

Phenology: Flowers and capsules have been recorded from February to June.

Affinities: *S. prophyllum* is closely related to *S. fissilobum*, but differs by the glabrous sepals (glandular-hairy for *S. fissilobum*); labellum attached at the base of the anterior sinus of corolla tube (attached to outside of corolla tube for *S. fissilobum*); anterior petals 2.3–2.6 mm long (1.3–2.2 mm for *S. fissilobum*); anterior and posterior petals entire (bilobed for *S. fissilobum*).

Conservation status: Data deficient (IUCN 1994).

22. Stylidium aquaticum A.R.Bean **sp. nov.** affinis *Stylidio fissilobo* sed differens foliis filiformibus 0.1–0.3 mm latis, paracorolla 0.1–0.2 mm alta columna breviore et lobis contra petala antica nullis. **Typus:** Northern Territory. Headwaters Cui-Eci Creek, [14°28'S 130°06'E], 12 May 1994, *I.D. Cowie* 4906 & *D. Albrecht* (holo: DNA).

Annual, 18–30 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 20–100 per plant, scattered along stems, linear, 1.7–11 mm long, 0.1–0.3 mm wide, glabrous; apex acute; base truncate; margins entire. Petioles absent. Scapes absent. Inflorescences 3–8 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear, 1.5–2.5 mm long, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 1.5–1.9 mm long, 0.4–0.5 mm wide, glandular-hairy, acute. Corolla white or pink, glandular-hairy on tube and petals; tube 1.5–1.8 mm long, with sinus on anterior side only. Paracorolla continuous, thin, glabrous, 0.1–0.2 mm high. Paracorolla lobes or appendages 4, all similar, obtuse, 0 opposite the anterior petals, 4 opposite the posterior petals. Paracorolla glands absent or 2. Labellum attached to outside of corolla tube, ovate or lanceolate, 0.5–0.6 mm long, thick, glabrous, acuminate; 0.2–0.3 mm long. Petals all free, A1+A2+P1+P2. Anterior petals 1.3–1.6 mm long, 0.9–1.3 mm wide, bilobed, acute or obtuse. Posterior petals 3.3–4.4 mm long, 3–4.1 mm wide, bilobed, obtuse. Column 4.5 mm long, of uniform width throughout, glabrous; lateral lobes present, c. 0.3 mm wide. Corona absent. Capsule linear, 19 mm long excluding sepals, c. 0.4 mm wide, without raised longitudinal ribs. Seeds not seen. Fig. 6A-D.

Specimens examined: see type

Reconstituted or spirit material examined: *Cowie* 4906 & *Albrecht* (3 fls)

Distribution and habitat: *Stylidium aquaticum* is known only from the type specimen collected in north-western Northern Territory (Map 16). It was recorded from a *Melaleuca viridiflora* swamp, growing in shallow water c. 7 cm deep.

Phenology: Flowers have been recorded for May

Affinities: *S. aquaticum* is closely related to *S. fissilobum*, but differs by the thread-like leaves 0.1–0.3 mm wide (0.3–0.7 mm for *S. fissilobum*); paracorolla 0.1–0.2 mm high with no lobes opposite the anterior petals (0.2–0.5 mm high, 2–4 lobes opposite the anterior petals for *S. fissilobum*); and column c. 4.5 mm long (5–7 mm long for *S. fissilobum*).

Conservation status: Data deficient (IUCN 1994).

Etymology: From the Latin *aquaticus*, in reference to the habitat of this species.

23. Stylidium fissilobum F.Muell., Fragm. 1: 154 (1859); *Candollea fissiloba* (F.Muell.) F.Muell., Syst. census Austral. pl. 86 (1883). **Type:** [Northern Territory]. Victoria River, [15° —'S 129° —'E], 1855–56, *F. Mueller* (lecto: MEL [MEL1061830]), here chosen.

Stylidium pseudotenellum O.Schwarz, Repert. Spec. Nov. Regni Veg. 24: 104 (1927). **Type:** Northern Territory. Port Darwin, 8 miles [13 km] east, [12° 2–'S 130° 5–'E], undated, *F.A.K. Bleeser* 466 (holo: B, destroyed).

Illustrations: R. Erickson, Triggerplants, plates 51, 56 (1958); J.R. Wheeler (ed.), Fl. of Kimb. Region 878, t. 271B (1992).

Annual, 5–50 cm high. Glandular hairs 0.05–0.2 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 4–34 per plant, scattered along stems, linear or deltate, 1–6 mm long, 0.3–0.7 mm wide, glabrous; apex obtuse, or acute; base truncate; margins entire. Petioles absent. Scapes absent. Inflorescences 3–18 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear or deltate or lanceolate, 1–4 mm long, glabrous, obtuse or acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only. Sepals deltate or oblanceolate, with 3 free and 2 fused for more than half their length, 1.4–2.3 mm long, 0.2–0.7 mm wide, glandular-hairy, obtuse or acute. Corolla white or pink or mauve, glandular-hairy on tube and petals, or on tube only; tube 1.6–2.3 mm long, with sinus on anterior side only. Paracorolla continuous, thin, glabrous, 0.2–0.5 mm high. Paracorolla lobes or appendages 4–8, all similar, acute or obtuse, 2–4 opposite the anterior petals, 2–4 opposite the posterior petals. Paracorolla glands absent or present, 0, 2 or 8. Labellum attached to outside of corolla tube, ovate or lanceolate, 0.4–0.7 mm long, thick, glabrous, acute or acuminate; 0.1–0.3 mm long. Petals all free, A1+A2+P1+P2 or with posterior ones fused, A1+A2+(P1&P2). Anterior petals 1.3–2.2 mm long, 0.6–1.5 mm wide, bilobed, acute or obtuse. Posterior petals 1.9–4.2 mm long, 1.4–3.4 mm wide, bilobed, obtuse. Column 5–7 mm long, of uniform width throughout, glabrous; lateral lobes absent or present, 0–0.5 mm wide. Corona absent or not extending beyond anthers. Capsule linear, 12–21 mm long excluding sepals, 0.4–1 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds globose or ellipsoidal, 0.15–0.25 mm long, brown; surface convex, smooth or colliculate.

Specimens examined: **Western Australia.** 30 km NW of Drysdale River crossing, c. 12 km W of Gibb River-Kalumburu Mission road, Jun 1976, *Beauglehole* 52220 (DNA); Mount Brophy Springs, Gardner Range, 190 km SE of Halls Ck, Jul 1995, *Coate* 370B (BRI). **Northern Territory.** 2 km E of Berry Springs turnoff, on road to Water Supply Dam, Jun 1977, *Carlquist* 15195 (DNA); Mary River, undated, *Clark* 1737 (DNA); Malabanbandjii Swamp, 10 km E of Nourlangie Ranger station on Pine Creek road, May 1980, *Craven* 5484 (CANB, DNA); 18 km SSW of Cooinda on Pine Creek road, May 1980, *Craven* 5624 (CANB, DNA, MEL); 19 km NNW of Twin Falls, Jun 1980, *Craven* 6292 (MEL); Muirella Park turnoff, May 1974, *Fox* 409 (DNA); Port Darwin, 1885, *Holtze* 482 (MEL); Port Darwin, Oct 1888, *Holtze* 882 (MEL); Nourlangie Rock area, May 1973, *Must* 1125 (BRI, DNA); Nourlangie Creek, [12° 50'S 132° 46'E], May 1974, *Must* 1211 (BRI, DNA); Berry Springs reserve, May 1977, *Parker* 852 (DNA); Berry Springs, Apr 1978, *Rankin* 1217 (DNA); end of Gulnare road, Elizabeth River, Mar 1995, *van Kerckhof* D36 (DNA). **Queensland.** Cook District : Robertson River, c. 1878, *Armit* 797 (MEL); One Hundred Mile swamp, near Undara resort, E of Mt Surprise, Jul 1998, *Bean* 13757 & *Fox* (BRI, DNA, MEL, NSW, PERTH, QRS). BurkeDistrict: 21 miles [34 km] SE of Croydon, Jul 1954, *Blake* 19581 (BRI, DNA); c. 29 km NW of old "Corinda" on the road from Doomadgee Aboriginal Station to Woologorang, May 1974, *Pullen* 9149 (BRI); 23 miles [37 km] SE of Croydon township, Jul 1954, *Speck* 4723 (BRI, CANB, DNA).

Reconstituted or spirit material examined: *Bean* 13757 (3 fls); *Blake* 19581 (2 fls); *Must* 1211 (2 fls); *Parker* 852 (3 fls).

Distribution and habitat: *Stylidium fissilobum* has a broad distribution across northern Australia, from the western Kimberley and Northern Territory to as far east as Mt Surprise in Queensland (Map 15). It grows in moist to wet sand at the edge of swamps, often in association with grassland-sedgeland. The weak-stemmed *S. fissilobum* threads its way through the often dense cover of grasses and sedges and is supported by them.

Phenology: Flowers and capsules have been recorded from March to July

Affinities: *S. fissilobum* is related to *S. oviflorum* and *S. aquaticum*. See notes under those species.

Typification: The only Mueller specimen of *S. fissilobum* at MEL is one which has come via the O.W. Sonder herbarium. Presumably there was or is other material at MEL, but it cannot now be found. Therefore the specimen cited above is chosen as lectotype, as it is a good specimen and its details agree with the protologue.

No isotypes of *S. pseudotenellum* are known (McKee 1963). From the description, it appears to be a synonym of *S. fissilobum*. Carlquist (1979: 443) was also of this opinion.

Conservation status: Data deficient (IUCN 1994).

24. Stylidium oviflorum A.R.Bean **sp. nov.** affinis *S. fissilobo* sed differens corolla alba luteaque, paracorollae lobis 4-6 contra petala postica et capsulis generaliter longioribus (18–25 mm longis). **Typus:** Queensland. Cook District: Gorge Creek, c. 10 km west of Mareeba on the Dimbulah road, [17° 01'S 145° 20'E], 15 April 1989, *J.R. Clarkson* 7880 & *R.J.F. Henderson* (holo: BRI; iso: DNA, MBA, PERTH, QRS).

Annual, 6–26 cm high. Glandular hairs 0.1–0.2 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 3–11 per plant, scattered along stems, linear or deltate, 1.4–3 mm long, 0.25–0.6 mm wide, glabrous; apex obtuse, or acute; base truncate; margins entire. Petioles absent. Scapes absent. Inflorescences 4–15 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear or deltate, 1.0–2.0 mm long, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only. Sepals deltate, with 3 free and 2 fused for more than half their length, 1.5–1.8 mm long, 0.3–0.5 mm wide, glandular-hairy, acute. Corolla white and yellow, glandular-hairy on tube only or glandular-hairy on tube and petals; tube 1.6–2 mm long, with sinus on anterior side only. Paracorolla continuous, thin, glabrous, 0.3–0.4 mm high. Paracorolla lobes or appendages 6–8, all similar, obtuse, 2 opposite the anterior petals, 4–6 opposite the posterior petals. Paracorolla glands absent. Labellum attached to outside of corolla tube, ovate, 0.5–0.6 mm long, thick, glabrous, acuminate, terminal appendage absent. Petals all free, A1+A2+P1+P2 or with posterior ones fused, A1+A2+(P1&P2). Anterior petals 1.4–1.8 mm long, 0.9–1.5 mm wide, bilobed, obtuse. Posterior petals 2.7–4 mm long, 1.6–2.7 mm wide, bilobed, obtuse. Column 5–6 mm long, of uniform width throughout, glabrous; lateral lobes present, 0.25–0.3 mm wide. Corona absent or not extending beyond anthers. Capsule linear, 18–25 mm long excluding sepals, 0.6–0.8 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds ellipsoidal, 0.2 mm long, brown; surface convex, smooth. Fig 6E-F.

Specimens examined: **Queensland.** Cook District: 18 km from Kennedy Highway, on road to 'Barwidgi', Aug 1997, *Bean* 12212 (BRI); Boyle Creek, NW of Mareeba, Apr 1962, *McKee* 9176 (BRI, NSW); Gorge Creek, 10 miles [16 km] W of Mareeba on Dimbulah road, Apr 1962, *McKee* 9228 (BRI, NSW); Cobra Creek, Mareeba District, Apr 1962, *McKee* 9386 (BRI); Herberton-Chillagoe road, c. 8 miles [13 km] from Herberton, Jun 1958, *Pedley* 252 (BRI). North Kennedy District: c. 1 km south of 'Glen Harding' turnoff, south of Mt Garnet, Jul 1997, *Bean* 12144 (BRI); c. 8 km NE of Wairuna, Aug 1997, *Bean* 12179 (BRI); Evelyn Creek Conservation Park, Jun 1999, *McDonald* KRM1 & *Thompson* (BRI).

Reconstituted or spirit material examined: *Bean* 12144 (2 fls); *Bean* 12179 (2 fls); *Bean* 12212 (2 fls); *Clarkson* 7880 & *Henderson* (1 fl).

Distribution and habitat: *Stylidium oviflorum* is restricted to north Queensland, from Mareeba to Wairuna and west to Barwidgi (Map 15). It grows on sandy soils, in seepage areas on hillsides, or beside creeks. Canopy species include *Eucalyptus camaldulensis, E. cullenii* or *Melaleuca viridiflora.*

Phenology: Flowers and capsules have been recorded from April to August.

Affinities: *S. oviflorum* is closely related to *S. fissilobum*, but differs by the corolla colour, combining white and rich yellow, the erect self-supporting stems, the 4–6 paracorolla lobes opposite the posterior petals, and the generally longer capsules 18–25 mm long.

Conservation status: Data deficient (IUCN 1994).

Etymology: From the Latin *ovi-* egg and *florus-* flower, in reference to the corolla colour which combines rich yellow and pure white, just as in a fried hen's egg.

25. Stylidium confertum A.R.Bean **sp. nov.** affinis *Stylidio fissilobo* sed differens foliis numerosis prope basin plantae dense aggregatis, paracorolla interrupta lobis 0–2 (0.1–0.3 mm altis) contra petala antica. **Typus:** Queensland. Cook District: Walsh's Pyramid, east flank of main north ridge, [17° 07'S 145° 48'E], 28 April 1998, *C. Lyons* 194 (holo: BRI; iso: DNA, JCT, K, L, MEL, MO, NSW, PERTH, QRS, distribuendi).

Annual, 6–21 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 15–100 per plant, scattered along stems, linear or deltate, 1.5–4 mm long, 0.2–0.7 mm wide, glabrous; apex obtuse, or acute, or acuminate; base truncate; margins entire. Petioles absent. Scapes absent. Inflorescences 3–13 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear or deltate, 1–2.5 mm long, glabrous, obtuse or acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only. Sepals deltate, with 3 free and 2 fused for more than half their length, 1.1–1.8 mm long, 0.3–0.5 mm wide, glandular-hairy or glabrous, acute. Corolla white, glandular-hairy on tube and petals; tube 1.3–1.9 mm long, with sinus on anterior side only. Paracorolla discontinuous, thin, glabrous, 0.1–0.3 mm high. Paracorolla lobes or appendages 2–6, all similar, obtuse, 0–2 opposite the anterior petals, 2–4 opposite the posterior petals. Paracorolla glands absent. Labellum attached to outside of corolla tube, ovate, 0.4–0.7 mm long, thick, glabrous, acuminate, terminal appendage absent. Petals all free, A1+A2+P1+P2. Anterior petals 1–1.7 mm long, 0.5–2 mm wide, bilobed, acute or obtuse. Posterior petals 2.5–3.8 mm long, 1.5–3.3 mm wide, bilobed, obtuse. Column 4.5–6 mm long, of uniform width throughout, glabrous or with glandular hairs; lateral lobes present, 0.25–0.35 mm wide. Corona absent. Capsule linear, 16–24 mm long excluding sepals, 0.4–0.7 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds ellipsoidal, 0.15–0.25 mm long, brown; surface convex, colliculate or smooth. Fig. 7A-C.

Specimens examined: **Queensland.** Cook District: lower western slopes of Walsh's Pyramid, May 1962, *Blake* 21760 (BRI); slopes of Mt Fraser, Apr 1932, *Brass* 2534 (BRI); Daintree N.P., Little Daintree River, May 1998, *Forster* 22800 et al. (BRI, DNA, QRS); Davies Creek, 0.4 km E of falls, Apr 1998, *Wannan* 725 (BRI).

Reconstituted or spirit material examined: *Blake* 21760 (1 fl); *Brass* 2534 (2 fls); *Forster* 22800 (2 fls); *Lyons* 194 (3 fls).

Distribution and habitat: *Stylidium confertum* is known only from a few localities in the "wet tropics" of north Queensland, between Tully and Cooktown (Map 13). Altitudes where found range from 100–880 metres. The habitat is open rock faces or rocky creekbanks, where the species is confined to small islands or pockets of vegetation which remain damp for a few months after the wet season, and are dominated by mosses, *Micraira subulifolia* or small herbs.

Phenology: Flowers and capsules have been recorded for April and May.

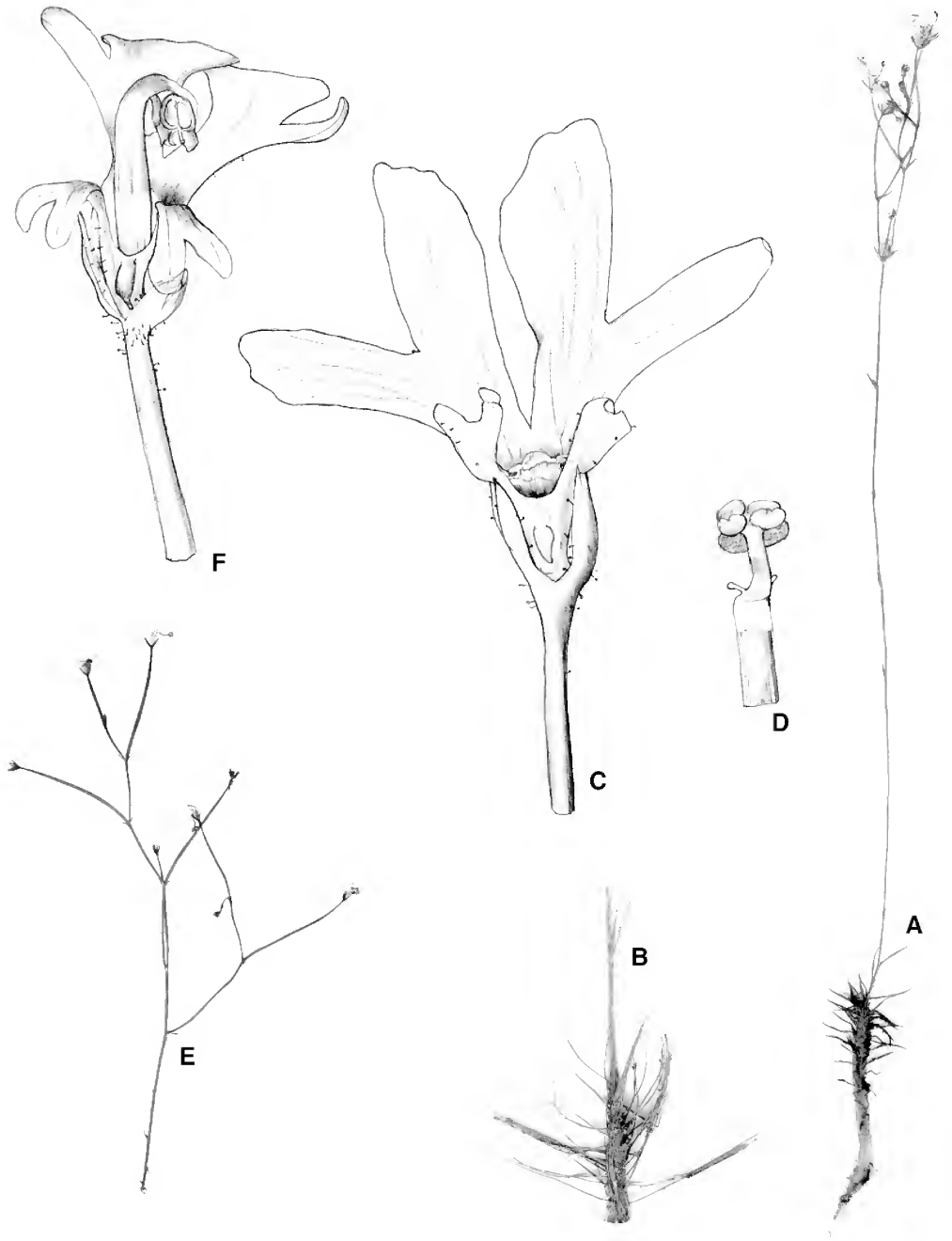

Fig. 6. A-D: ***Stylidium aquaticum***. A. habit×0.9; B. lower part of stem and leaves×2; C. anterior view of flower (column removed)×9; D. column, showing lateral lobes×9. **E-F:** ***Stylidium oviflorum***. E. habit×0.7; F. anterior view of flower×9. A-D: *Cowie* 4906 & *Albrecht*; E-F: *Bean* 12179.

Affinities: *S. confertum* is close to *S. fissilobum*, but differs by the 15–100 leaves densely clustered at base of plant (4–34 leaves scattered along stem for *S. fissilobum*); discontinuous paracorolla with 0–2 lobes opposite the anterior petals (continuous, 2–4 lobes opposite the anterior petals for *S. fissilobum*); paracorolla lobes 0.1–0.3 mm high (0.2–0.5 mm for *S. fissilobum*).

Conservation status: Data deficient (IUCN 1994).

Etymology: The specific epithet is from the Latin *confertus*, meaning crowded or close together. This refers to the clustering of leaves near the base of the stem in this species.

26. Stylidium diffusum R.Br., Prodr. 571 (1810); *Candollea diffusa* (R.Br.) F.Muell., Syst. census Austral. pl. 86 (1883). **Type:** Shoalwater Bay [Queensland. Port Curtis District: near Pine Mountain, 22° 2–' S 150° 1–' E], 3 September 1802, *R. Brown* (holo: BM).

Annual, 3–14 cm high. Glandular hairs 0.025–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 5–20 per plant, scattered along stems, linear or deltate, 2–8 mm long, 0.4–1.7 mm wide, glabrous; apex obtuse, or acute; base truncate; margins entire. Petioles absent. Scapes absent. Inflorescences 1.5–8 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear or deltate or lanceolate, 1.5–3.5 mm long, glabrous, obtuse or acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only or glabrous. Sepals oblanceolate or elliptical, with 3 free and 2 fused for more than half their length, 1.1–2 mm long, 0.25–0.6 mm wide, glabrous or glandular-hairy, obtuse or acute. Corolla white or pink or mauve, glandular-hairy on tube and petals; tube 1.3–1.6 mm long, with sinus on anterior side only. Paracorolla discontinuous or continuous, thin or thick, glabrous, 0.1–0.3 mm high. Paracorolla lobes or appendages 2–6, all similar, acute or obtuse, 2 opposite the anterior petals, 0–4 opposite the posterior petals. Paracorolla glands absent. Labellum attached to outside of corolla tube, ovate or lanceolate, 0.3–0.7 mm long, thick, glabrous, acute or acuminate; 0.1–0.2 mm long. Petals all free, A1+A2+P1+P2. Anterior petals 0.5–1 mm long, 0.5–1 mm wide, bilobed or entire, acute or obtuse. Posterior petals 1.5–2.6 mm long, 1–1.9 mm wide, bilobed, obtuse. Column 3.5–5 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 8–18 mm long excluding sepals, 0.5–1 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds ellipsoidal, 0.2–0.25 mm long, brown; surface convex, colliculate. Fig. 7D-F.

Specimens examined: **Northern Territory.** Ritjirriur Swamp, Elcho Is., Jul 1975, *Latz* 6120 (CANB, DNA, L, NSW); Hemple Bay, Groote Eylandt, May 1948, *Specht* 352 (BRI). **Queensland.** Cook District: Embley Range, 13 km SSW of the Batavia Downs HS, Jul 1985, *Clarkson* 6060 (BRI, DNA, K, L, MBA, QRS); Jardine River, May 1948, *Brass* 18885 (BRI); Coen River, Aug 1948, *Brass* 19786 (BRI); southern end of Temple Bay in upper reaches of an unnamed creek between Glennie and Hunter Inlets, Jun 1978, *Clarkson* 2204 (BRI, NSW); c. 10 km S of Musgrave Telegraph Station, Jul 1978, *Clarkson* 2344 (BRI, NSW); McLeod River, Sep 1936, *Flecker* 2261 (BRI); Namelita Creek, on Venture Mine campsite, Apr 1994, *Gunness* AG2326 (BRI). Burnett District: Teatree Paddock, 'Toondahra', fence with 'Manar', Mar 1984, *Forster* 1760 (BRI); 1 km SE of Mt Lorna, 'Toondahra', Jun 1998, *Forster* 22992 (BRI, MEL). Moreton District: Coolum, south of Noosa, Apr 1974, *Blaxell* 1298 (BRI, NSW).

Reconstituted or spirit material examined: *Blaxell* 1298 (3 fls); *Clarkson* 2204 (3 fls); *Clarkson* 6060 (2 fls); *Forster* 1760 (2 fls); *Forster* 22992 (2 fls).

Distribution and habitat: *Stylidium diffusum* has a scattered distribution along the east coast of Queensland, and is known from Elcho Island and Groote Eylandt in the Northern Territory (Map 17). It has been recorded as growing in *Melaleuca viridiflora* woodlands, a soakage area in eucalypt woodland, on swamp edges and on damp sandy creekbanks.

Phenology: Flowers and capsules have been recorded from March to September.

Affinities: *S. diffusum* is most closely related to *S. tenellum* (see notes under that species)

Conservation status: Data deficient (IUCN 1994).

27. Stylidium tenellum Sw. ex Willd., Sp. Pl. 4: 146 (1805). **Type:** "Malacca" [Malaya], 18 February 1779, *J.G. Koenig* (holo: B, microfiche BRI).

Stylidium roseum Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 46(2): 212 (1877). **Type:** [Bangladesh] Chittagong, [22°—' N 91°—' E], undated, *?W.S. Kurz* (holo: ?CAL *n.v.*)

Stylidium tenellum var. *minimum* C.B.Clarke in Hook.f., Fl. Brit. India 3: 420 (1881) (as *'minima'*). **Type:** India. Chota Nagpore, at Hazaribagh, [24°—' N 85°—' E], 9 October 1873, *C.B. Clarke* 20282 (holo: K).

Epilobium tonkinense H.Lév., Bull. Herb. Boissier sér. 2, 7: 588 (1907). **Type:** [Vietnam] Tonkin, near Quang-Yen, [20°—' N 106°—' E], 25 November 1885, *B. Balansa* 1398 (iso: E *n.v.*, P).

Illustration: R. Erickson, Triggerplants, plate 56 (1958).

Annual, 5–27 cm high. Glandular hairs 0.025–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 6–14 per plant, scattered along stems, elliptical or obovate, 3.5–8.5 mm long including petiole, 0.8–2.5 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles 0–0.4 mm long. Scapes absent. Inflorescences 2–8 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear, 2–4 mm long, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only. Sepals oblanceolate or elliptical, with 3 free and 2 fused for more than half their length, 1.3–1.9 mm long, 0.3–0.5 mm wide, glandular-hairy, obtuse or acute. Corolla white or pink or mauve, glandular-hairy on tube and petals; tube 1.6–1.8 mm long, with sinus on anterior side only. Paracorolla continuous, thin, glabrous, 0.2–0.3 mm high. Paracorolla lobes or appendages 3–6, all similar, obtuse, 0–2 opposite the anterior petals, 3–4 opposite the posterior petals. Paracorolla glands absent. Labellum attached at base of anterior sinus of corolla tube, lanceolate, 0.4–0.6 mm long, thick, glabrous, acute or acuminate, terminal appendage usually present; 0–0.1 mm long. Petals all free, A1+A2+P1+P2. Anterior petals 0.4–0.6 mm long, 0.2–0.4 mm wide, bilobed or entire, obtuse. Posterior petals 2.1–3.3 mm long, 1.2–1.3 mm wide, bilobed, obtuse. Column 4–5 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 9–21 mm long excluding sepals, 0.7–0.9 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds ellipsoidal, 0.2–0.25 mm long, brown; surface lacunose, colliculate.

Specimens examined: **India.** Serampore, East Bengal, [22°N 88°E], undated, *Griffith* 3450 (K); Serampore, undated, coll. unknown (AAU); Geirsoppa Falls, 1400 ft, Oct 1919, *Hallberg* 7142 (K); Bhatodih, Keonjhar, Orissa, [21°N 85°E], Oct 1946, *Mooney* 2763 (K). **China.** High Island, N.T., [22°N 114°E], Nov 1969, *Hu* 8619 (K); Hong Kong, [22°N 114°E], Nov 1881, *Hance* 887 (BM). **Bangladesh.** Dacca, [23°N 90°E], Oct 1868, *Clarke* 7866 (K). **Thailand.** Kanchanadit, Surat Thani, [9°N 99°E], Aug 1927, Kerr 13088 (BM); Hat Yai, Songkhla, [7°N 100°E], Dec 1927, *Kerr* 14363 (BM); Ban Bua Dut, Ko Samui, 9N 99E, May 1928, *Kerr* 15718 (BM); between Chanthaburi and Trat, [12°N 102°E], Sep 1972, *Larsen* 32405 et al. (AAU); Sahm Lahn forest, Muang District, Saraburi Province, [14°N 101°E], Oct 1973, *Maxwell* 73–440 (AAU). **Burma.** Mergui, 12N 98E, undated, *Griffith* 240 (BM); Kyaukpyu, Ramree Is., 19N 93E, Oct 1945, *Wallace* 9181 (BM). **Vietnam.** Phuong Mai, Ninh Binh province, [20°N 105°E], Jan 1883, *Bon* (P); Phu Quoc Island, [10°N 103°E], Sep 1875, *Godefroy* 876 (P). **Cambodia.** Kampot, [10°N 104°E], Oct 1903, *Geoffray* 159 (P). **Laos.** Sedone, Me-Kong R., [14°N 105°E], 1866–8, *Thorel* (P). **Malaya.** Penang Island, [5°N 100°E], Dec 1895, *Ridley* 7103 (BM); Setul, Mar 1910, *Ridley* 14694 (BM); 8.25 miles [13.2 km] Kuala Trengganu-Besut road, Trengganu, [5°N 103°E], Sep 1955, *Sinclair* 40873 (L). **Sumatra.** Taram, Kepala Bandar, E of Pajakumbuh, [0°S 100°E], Apr 1957, *Meijer* 5750 (L); Taram, Pajakumbuh region, [0°S 100°E], Jul 1957, *Meijer* 7151 (L).

Reconstituted or spirit material examined: *Larsen* 32405 et al. (2 fls); *Wallace* 9181 (1 fl).

Distribution and habitat: *Stylidium tenellum* has a broad distribution in south-east Asia from southern India to southern China and south to Sumatra (Map 3). The recent collection by Bhasker and Kushalappa (1992) from southern India provided a considerable extension of the known range. It inhabits seasonally swampy areas and has been on several occasions reported growing near rice paddies. It often grows at low altitudes, but has been found as high as 1100 metres above sea level on Sumatra

(Slooten 1954). Species or genera recorded by Bhaskar and Kushalappa (1992) to be growing in association with *S. tenellum* were *Rotala ilecebroides, Lindernia, Bergia, Canscora diffusa, Xyris, Commelina* and *Eriocaulon.*

Phenology: Flowers and capsules have been recorded mostly from September to December, with a few records from other months of the year.

Affinities: *S. tenellum* is very closely related to *S. diffusum*, but differs by the cuneate leaf bases (truncate for *S. diffusum*); labellum attached at base of anterior sinus of corolla tube (attached to outside of corolla tube for *S. diffusum*); corolla tube 1.6–1.8 mm long (1.3–1.6 mm for *S. diffusum*) and anterior petals 0.2–0.4 mm wide (0.5–1 mm wide for *S. diffusum*).

Notes: No specimens from China (except Hong Kong) have been seen by the present author, but it is described very adequately in Hong (1983) where it is reported to occur in the Guangdong, Yunnan and southern Fujian provinces.

Typification: The holotype of *S. tenellum* var. *minimum* consists of the specimens on the upper half of the sheet only. The other specimens are labelled as originating from Dacca, and are therefore excluded. From the protologue of *S. roseum*, it seems clearly referrable to *S. tenellum.*

Conservation status: Not evaluated.

28. Stylidium longissimum A.R.Bean **sp. nov.** affinis *S. inconspicuo* sed differens foliis obtusis, corolla glandulosa purpurea (rosacea usque rosinea, HCC 6.29 usque 5.33), paracorolla prominenti, sepalis petalis columnisque longioribus et capsulis multo longioribus. **Typus:** Queensland. Cook District: Smugglers track, Cape Melville National Park, north of Cooktown, [14°17' S 144°26' E], 19 July 1998, *A.R. Bean* 13671 (holo: BRI; iso: DNA, K, L, MEL, NSW).

Annual, 16–30 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 4–14 per plant, scattered along stems, elliptical, 3.5–9.5 mm long including petiole, 1.8–5 mm wide, glabrous; apex obtuse, or acute; base cuneate; margins entire. Petioles 0–0.5 mm long. Scapes absent. Inflorescences 5–20 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear or lanceolate, 1.5–4.5 mm long, glabrous, obtuse or acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only. Sepals deltate or oblanceolate, with 3 free and 2 fused for more than half their length, 2–3 mm long, 0.5–0.7 mm wide, glandular-hairy, acute. Corolla pink or mauve, glandular-hairy on tube and petals; tube 2–2.3 mm long, with sinus on anterior side only. Paracorolla continuous, thick, minutely papillose, 0.4–0.5 mm high. Paracorolla lobes or appendages 4, all similar, obtuse, 2 opposite the anterior petals, 2 opposite the posterior petals. Paracorolla glands absent. Labellum attached at base of anterior sinus of corolla tube, ovate, 0.5–0.7 mm long, thick, glabrous, acuminate; 0.7–0.8 mm long. Petals all free, A1+A2+P1+P2. Anterior petals 2.1–2.9 mm long, 1.2–1.5 mm wide, bilobed, acute or obtuse. Posterior petals 4.1–5.4 mm long, 3–3.2 mm wide, bilobed, obtuse. Column 7–8 mm long, slightly dilated near distal end, glabrous; lateral lobes absent or present, 0–0.2 mm wide. Corona absent. Capsule linear, 26–48 mm long excluding sepals, 0.7–1 mm wide, without raised longitudinal ribs; halves detaching distally, not recurved. Seeds ellipsoidal, 0.25–0.35 mm long, brown; surface convex, colliculate. Fig. 8E-H.

Specimens examined: **Queensland.** Cook District: 11 km S of beach at Bathurst Bay, Cape Melville N.P., Jul 1998, *Bean* 13688 (BRI); 33 km from Wakooka on the track to Bathurst Bay and Cape Melville National Park, June 1984, *Clarkson* 5382 (BRI, QRS).

Reconstituted or spirit material examined: *Bean* 13671 (3 fls); *Clarkson* 5382 (3 fls).

Distribution and habitat: *Stylidium longissimum* is known only from the Cape Melville area of Cape York Peninsula in north Queensland (Map 16). It grows in *Melaleuca viridiflora* woodland in sandy soil.

Phenology: Flowers and capsules have been recorded for June.

Affinities: *S. longissimum* is related to *S. inconspicuum* Slooten, based on the

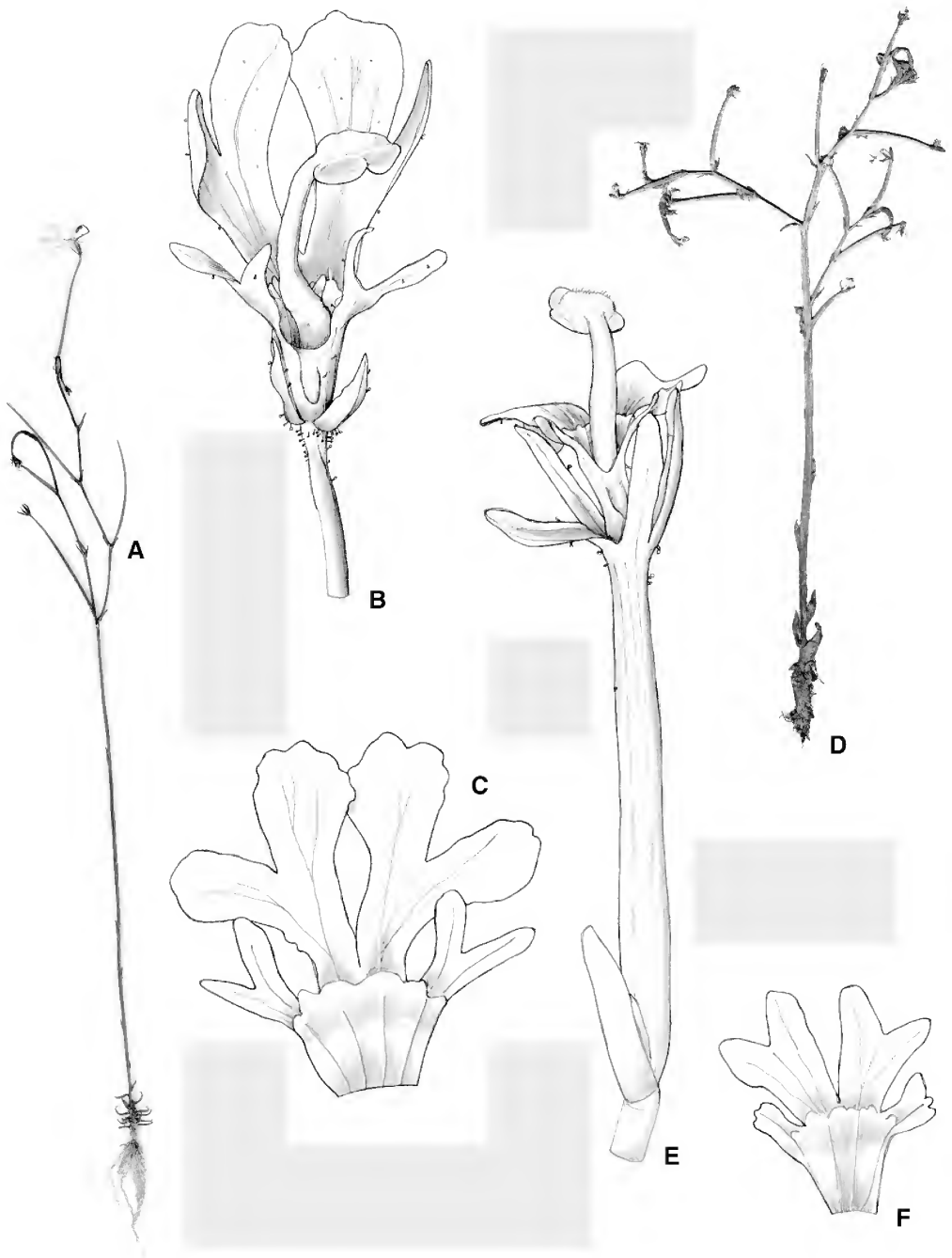

Fig. 7. A-C: *Stylidium confertum*. A. habit×1; B. anterior view of flower×9; C. corolla, opened out×9. **D-F: *Stylidium diffusum***. D. habit×1; E. anterior view of flower and hypanthium×9; F. corolla, opened out×9. A-C: *Lyons* 194; D: *Brass* 19786; E-F: *Forster* 22992.

description and illustrations provided by Slooten (1954), but differs by its obtuse leaf apices, pink to mauve corolla (rosy for *S. inconspicuum*), glandular-hairy corolla tube and petals (glabrous for *S. inconspicuum*), longer sepals, anterior petals, posterior petals, column, and much longer capsules (26–48 mm long vs. c. 15 mm long for *S. inconspicuum*). The paracorolla in *S. longissimum* is much more prominent than in *S. inconspicuum*.

Conservation status: *S. longissimum* has an extent of occurrence of about 30×30 kilometres, and the area of occupancy is only a small fraction of this. A Conservation status of "Vulnerable" is recommended, based on the IUCN Criteria A2(e) and D2.

Etymology: The species epithet is from the Latin *longissimus* meaning "very long". This refers to the capsules of this species, which are perhaps the longest of the genus.

29. Stylidium inconspicuum Slooten, Bull. Jard. Bot. Buitenzorg Ser. III, 14: 171 (1937). **Types:** Java. Plosokerep near halting-place Terisi, partition 7 and 56 of forest-section Indramajoe, [6° —'S 108° —'E], 3 March 1935, C.G.G.J. van Steenis 6719 (syn: ?BO, *n.v.*); Plosokerep near halting-place Terisi, partitions 7, 3 and 5 of forest-section Indramajoe, [6° —'S 108° —'E], 3 May 1936, *C.G.G.J. van Steenis* 8214 & *D.F. van Slooten* (syn: ?BO, *n.v.*).

Illustration: R. Erickson, Triggerplants, plate 56 (1958).

Annual, 5–20 cm high. Stem base not thickened. Stems elongate, glabrous. Leaves 5–30 per plant, scattered along stems, elliptical or obovate, 4–8 mm long, 2–5 mm wide, glabrous; apex acute; base cuneate; margins entire. Petioles absent. Scapes absent. Inflorescences 5–8 cm long, determinate, monochasially cymose; branches glabrous. Bracts lanceolate or ovate, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear. Sepals oblanceolate or ovate or elliptical, with 3 free and 2 fused for more than half their length, 1–1.5 mm long, obtuse. Corolla pink or red, glabrous; tube 1–1.5 mm long, with sinus on anterior side only. Paracorolla discontinuous or continuous. Paracorolla glands absent. Labellum attached at base of anterior sinus of corolla tube, ovate, c. 0.5 mm long, glabrous, acuminate, terminal appendage usually present. Petals all free, A1+A2+P1+P2. Anterior petals c. 1 mm long, bilobed or entire, obtuse. Posterior petals 1.75–2 mm long, bilobed, obtuse. Column 3–3.5 mm long, of uniform width throughout; lateral lobes absent. Capsule linear, 15 mm long excluding sepals. Seeds not seen.

Distribution and habitat: *Stylidium inconspicuum* is endemic to Java (Map 3), where it is apparently rare. It was recorded from "moist places of grass-fields at 20–30 metres".

Note: No material of this species was available for examination. The description is based on Slooten (1937).

Conservation status: Not evaluated.

D. **Stylidium** sect. **Biloba** A.R.Bean **sect. nov.** Folia in rosula basali vel caulina; calyx bilabiatus, integer, obtusus; inflorescentia cymosa; columna glabra, fine distali magnopere dilatata. **Typus:** *S. rotundifolium* R.Br.

Leaves in basal rosette or cauline; calyx 2-lipped, entire, obtuse; inflorescences cymose; labellum attached at base of anterior sinus; column glabrous, strongly dilated at distal end.

3 species; northern Australia.

30. Stylidium rotundifolium R.Br., Prodr. 571 (1810); *Candollea rotundifolia* (R.Br.) F.Muell., Syst. census Austral. pl. 86 (1883). **Type:** East Coast, Port 1 [Queensland. Port Curtis District: Curtis Island or Facing Island, 23° 4–' S 151° 1–' E], 5–9 August 1802, *R. Brown* (Bennett No. 2600) (lecto: BM), here chosen.

Stylidium irriguum W.Fitzg., J. & Proc. Roy. Soc. Western Australia 3: 219 (1918), **syn. nov. Types:** Western Australia. Messmate Creek, 1905–6, *W.V. Fitzgerald* (syn, *n.v.*); Isdell & Charnley Rivers, 1905–6, *W.V. Fitzgerald* (syn, *n.v.*).

Stylidium reductum Carlquist, Aliso 9: 313 (1978), **syn. nov. Type:** Queensland. North Kennedy District: Millstream Falls Park, along the Ravenshoe-Mt Garnet road, [17° 3–'S 145° 2–'E], 5 July 1977, *S. Carlquist* 15230 (holo: RSA).

Annual, 4–18 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base not thickened. Stems compressed (with leaves in basal rosette). Leaves 4–17 per plant, oblanceolate or obovate, 5–29 mm long including petiole, 3–10 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles 1–12 mm long. Scapes 1–10 per plant, 0.2–0.4 mm in diameter, glabrous; sterile bracts absent. Inflorescences 4–18 cm long, monochasially cymose; branches glabrous. Bracts deltate or lanceolate, 1–1.5 mm long, glabrous, mucronate. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only. Sepals ovate, fused into 2 entire lips, 1–1.8 mm long, 0.8–1.3 mm wide, sparsely glandular-hairy or glabrous, obtuse. Corolla white or pink, glandular-hairy on tube and petals; tube 2–3 mm long, with sinus on anterior side only. Paracorolla absent. Labellum attached at base of anterior sinus of corolla tube, lanceolate, 0.4–0.6 mm long, thick, glabrous, acuminate, terminal appendage usually present; 0–0.1 mm long. Petals all free, A1+A2+P1+P2. Anterior petals 1–2 mm long, 0.7–1.2 mm wide, entire, obtuse. Posterior petals 1.3–2 mm long, 0.8–1.3 mm wide, bilobed or entire, obtuse. Column 3.5–5 mm long, conspicuously dilated near distal end forming a pouch for the stigma and anthers, glabrous; lateral lobes absent. Corona absent. Capsule linear, 12–30 mm long excluding sepals, 0.5–0.7 mm wide, without raised longitudinal ribs; halves detaching distally, strongly recurved or not recurved. Seeds ellipsoidal, 0.2–0.25 mm long, brown; surface convex, colliculate.

Selected specimens: **Western Australia.** Gibb River-Kalumburu road, 15.3 km N of Doggan River, May 1976, *Beauglehole* 51795 (DNA); Manning Gorge, c. 275 km SW of Wyndham, Jun 1976, *Beauglehole* 52581 (DNA); Adcock Gorge, c. 180 km E of Derby, Jul 1974, *Carr* 4233 & *Beauglehole* 48011 (DNA); Mitchell River, Feb 1980, *Dunlop* 5275 (DNA). **Northern Territory.** UDP Falls, c. 80 km NE of Pine Creek, Aug 1978, *Beauglehole* 58538 & *Errey* 2238 (DNA); south of mouth of Daly River, Jul 1946, *Blake* 16548 (BRI); 9.5 km S of Twin Fall, May 1980, *Craven* 5856 (DNA); Mt Gilruth area, Jun 1978, *Dunlop* 4897 (CANB, DNA); Caledon Bay, Jun 1972, *Latz* 2927c (DNA); South Bay, Bickerton Island, Jun 1948, *Specht* 465 (BRI). **Queensland.** Burke District: Westmoreland, Lagoon Creek, off track to Camp Ridgeway, May 1997, *Forster* PIF21025 & *Booth* (BRI); Murrays Springs, 12.1 km by road west of Musselbrook mining camp, 175 km N of Camooweal, Apr 1995, *Thomas* MRS32 & *Johnson* (BRI). Cook District: 13.8 km from Irvinebank towards Herberton, Aug 1997, *Bean* 12192 (BRI); One Hundred Mile swamp, near Undara resort, E of Mt Surprise, Jul 1998, *Bean* 13758 & *Fox* (BRI, MEL); c. 1 mile [1.6 km] south of Bamaga, Jul 1977, *Carlquist* 15250 (BRI, RSA); 0.5 km SE of Kimba HS, Jun 1981, *Clarkson* 3737 (BRI, DNA, K, MO, NSW, PERTH, QRS, RSA); Weipa, Vyse Crossing, Jul 1980, *Morton* 656 (BRI, MEL). North Kennedy District: Walkers Creek, Mount Elliot, S of Townsville, Aug 1991, *Bean* 3616 (BRI); Mt Garnet-Wairuna road, 4.8 km S of Princess Hills T/O, Aug 1997, *Bean* 12168 (BRI). Leichhardt District: Mt Rose, Taroom district, Jan 1996, *Fensham* 2500 (BRI).

Reconstituted or spirit material examined: *Bean* 12100 (2 fls); *Bean* 12114 (2 fls); *Bean* 12168 (2 fls); *Bean* 12192 (2 fls); *Clarkson* 3737 (2 fls); *Fensham* 2500 (1 fl).

Distribution and habitat: *Stylidium rotundifolium* is widespread (though sporadic) from the Kimberley region of Western Australia to north-eastern Queensland, with a remarkable disjunct occurrence near Taroom (Map 18). It occurs in damp sandy soil, on receding waterholes, on creekbanks or in *Melaleuca* woodlands. The occurrence near Taroom is associated with mound-springs, locally known as "boggomosses".

Phenology: Flowers and capsules have been recorded from April to October, with one record for January and one for February.

Affinities: *S. rotundifolium* is closest to *S. dunlopianum*. See notes under that species.

Notes: Specimens of this species collected by Banks and Solander were available to Robert Brown when drawing up his description, hence the need to choose a lectotype. The lectotype locality for *S. rotundifolium* is Curtis or Facing Island near Gladstone but it has not been found there, nor indeed in the Port Curtis Pastoral District, since Brown's collection in 1802.

Fitzgerald (1918) did not explain why he considered *S. irriguum* to be specifically distinct from *S. rotundifolium*, but by comparing the description given under both names, it seems that the distinction was based on: the pale yellow to white corolla for *S. irriguum* (vs. pink with red blotches for

S. rotundifolium) and a shorter capsule. However pale yellow to white is the usual flower colour for *S. rotundifolium*, and the capsule length given for *S. irriguum* (to nearly 0.75 inches [19 mm]) is within the normal range for *S. rotundifolium*.

S. reductum represents juvenile forms of *S. rotundifolium* which are only 1–flowered. There is continuous variation between this form and typical *S. rotundifolium*.

Conservation status: *S. rotundifolium* is a widespread species, and not considered to be rare or threatened.

31. Stylidium dunlopianum Carlquist, Aliso 9: 431 (1979). **Type:** Northern Territory. Cultivated in Darwin, ex permanent spring near Munmarlary Station, [12° 2–'S 132° 3–'E], 21 July 1978, *C.R. Dunlop* 4998 (holo: RSA; iso: ?CANB, *n.v.*, DNA, ?K, *n.v.*).

Perennial, 15–50 cm high. Glandular hairs 0.05–0.1 mm long; glands globose, dark. Stem base thickened. Stems elongate or leaves in basal rosette, glabrous. Leaves 6–12 per plant, scattered along stems, obovate, 20–60 mm long including petiole, 7–19 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Petioles 8–35 mm long. Scapes 1–5 per plant, 0.5–0.9 mm in diameter, glabrous; sterile bracts absent. Inflorescences 13–40 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear or ovate, 1–2.5 mm long, glabrous, acute or mucronate. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only. Sepals ovate, fused into 2 entire lips, 1.9–2.5 mm long, 1.1–1.6 mm wide, glandular-hairy, obtuse. Corolla pink or mauve, glandular-hairy on tube and petals; tube 4.5–6 mm long, with sinus on anterior side only. Paracorolla absent. Labellum attached at base of anterior sinus of corolla tube, lanceolate, 0.7–0.9 mm long, thick, glabrous, acuminate, terminal appendage usually present; 0.4–0.5 mm long. Petals all free, A1+A2+P1+P2. Anterior petals 1.1–2.1 mm long, 1.1–2 mm wide, entire, obtuse. Posterior petals 1.3–2.1 mm long, 1–1.8 mm wide, entire, obtuse. Column 7–8.5 mm long, conspicuously dilated near distal end forming a pouch for the stigma and anthers, glabrous; lateral lobes absent. Corona absent. Capsule linear, 20–32 mm long excluding sepals, 0.5–0.6 mm wide, without raised longitudinal ribs; halves detaching distally, not recurved. Seeds ellipsoidal, 0.2–0.25 mm long, brown; surface convex, colliculate.

Specimens examined: **Western Australia.** Gibb River-Kalumburu road, Ngolalah Creek, 38.6 km NE of Mitchell River turnoff, Jun 1976, *Beauglehole* 52145 (DNA); King Edward River, c. 50 km NE of Mitchell River HS., Aug 1978, *Beauglehole* 29112 & *Errey* 2853 (DNA). **Northern Territory.** Edith Falls, Jul 1965, *Beauglehole* 43214 (DNA); 2 km W of East Alligator River crossing, Aug 1978, *Beauglehole* 58648 & *Errey* 2348 (DNA); Horn Billabong, Sep 1946, *Blake* 17009 (BRI); Docherty Ck, Sep 1967, *Byrnes* NB497 (DNA); 47 miles [75 km] N of Oenpelli, Jul 1961, *Chippendale* 8115 (DNA); Ningalaye Brook, 30 km WNW of Cannon Hill Ranger Station, May 1980, *Craven* 6172 (CANB, DNA); 65 km NE of Pine Creek, Nov 1980, *Dunlop* 5615 (DNA); Maxwell Creek, Melville Island, Nov 1983, *Dunlop* 6547 & *Wightman* (DNA); Point Stuart, Swim Creek, May 1987, *Dunlop* 7012 (DNA); S of Koolpinyah Stn., Sep 1995, *Harwood* B153 (DNA); 26 km E of Goomadeer River at Nungbalgari Creek, Oct 1981, *Henshall* 3816 (DNA); Katherine Gorge N.P., amphitheatre, Jun 1981, *King* s.n. (DNA); headwaters of Florence Creek, May 1989, *Leach* 2583 & *Dunlop* (DNA); Oenpelli, Oct 1948, *Specht* 1313 (BRI); Old Oenpelli road, just N of Lonely Rock, Magela Ck, Sep 1980, *Waterhouse* 11210/1 (BRI).

Reconstituted or spirit material examined: *Beauglehole* 29112 & *Errey* 2853 (2 fls); *Dunlop* 7012 (1 fl); *Leach* 2583 & *Dunlop* (1 fl).

Distribution and habitat: *Stylidium dunlopianum* is distributed from the Mitchell River area of Western Australia to Kakadu Natonal Park in the Northern Territory (Map 19). It inhabits seepage areas in *Melaleuca leucadendra* swamps or near rainforest, or on creekbanks, in sand or black organic soil.

Phenology: Flowers and capsules have been recorded from May to November.

Affinities: *S. dunlopianum* is closely related to *S. rotundifolium* but differs by its perennial habit with thickened stem base (annual with unthickened stem base for *S. rotundifolium*), scapes 0.5–0.9 mm wide (0.2–0.4 mm wide for *S. rotundifolium*), sepals 1.9–2.5 mm long (1.0–1.8 mm long for *S. rotundifolium*), corolla tube 4.5–6 mm long (2–3 mm long for *S. rotundifolium*), labellum 0.7–0.9 mm long (0.4–

0.6 mm long for *S. rotundifolium*) and column 7–8.5 mm long (3.5–5 mm long for *S. rotundifolium*).

Conservation status: Data deficient (IUCN 1994).

32. Stylidium fimbriatum Lowrie & Kenneally, Nuytsia 10: 425 (1996). **Type:** Western Australia. Peter Lacy's camp, 73 km WNW of Mount Elizabeth homestead, 16° 00'S 125° 20'E, August 1993, *M.D. Barrett* 230 (holo: PERTH, *fide* Lowrie & Kenneally (1996) *n.v.*; iso: MEL, *n.v.*).

Annual, 15–30 cm high. Stem base not thickened. Stems compressed (with leaves in basal rosette). Leaves c. 16 per plant, oblanceolate, 5–20 mm long including petiole, 2–7 mm wide, glabrous; apex obtuse; base cuneate; margins entire. Scapes c. 2 per plant, glabrous; sterile bracts absent. Inflorescences 15–30 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear or lanceolate, 1–2 mm long, acute or mucronate. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy at distal end only or glandular-hairy throughout. Sepals ovate or elliptical, fused into 2 entire lips, 1.5–2 mm long, glandular-hairy, obtuse. Corolla pink, glandular-hairy on tube and petals; with sinus on anterior side only. Paracorolla discontinuous, thick, glabrous, c. 1.5 mm high. Paracorolla lobes or appendages 13–17, all similar, acute, none opposite the anterior petals, 13–17 opposite the posterior petals. Paracorolla glands absent. Labellum attached at base of anterior sinus of corolla tube, lanceolate, c. 0.6 mm long, thick, glabrous, acuminate, terminal appendage usually present. Petals all free, A1+A2+P1+P2. Anterior petals c. 3.5 mm long, c. 2 mm wide, bilobed, obtuse. Posterior petals c. 5.5 mm long, c. 2.5 mm wide, bilobed, obtuse. Column c. 10 mm long, conspicuously dilated near distal end forming a pouch for the stigma and anthers, glabrous; lateral lobes absent. Corona absent. Capsule linear, 25–50 mm long excluding sepals, 0.6–0.7 mm wide, without raised longitudinal ribs. Seeds c. 0.2 mm long, yellow or brown; surface convex.

Distribution and habitat: *Stylidium fimbriatum* is reportedly confined to the Bachsten Creek area in the Kimberley region of Western Australia (Map 19), where it grows in seasonally wet herbfields (Lowrie and Kenneally 1996).

Note: No material of this species was available for examination. The description above is based on Lowrie & Kenneally (1996).

E. **Stylidium** sect. **Alsinoida** (Mildbr.) A.R.Bean **comb.** et **stat. nov.**

S. subg. *Alsinoida* Mildbr. in Engl., Pflanzenr. 35: 40 (1908), as *'Alsinoides'*. **Type:** *S. alsinoides* R.Br.

Leaves cauline, alternate. Scapes absent. Bracts opposite, often leaf-like. Petals laterally fused (i.e. adjacent posterior and anterior petals fused), often acute. Paracorolla absent. Labellum attached at top of corolla tube. Capsules coherent at apex, shedding medially; seeds ridged or lacunose, colliculate.

5 species; Malesia, New Guinea, northern Australia.

33. Stylidium alsinoides R.Br., Prodr. 572 (1810); *Candollea alsinoides* (R.Br.) F.Muell., Syst. census Austral. pl. 86 (1883). **Type:** [Queensland. Cook District:] Endeavour River, [15°2–'S 145°1–'E, June-July 1770], *J. Banks & D. Solander* (holo: ?BM, *n.v.*).

Illustration: R. Erickson, Triggerplants, plates 51, 56 (1958).

Annual, 18–30 cm high. Glandular hairs 0.05–0.1 mm long; glands globose or capitate, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 20–100 per plant, scattered along stems, elliptical or obovate, 5.5–14 mm long including petiole, 3–8 mm wide, glabrous; apex acute; base cuneate; margins entire. Petioles 0–2.5 mm long. Scapes absent. Inflorescences 5–15 cm long, determinate, monochasially cymose; branches glabrous. Bracts lanceolate or ovate, 5.5–9 mm long, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glabrous throughout or glandular-hairy at distal end only. Sepals deltate, with 3 free and 2 fused for more than half their length, 1.3–2 mm long, 0.3–0.5 mm wide, glabrous, acute. Corolla white,

glabrous, or sparsely glandular-hairy on tube and petals; tube 0.6–0.9 mm long, without sinus. Paracorolla absent. Labellum attached at top of corolla tube, ovate, 0.3–0.5 mm long, thick, glabrous, obtuse or acuminate, terminal appendage absent. Petals laterally fused, (A1&P1)+(A2&P2). Anterior petals 1.7–2.5 mm long, 0.9–1.2 mm wide, entire, acute or obtuse. Posterior petals 2–2.5 mm long, 0.8–1 mm wide, entire, acute or obtuse. Column 2.5–3 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona extending beyond anthers. Capsule linear, 16–30 mm long excluding sepals, 0.7–1.2 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds ellipsoidal, 0.4–0.5 mm long, brown; surface lacunose, colliculate.

Selected specimens: **Philippines.** Philippine Islands, 1906, *Loher* 6478 (K); Neuva Vizcaya, Luzon, [16°N 121°E], Jan 1913, *McGregor* 20136 (BM, P); Mt Irig, Rizal Province, Luzon, [14°N 121°E], Feb 1923, *Ramos* 41978 (BM, BRI, L); Mt Marayep, Zambales province, Luzon, [15°N 120°E], Dec 1924, *Ramos & Edano* 44782 (BM, P); Setio, Apulul, Barrio Amungan Iba, Zambales, [15°N 119°E], Dec 1954, *Santos* 6105 (L). **Sulawesi**. Lepo Lepo pr. Kendari, SE Celebes, [4°S 122°E], Jun 1874, *Beccari* (L); Lombasang, SW Celebes, [5°S 119°E], Apr 1921, *Bunnemeijer* 11091a (L). **Irian Jaya.** Merauke, [8°S 140°E], Jul 1923, *Vertenten* (BRI, L, P). **New Guinea.** Wuroi, Oriomo River, [8°S 143°E, Jan-Mar 1934, *Brass* 6070 (BRI, L); Wassi Kussa River, Morehead subdistrict, 8S 141E, Jul 1968, *Henty & Katik* NGF38734 (BRI, L); c. 3 miles [5 km] S of Morehead Patrol post, along road to Tonda, 9S 141E, Sep 1967, *Pullen* 7242 (L). **Queensland.** Cook District: 20.4 km from Peninsula Development road, towards Iron Range, Jul 1998, *Bean* 13606 (BRI, MEL); Yarrabah, Jun 1935, *Blake* 9642 (BRI); Isabella Falls near Cooktown, May 1970, *Blake* 23433 (BRI); Chester River campsite, Jul 1978, *Clarkson* 2418 (BRI, K, L, MO, NSW); Scrubby Creek, N of Silver Plains, Aug 1978, *Clarkson* 2444 (BRI, K, NSW); 16.4 km S of aboriginal settlement at Mapoon, on the road to Weipa, Aug 1983, *Clarkson* 4943 (BRI, PERTH, QRS); Finch Bay, Cooktown, May 1993, *Clarkson* 10084 & *Neldner* (BRI, DNA, K, MBA, PERTH); Endeavour River, Jun-Jul 1819, *Cunningham* 277 (BM, BRI); west Claudie River falls, 2.5 km NE of Mt Tozer, May 1992, *Fell* DF2613 (BRI); Fred's Creek, 2.5 km SE of Kennedy Hill, Jul 1991, *Forster* PIF8813 (BRI, DNA, MEL); Badu Island, Torres Strait, Oct 1979, *Garnett* 220 (BRI); 2 km S of Cooktown, Jul 1991, *Sharpe* 5100 & *Levine* (BRI, CANB, MEL, NSW).North Kennedy District: Dunk Island, E of airstrip, Aug 1959, *Adams* 20012 (BRI); Travelling Dairy Creek, 9 km W of Tully, Sep 1992, *Bean* 4996 (BRI); Hinchinbrook Is., S of Kirkville Hills, Aug 1970, *Everist* 9662 (BRI); 50 km NNW of Ingham and 3.5 km E of Bruce Highway, Aug 1976, *Lazarides* 8125 (BRI, CANB); 3 km W of Cardwell, Sep 1976, *Williams* 76074 (BRI).

Reconstituted or spirit material examined: *Clarkson* 2444 (2 fls); *Clarkson* 4943 (2 fls); *Clarkson* 10084 & *Neldner* (2 fls); *Fell* DF2613 (1 fl).

Distribution and habitat: *Stylidium alsinoides* is widespread, being recorded from the island of Luzon in the Philippines, southern parts of Sulawesi, southern New Guinea and north Queensland (Map 1). In Australia, it typically grows in sandy soil in swamps dominated by *Melaleuca quinquenervia*, which are moist even in the dry season. It may also grow on creekbanks with *M. leucadendra*, or in rock crevices where water seepage is available.

Phenology: Flowers and capsules have been recorded mostly from April to September for Australia; throughout the year for Malesia.

Affinities: *S. alsinoides* is most closely related to *S. fluminense*. See notes under that species.

Note: The bracts of *S. alsinoides* and its relatives are very large and resemble the leaves. In fact the transition from stem to inflorescence can sometimes only be determined by the phyllotaxis; the leaves are alternate while the bracts are opposite. The seemingly solitary axillary inflorescences are in fact cymose and monochasial as in most other species.

Conservation status: Data deficient (IUCN 1994).

34. Stylidium fluminense F.L.Erickson & J.H.Willis, Victorian Naturalist 83: 108 (1965). **Type:** Western Australia. Dales Gorge, Hamersley Range, [22° 30'S 118° 36'E], 3 July 1958, *F.L. Erickson* (holo: MEL; iso: K, MEL, PERTH).

Illustration: J.R. Wheeler (ed.), Fl. of Kimb. Region 876, t. 270D (1992).

Annual, 15–30 cm high. Glandular hairs 0.025–0.05 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 10–40 per plant, scattered along stems, elliptical, 5–19 mm long including petiole, 1.5–

6 mm wide, glabrous; apex acute; base cuneate; margins entire. Petioles 0–2 mm long. Scapes absent. Inflorescences 5–11 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear or lanceolate, 2.5–10 mm long, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glandular-hairy throughout. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 3–4.1 mm long, 0.4–0.5 mm wide, glabrous, acute. Corolla pink or mauve or red, glandular-hairy on tube and petals; tube 1.1–1.5 mm long, without sinus. Paracorolla absent. Labellum attached at top of corolla tube, ovate, 0.6–0.7 mm long, thick, glandular-hairy, obtuse or acuminate, terminal appendage usually present; 0–0.1 mm long. Petals laterally fused, (A1&P1)+(A2&P2). Anterior petals 5.2–5.5 mm long, 1.9–2.3 mm wide, entire, acute. Posterior petals 5.2–5.5 mm long, 1.9–2.3 mm wide, entire, acute. Column 5.5–6 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 11–16 mm long excluding sepals, 0.7–0.9 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds globose or ellipsoidal, 0.25–0.3 mm long, brown; surface convex, colliculate.

Specimens examined: **Western Australia.** Dales Gorge, near Fortescue Falls, Hamersley Range, Aug 1965, *Beauglehole* 11496 (DNA, MEL); Wittenoom Gorge, c. 10 km S of Wittenoom P.O., Aug 1974, *Beauglehole* 48874 (DNA); Exmouth Gulf, 1895, *Cusack* s.n. (MEL); Harding River, 1895, *Cusack* 140 (MEL); Dale's Gorge, 40 miles [64 km] E of Wittenoom Gorge, Jul 1956, *Meston* s.n. (MEL); Dale's Gorge, Hamersley Range, Oct 1989, *Nordenstam & Anderberg* 331 (MEL). **Northern Territory.** 50 km NNW of Inverway homestead, Jun 1974, *Latz* 5419 (DNA).

Reconstituted or spirit material examined: *Beauglehole* 11496 (2 fls); *Beauglehole* 48874 (1 fl).

Distribution and habitat: *Stylidium fluminense* is known from the Hamersley Ranges in Western Australia and from one site in Northern Territory, and there are historical collections from the Harding River (near Karratha) and from the Exmouth Gulf (Map 17). It grows in sheltered sites with permanent moisture in sandstone gorges.

Phenology: Flowers and capsules have been recorded from June to October

Affinities: *S. fluminense* is most closely related to *S. alsinoides*, but differs by the oblanceolate, acute sepals 3.0–4.1 mm long (deltate, obtuse, 1.3–2.0 mm long for *S. alsinoides*); corolla tube 1.1–1.5 mm long (0.7–0.8 mm long for *S. alsinoides*); anterior petals 5.2–5.5 mm long (1.7–2.5 mm for *S. alsinoides*); column 5.5–6 mm long (2.5–3 mm for *S. alsinoides*); capsule 11–16 mm long (16–30 mm for *S. alsinoides*) and seeds 0.25–0.3 mm long (0.4–0.5 mm for *S. alsinoides*).

Conservation status: Data deficient (IUCN 1994).

35. Stylidium tenerrimum F.Muell., Fragm. 1: 150 (1859); *Candollea tenerrima* (F.Muell.) F.Muell., Syst. census Austral. pl. 86 (1883). **Type:** [Northern Territory]. between Providence Hill and Macadam's Range, [14° —'S 129° —'E], October 1855, *F. Mueller* (lecto: MEL [MEL1061526]), here chosen.

Stylidium mitrasacmoides F.Muell., Fragm. 1: 150 (1859). **Type:** [Northern Territory]. banks of Victoria River, near Palm Island, [15° —'S 129° —'E, 1855–6], *Flood, n.v.* (not located).

Stylidium evolutum Carlquist, Aliso 9: 309 (1978), **syn. nov. Type:** Northern Territory. road west from Stuart Highway, opposite juncture with the Shoal Bay road, [12° 3–'S 131° 0–'E], 25 June 1977, *S. Carlquist* 15190 (holo: RSA).

Annual, 4–30 cm high. Glandular hairs 0.025–0.05 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 5–24 per plant, scattered along stems, linear or oblanceolate or deltate, 1.2–4.8 mm long, 0.3–0.8 mm wide, glabrous; apex obtuse, or acute; base truncate; margins entire. Petioles absent. Scapes absent. Inflorescences 4–11 cm long, determinate, monochasially cymose; branches glabrous. Bracts linear, 2–4.5 mm long, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary or present, 0–5 mm long, glabrous. Hypanthium linear, glabrous

throughout or glandular-hairy throughout. Sepals oblanceolate or ovate, with 3 free and 2 fused for more than half their length, 2.1–2.8 mm long, 0.3–0.5 mm wide, glabrous, acute. Corolla white and red, glandular-hairy on tube and petals or glandular-hairy on petals only; tube 0.5–0.7 mm long, without sinus. Paracorolla absent. Labellum attached at top of corolla tube, ovate, 0.3–0.5 mm long, thick, glabrous, obtuse or acuminate, terminal appendage usually present; 0–0.1 mm long. Petals laterally fused, (A1&P1)+(A2&P2). Anterior and posterior petals entire, acute or obtuse. A1 and P1 2–2.6 mm long, 1.2–1.5 mm wide; A2 and P2 3.3–4.4 mm long, 1.7–2.3 mm wide. Column 4–4.5 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule ellipsoidal or linear, 4.5–9 mm long excluding sepals, 1–1.6 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds ellipsoidal, 0.45–0.5 mm long, brown; surface lacunose, colliculate.

Specimens examined: **Northern Territory.** 2 km W of Stuart Highway on road opposite the juncture of Shoal Bay road with Stuart Highway, Jun 1978, *Carlquist* 15479 (DNA); between Elizabeth River and RAAF base, 23 miles [37 km] S of Darwin, Jun 1978, *Carlquist* 15455 (DNA); Melville Island, McClear Creek T/O, Jun 1987, *Clark* 1237 (DNA); Howard Springs, May 1995, *Egan* 4984 (DNA); Port Darwin, 1885, *Holtze* 489 (MEL); Port Darwin, 1885, *Holtze* 506 (MEL); Port Darwin, 1888, *Holtze* s.n. (MEL); near Darwin, undated, *Holtze* 1170 (MEL); RAAF Base, swamp off Amy Johnson Drive, Darwin, Apr 1983, *King* 323 (DNA); 1 mile [1.6 km] SE of McMinns Lagoon, Aug 1971, *Must* 758 (DNA); Ironstone Knob area, behind Holmes Jungle, Jun 1982, *Rankin* 2598 (CANB, DNA); Point Stuart, Swim Creek, Jun 1987, *Russell-Smith* 5568 & *Lucas* (DNA); Port Darwin, undated, *Schultz* 349 (MEL); North Australia, 1886, *Tenison-Woods & Holtze* 489 (MEL).

Reconstituted or spirit material examined: *Egan* 4984 (3 fls); *Russell-Smith* 5568 (3 fls).

Distribution and habitat: *Stylidium tenerrimum* is apparently reasonably common around Darwin, as there are numerous collections (both old and new) from that area. However, it has not been recollected from the type area near the Victoria River (Map 14). It grows in sandy soils which remain moist after the wet season, amongst grasses and sedges. Associated trees include *Pandanus* spp., *Melaleuca* spp. and *Grevillea pteridifolia.*

Phenology: Flowers and capsules have been recorded from April to August

Notes: *S. tenerrimum* is related to *S. alsinoides. S. tenerrimum* is distinctive because of the asymetrical petals (A1 andA2 of different sizes; P1 and P2 of different sizes), comparatively broad capsules, and the sometimes pedicellate flowers and capsules (pedicels up to 4 mm long). Two specimens of *S. tenerrimum* collected by Mueller have been seen, one at MEL and one at BM. It is uncertain whether these were both from the same collection. The MEL specimen is chosen as lectotype, as it is the better specimen.

The type of *S. mitrasacmoides* could not be found, and the application of the name is somewhat uncertain.

Conservation status: Data deficient (IUCN 1994).

36. Stylidium javanicum Slooten, Bull. Jard. Bot. Buitenzorg Ser. III, 14: 173 (1937). **Types:** Java. Plosokerep near halting-place Terisi, partitions 7, 3 and 5 of forest-section Indramajoe, [6° —'S 108° —'E], 3 May 1936, *C.G.G.J. van Steenis* 8213 & *D.F. van Slooten* (syn: ?BO, *n.v.*, MEL!); Soemba. East-Soemba, Lea plain, [9° —'S 120° —'E], 28 May 1936, *C.N.A. de Voogd* 2512 (syn: ?BO, *n.v.*).

Illustration: R. Erickson, Triggerplants, plate 56 (1958).

Annual, 5–21 cm high. Glandular hairs 0–0.05 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 10–30 per plant, scattered along stems, elliptical or obovate, 1.7–4.5 mm long, 0.9–2.1 mm wide, glabrous; apex obtuse, or acute; base obtuse, or cuneate; margins entire. Petioles absent. Scapes absent. Inflorescences 5–9 cm long, determinate, monochasially cymose; branches glabrous. Bracts lanceolate or ovate, 2–4 mm long, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glabrous throughout or glandular-hairy at distal end only. Sepals oblanceolate or elliptical, with 3 free and 2 fused for more than half their length, 1.6–2.5 mm long, 0.2–0.4 mm wide, glabrous, obtuse or acute. Corolla pink

or mauve, glandular-hairy on tube only; tube 0.7–0.8 mm long, without sinus. Paracorolla absent. Labellum attached at top of corolla tube, ovate or orbicular, 0.7–0.8 mm long, thin, glabrous, obtuse or acute, terminal appendage absent. Petals laterally fused, (A1&P1)+(A2&P2). Anterior petals 2.4–2.8 mm long, 1–1.4 mm wide, entire, acute. Posterior petals 2.4–2.8 mm long, 1–1.4 mm wide, entire, acute. Column 3.5–4 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 10–16 mm long excluding sepals, 0.5–0.8 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds ellipsoidal, 0.25–0.3 mm long, brown; surface lacunose, colliculate.

Specimens examined: **Java.** Plosokerep near halting-place Terisi, partitions 7, 3 and 5 of forest-section Indramajoe, May 1936, *van Steenis* 8213 & *van Slooten* (MEL). **New Guinea.** Rubulogo Creek c. 18 miles [29 km] N of Port Moresby, [9°S 147°E], Apr 1967, *Pullen* 6631 (BRI, CANB, L).

Reconstituted or spirit material examined: *Pullen* 6631 (2 fls).

Distribution and habitat: *Stylidium javanicum* has been found in Java, East Soemba Island and from eastern New Guinea (Map 2). It is recorded from open boggy depressions or wet grass-fields, from 20–500 metres altitude.

Phenology: Flowers and capsules have been recorded for April and May.

Affinities: *S. javanicum* is most closely related to *S. cordifolium*, but differs by the leaves being 1–1.7 mm wide (2.9–8 mm wide for *S. cordifolium*); leaf base cuneate (cordate for *S. cordifolium*); sepals 2.1–2.5×0.2–0.3 mm (2.6–3.5×0.4–0.7 mm for *S. cordifolium*); capsules 0.5–0.8 mm wide (1–1.5 mm for *S. cordifolium*) and seeds 0.25–0.3 mm long (0.4–0.5 mm long for *S. cordifolium*).

Conservation status: Not evaluated.

37. Stylidium cordifolium W.Fitzg., J. Proc. Roy. Soc. Western Australia 3: 217 (1918). **Types:** Isdell and King Rivers, 1905–6, *W.V. Fitzgerald* (syn, *n.v.*); Messmate Creek, 1905–6, *W.V. Fitzgerald* (syn, *n.v.*); between Isdell Range, 1905–6, *W.V. Fitzgerald* (syn, *n.v.*).

Stylidium alsinoides var. *cordifolium* Ewart, Jean White & B.Wood, Proc. Roy. Soc. Victoria ser. 2, 23: 299 (1911). **Types:** Port Darwin, 1890, *M. Holtze* 1171 (syn: MEL); Isdell River; Graces Knob; Messmate Creek in Packhorse range; between Isdell Range and Mt Bartlett (syn, *n.v.*).

Annual, 15–45 cm high. Glandular hairs 0.025–0.1 mm long; glands globose, dark. Stem base not thickened. Stems elongate, glabrous. Leaves 8–40 per plant, scattered along stems, obovate or orbicular, 3.5–8 mm long, 3.0–8 mm wide, glabrous; apex acute; base cordate; margins entire. Petioles absent. Scapes absent. Inflorescences 4–13 cm long, determinate, monochasially cymose; branches glabrous. Bracts lanceolate or ovate, 2–5 mm long, glabrous, acute. Bracteoles absent. Pedicels absent or rudimentary. Hypanthium linear, glabrous throughout or glandular-hairy at distal end only. Sepals oblanceolate, with 3 free and 2 fused for more than half their length, 2.6–3.5 mm long, 0.4–0.7 mm wide, sparsely glandular-hairy or glabrous, acute. Corolla pink or red, glandular-hairy on tube and petals, or on petals only; tube 0.7–1.3 mm long, without sinus. Paracorolla absent. Labellum attached at top of corolla tube, ovate, 0.5–0.7 mm long, thick or thin, glabrous or glandular-hairy, obtuse or acuminate, terminal appendage absent. Petals laterally fused, (A1&P1)+(A2&P2). Anterior petals 3.3–4.5 mm long, 1–1.8 mm wide, entire, acute. Posterior petals 3.4–5 mm long, 1–1.8 mm wide, entire, acute. Column 3.5–5 mm long, of uniform width throughout, glabrous; lateral lobes absent. Corona absent. Capsule linear, 7.5–18 mm long excluding sepals, 1–1.5 mm wide, without raised longitudinal ribs; halves coherent distally. Seeds ellipsoidal, 0.4–0.5 mm long, brown; surface lacunose, colliculate. Fig. 8A-D.

Specimens examined: **Western Australia.** Chapman River, 55 km by road WSW of Karungi Station HS, May 1976, *Beauglehole* 51509 (DNA); Barnett Gorge, c. 250 km SW of Wyndham, Jun 1976, *Beauglehole* 52341 (DNA); Gibb River road, 1.5 km W of Lennard River Gorge turnoff, Jul 1974, *Carr* 4108 & *Beauglehole* 47886 (DNA); Vansittart Bay, north Kimberley, May 1984, *Chesterfield* 352 & *Forbes* (DNA, MEL); c. 12 km W of Mt Hann,

Fig 8. A-D: *Stylidium cordifolium*. A. habit×0.7; B. anterior view of flower and hypanthium×5; C. developing capsule×3; D. seed×20. **E-H. *Stylidium longissimum*.** E. habit×0.5; F. anterior view of flower×5; G. developing capsule×4; H. seed×40. A-D: *Bean* 12181; E, G-H: *Bean* 13671; F: *Clarkson* 5382.

Gardner Plateau, May 1993, *Cowie* 4313 & *Stewart* (DNA); unnamed creek running into Pauline Bay, north Kimberley, May 1984, *Forbes* 2169 (MEL). **Northern Territory.** Berrimah Lagoon, S of Darwin, May 1978, *Carlquist* 15384 (BRI, DNA); Site 55, Mary River, May 1989, *Clark* 1753 (DNA); Melville Island, Soldier Point road camp, Jun 1987, *Clark* 1209 & *Orr* (DNA); Berrimah, Darwin, Apr 1976, *Dunlop* 4140 (DNA, NSW); Kakadu N.P., Mar 1982, *Dunlop* 6234 (DNA); c. 8 km NNE of Jabiru, Apr 1995, *Egan* 4846 & *Knox* (DNA); Howard Springs, May 1995, *Egan* 4985 (DNA); Port Darwin, 1890, *Holtze* 1171 (MEL); Nabarlek, Apr 1979, *Rankin* 2035 (BRI, DNA, K); Adelaide River, Arnhem Hwy, Apr 1980, *Rankin* 2248 (DNA). **Queensland.** COOK DISTRICT: 4.8 km N of Kennedy River crossing on Peninsula Development road, Jun 1981, *Clarkson* 3685 (BRI, K, MO, NSW, PERTH, QRS, RSA); Bulleringa NP, 80 km NW of Mt Surprise, track to Red River past Donkey Spring, Apr 1998, *Forster* PIF22595 & *Booth* (BRI); Granite Creek road, below Walsh Bluff, Apr 1981, *Gray* 1948 (BRI, QRS); Dixie station, Cook shire, Jun 1979, *Weaver* 33 (BRI).NORTH KENNEDY DISTRICT: 4 km west of Nymbool, via Mt Garnet, Aug 1997, *Bean* 12181 (BRI).

Reconstituted or spirit material examined: *Bean* 12181 (2 fls); *Clarkson* 3685 (2 fls); *Egan* 4985 (3 fls); *Gray* 1948 (1 fl).

Distribution and habitat: *Stylidium cordifolium* is distributed across tropical Australia (Map 20). It often grows in or on the margins of *Melaleuca viridiflora* swamps, in moist sand. It can sometimes occur on moist sandy creekbanks with *Pandanus* spp., grasses and sedges.

Phenology: Flowers and capsules have been recorded from March to August

Affinities: *S. cordifolium* is closest to *S. javanicum*. See notes under that species.

Conservation status: Data deficient (IUCN 1994).

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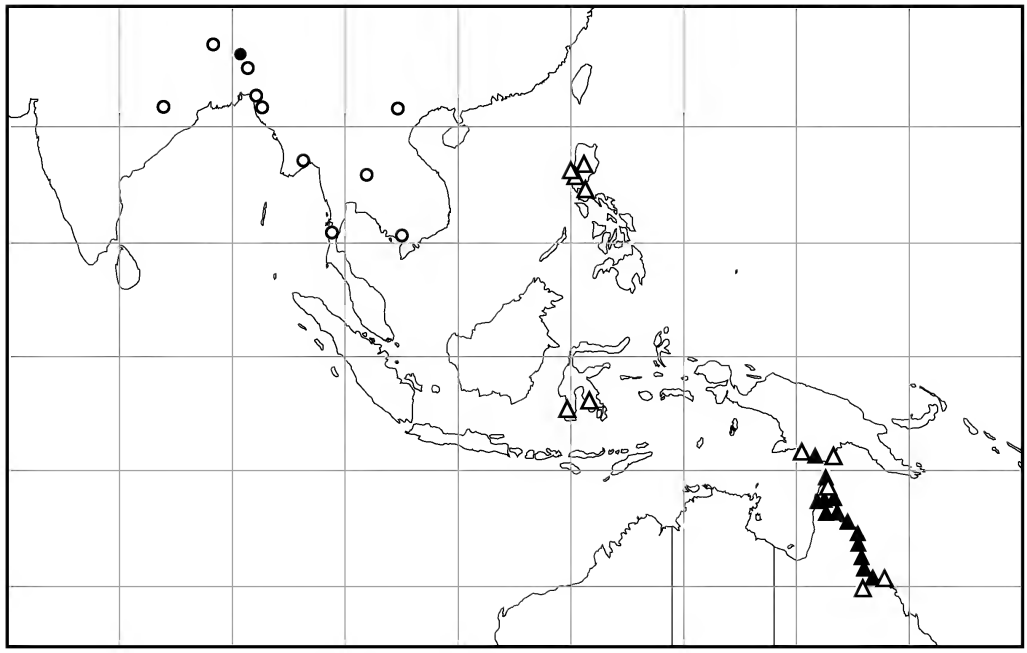
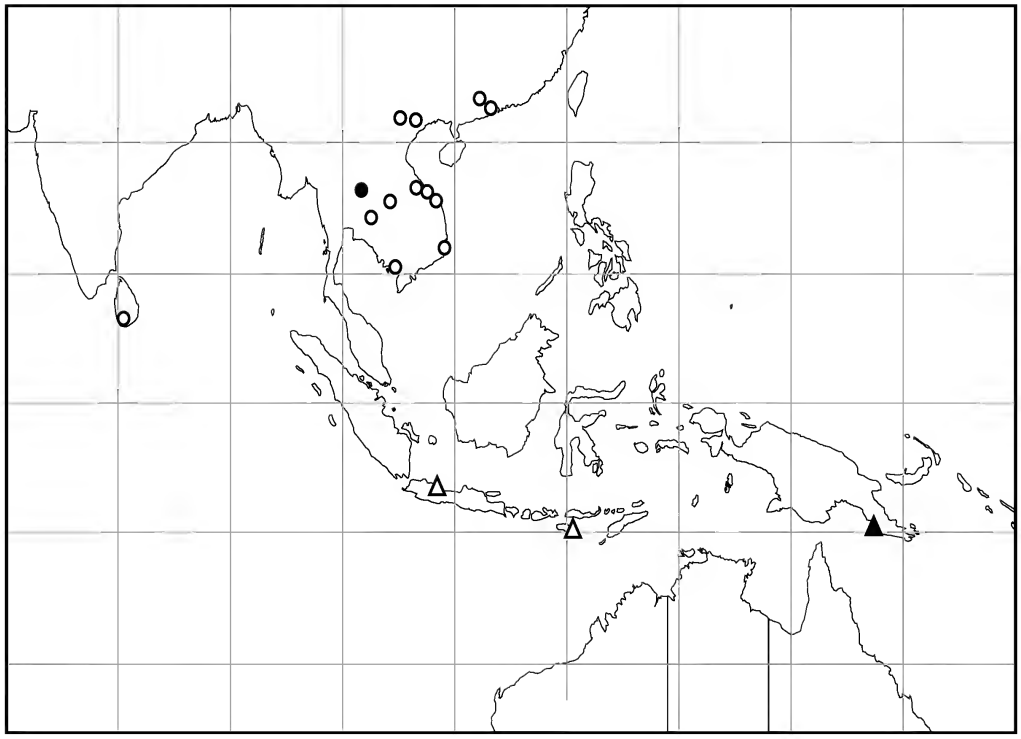


Map 1. Distribution of ○● *Stylidium kunthii*, ▲△ *S.alsinoides*.



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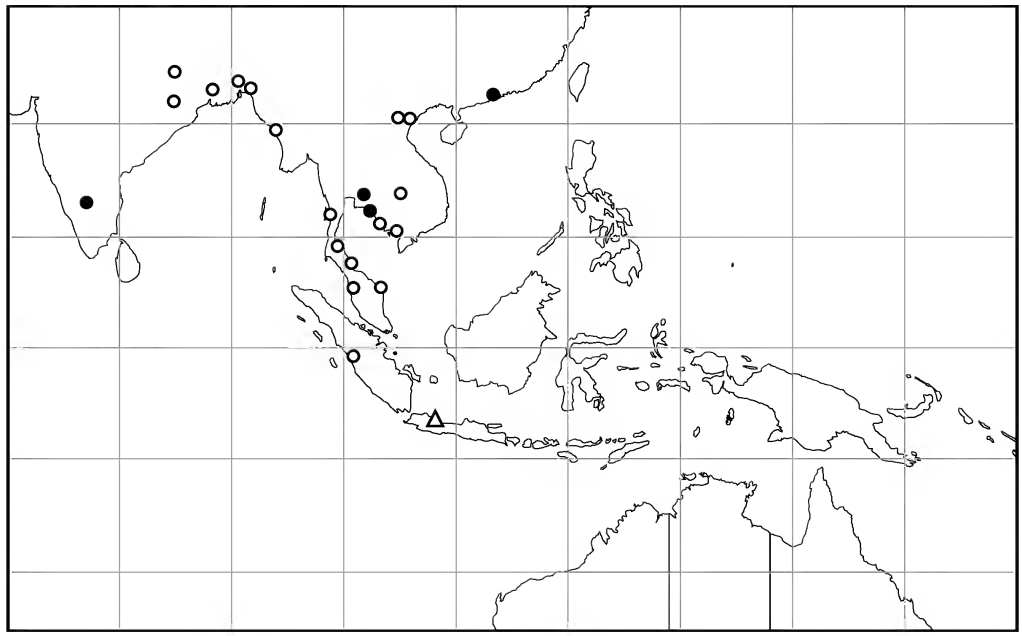
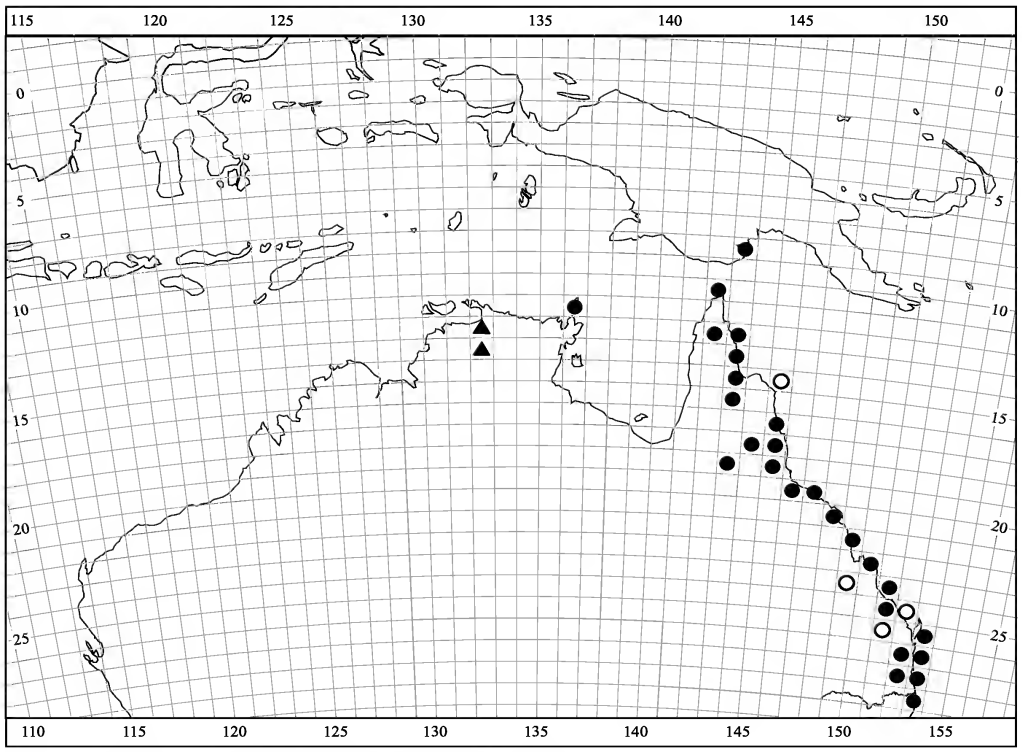
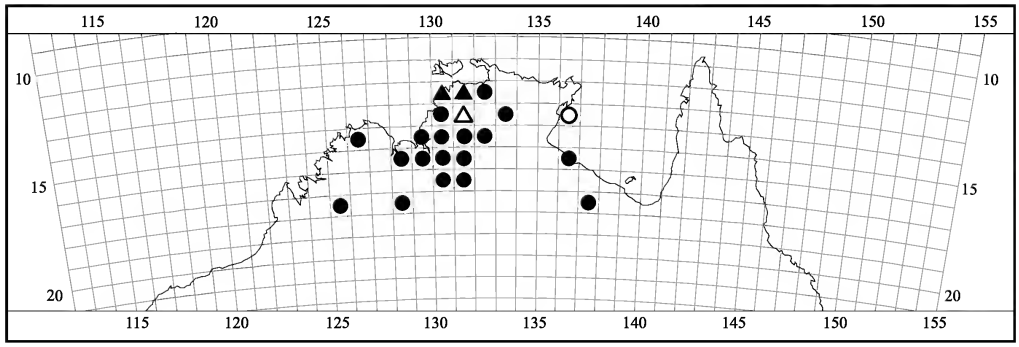


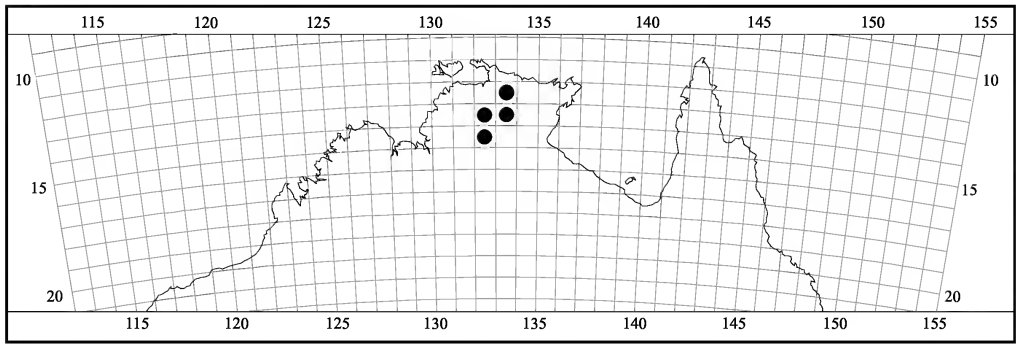
Map 3. Distribution of ○● *Stylidium tenellum*, △ *S.inconspicuum*.



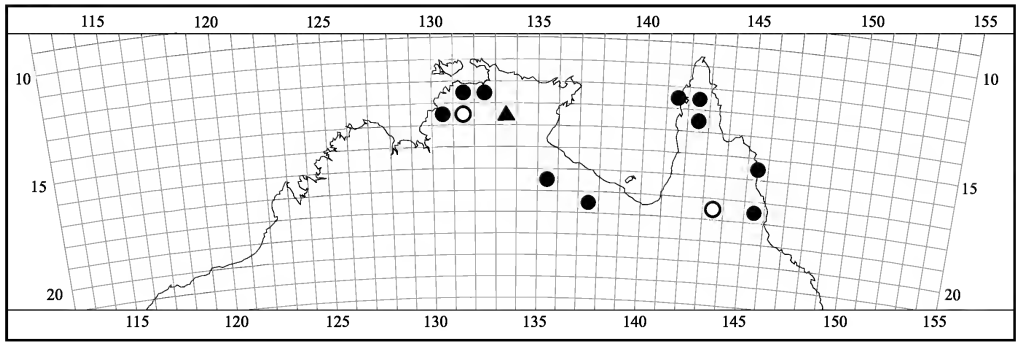
Map 4. Distribution of ○● *Stylidium tenerum*, ▲ *S.divergens*.



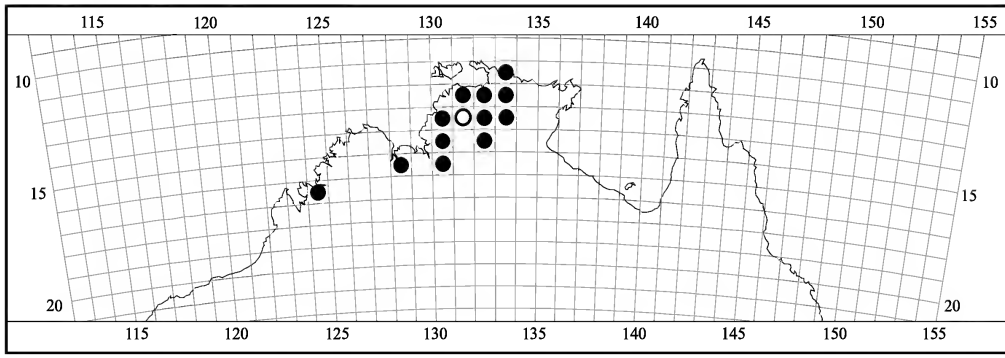
Map 5. Distribution of ○● *Stylidium muscicola,* ▲ △ *S.ensatum.*



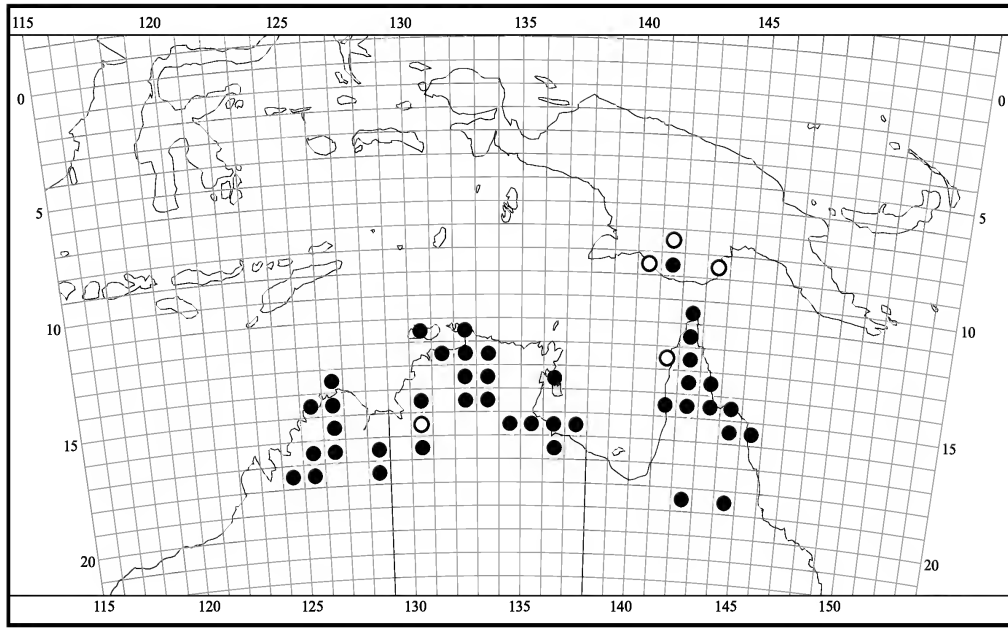
Map 6. Distribution of ● *Stylidium accedens.*



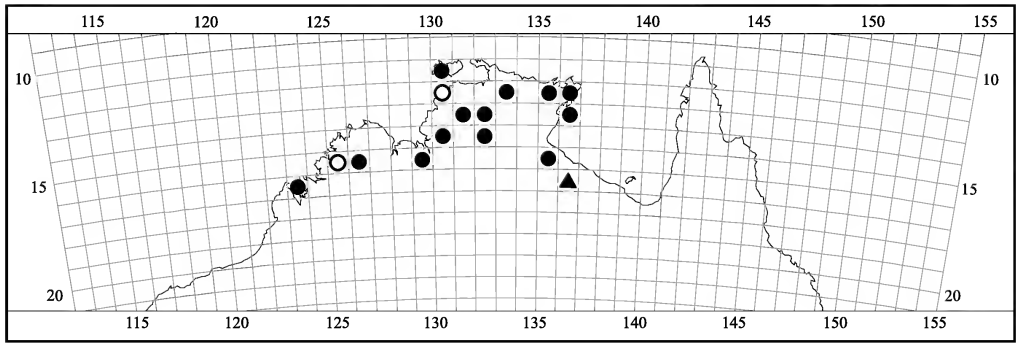
Map 7. Distribution of ○● *Stylidium capillare,and* ▲*S.simulans.*



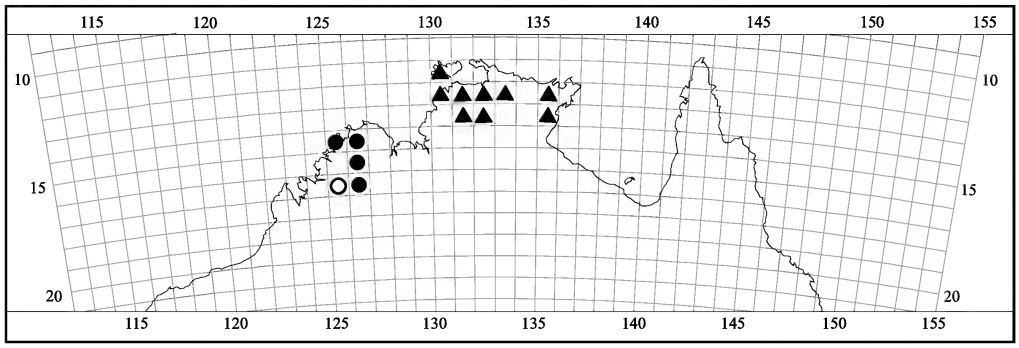
Map 8. Distribution of ○● *Stylidium lobuliflorum.*



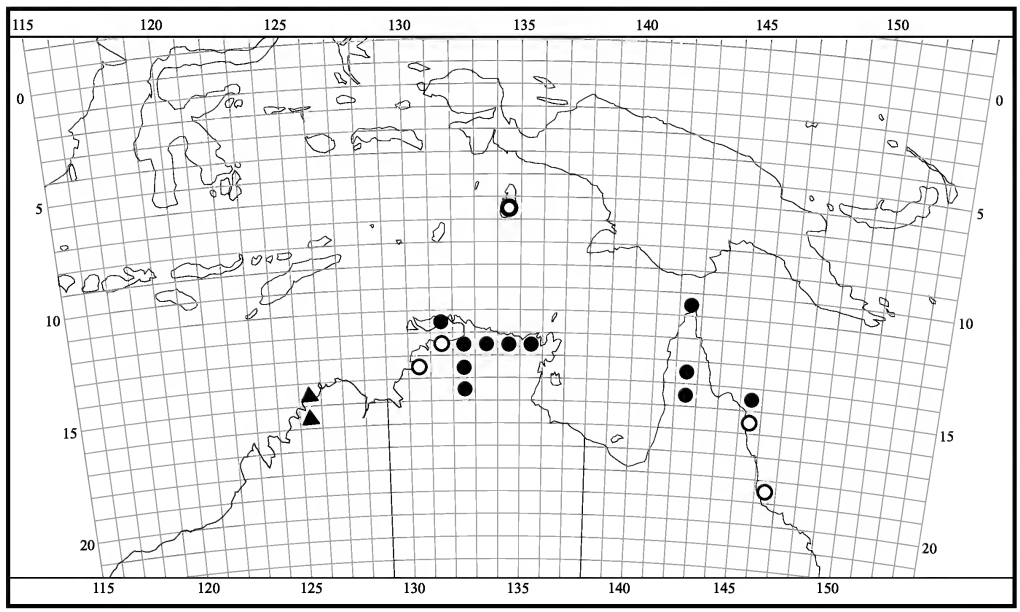
Map 9. Distribution of ○● *Stylidium schizanthum*



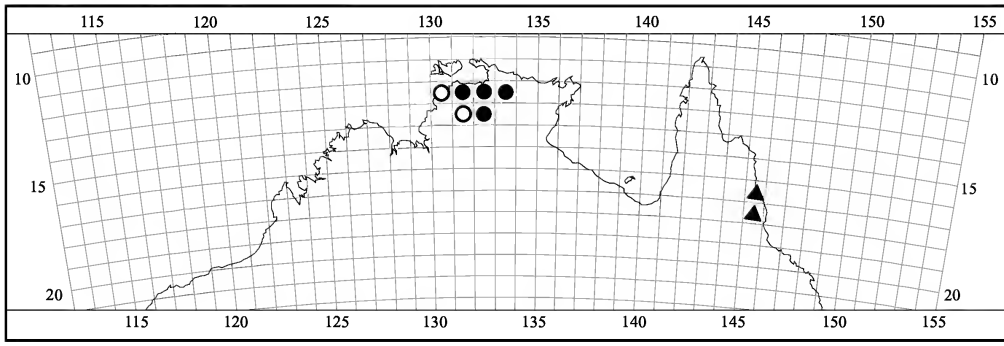
Map 10. Distribution of ○ ● *Stylidium pachyrrhizum, and* ▲*S.stenophyllum.*



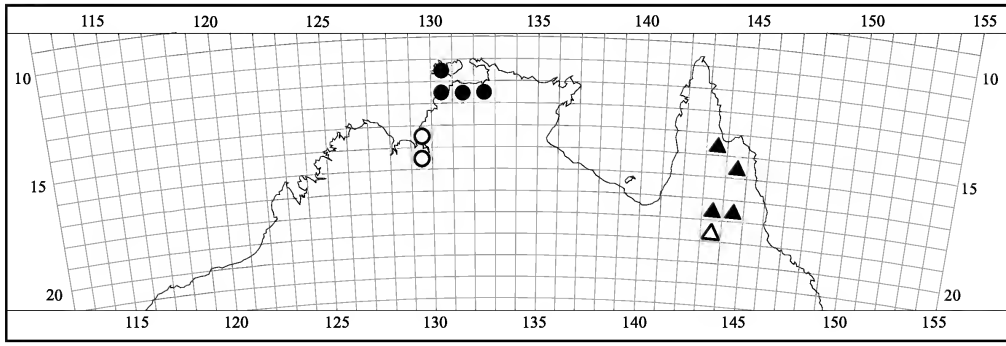
Map 11. Distribution of ○ ● *Stylidium claytonioides, and* ▲*S.candelabrum.*



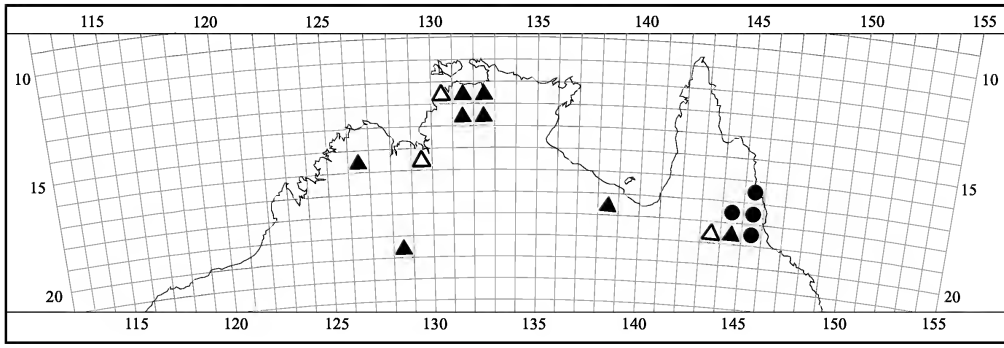
Map 12. Distribution of ○ ● *Stylidium pedunculatum, and* ▲*S.perizostera.*



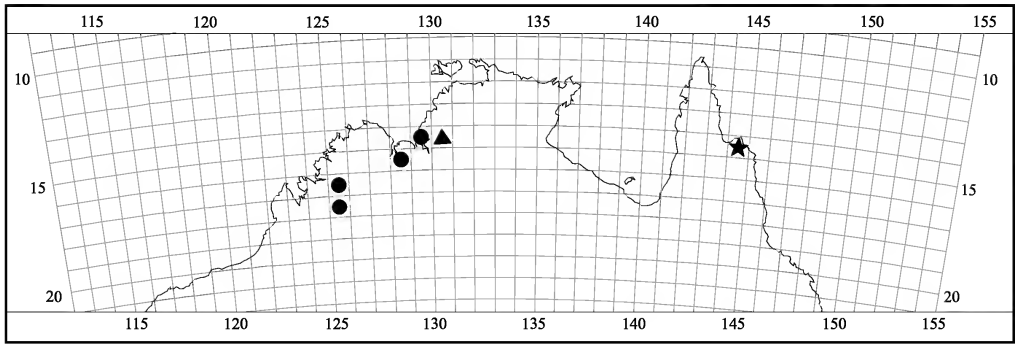
Map 13. Distribution of ○● *Stylidium ericksoniae,and* ▲ *S.confertum.*



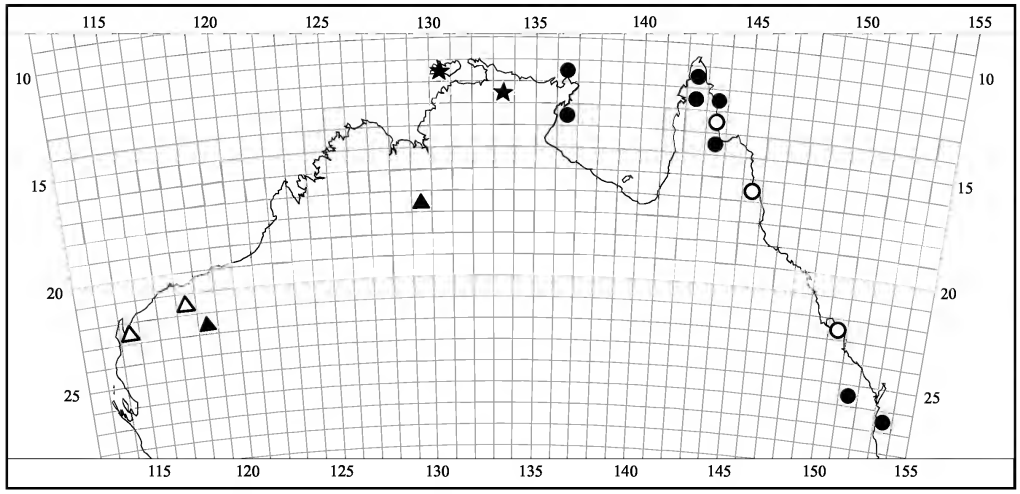
Map 14. Distribution of ○● *S.tenerrimum, and* ▲△ *S.trichopodum.*



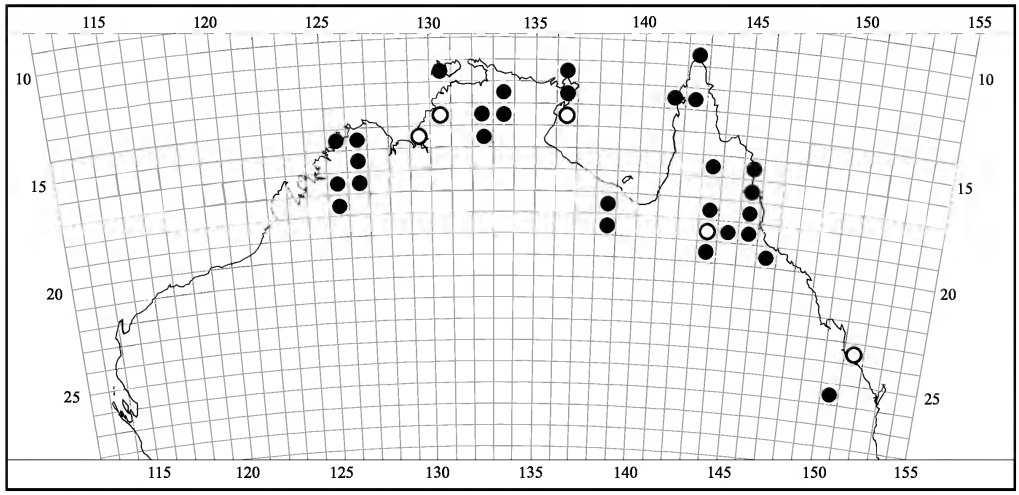
Map 15. Distribution of ○● *Stylidium oviflorum, and* △▲ *S.fissilobum.*



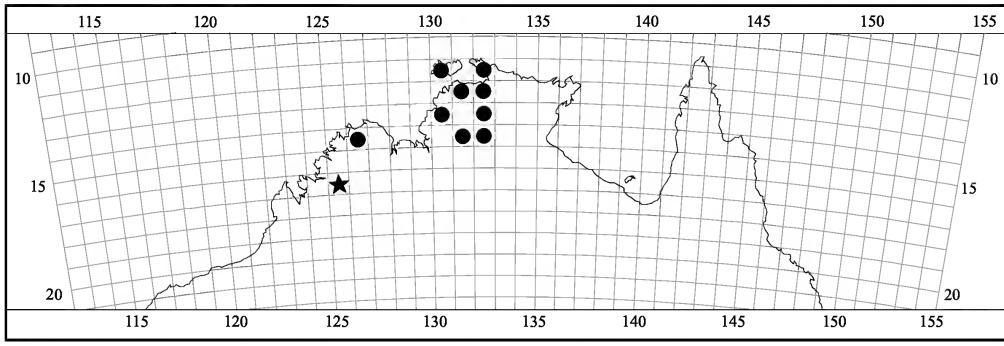
Map 16. Distribution of ★*Stylidium longissimum*● *S.prophyllum,and* ▲*S.aquaticum.*



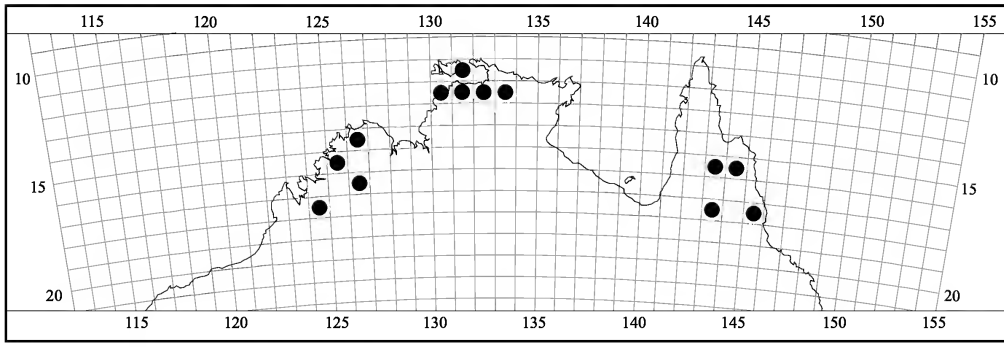
Map 17. Distribution of ○ ● *Stylidium diffusum* △ ▲ *S.fluminense,and* ★*S.nominatum.*



Map 18. Distribution of ○ ● *Stylidium rotundifolium.*



Map 19. Distribution of ● *Stylidium dunlopianum.* ★*S.fimbriatum.*



Map 20. Distribution of ● *S.cordifolium.*

Chromosome numbers of some Acanthaceae from Papua New Guinea

Thomas F. Daniel

Summary

Daniel, Thomas F. (2000). Chromosome numbers of some Acanthaceae from Papua New Guinea. *Austrobaileya* 5(4): 651–659. Meiotic chromosome numbers are reported for nine species representing eight genera of Acanthaceae from Madang and Morobe provinces in Papua New Guinea. Chromosome numbers of five species are reported for the first time and two new numbers are reported for the widely cultivated species *Graptophyllum pictum* (L.) Griff. Chromosome numbers obtained in *Calycacanthus* K.Schum. (n = 16) and *Jadunia* Lindau (n = ca 16) are the first reported for these genera. Subfamilial relationships are discussed with respect to the chromosome numbers now known for these and other Acanthaceae.

Keywords: Acanthaceae, chromosomes, Papua New Guinea, *Aphelandra*, *Calycacanthus*, *Graptophyllum*, *Hypoestes*, *Jadunia*, *Lepidagathis*, *Ruellia*, *Thunbergia*

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Introduction

The pantropical family Acanthaceae comprise more than 4000 species in some 230 genera. Major concentrations of species occur in the following regions: Mexico-Central America, Andean South America, Brazil, tropical Africa, Madagascar, India, southeastern mainland Asia, and insular Malesia. Two subfamilial classifications of Acanthaceae are currently in use. That of Lindau (1895) includes all genera of the family recognized up to its publication but is now largely out of date and contains many errors. Bremekamp's 1965 revised classification made some improvements on Lindau's, but did not assign all genera to suprageneric taxa. An updated subfamilial classification, based on both morphological and DNA sequence data, is being formulated (e.g., McDade et al. 2000, Manktelow et al. in review, McDade et al. submitted).

Like many large and predominantly tropical families of flowering plants, the Acanthaceae remain relatively little-studied cytologically. In 1982, Saggoo and Bir reported that chromosome numbers had been determined for only about 219 species in the family, and Daniel and Chuang (1998) noted that only 62 of the 228 genera of Acanthaceae (i.e., 27%) recognized in Brummitt (1992) have received any cytological investigation. Whereas Acanthaceae occurring in India and Mexico-Central America have received the most cytological attention, those in Madagascar and insular Malesia have received little, if any, such studies. Barker (1986) noted that no cytological studies had been carried out on Australian species either.

In 1992, I had the opportunity to collect cytological samples of Acanthaceae in Papua New Guinea. Chromosome number determinations based on acanthaceous plants growing in Papuasia had not previously been made. In the discussions that follow, Papuasia refers to New Guinea and the Solomon Islands; New Guinea refers to the nation of Papua New Guinea (including the archipelagos of New Britain and New Ireland) and the province of Irian Jaya of the nation of Indonesia. Höft (1992) recognized 129 species in 30 genera (incorrectly totaled as 32) of Acanthaceae in Papuasia. At least 23 of these genera are native and four of them are endemic there. Unfortunately, there is no comprehensive systematic treatment of the Acanthaceae of either Papuasia or the Malesian region. The recognition of 129 species of the family in Papuasia by Höft (1992) is likely a

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conservative estimate; for example, the genus of at least one species that I observed as naturalized in Papua New Guinea (*Blechum pyramidatum* (Lam.) Urb.) was not listed by Höft. For comparison, about 60 species of Acanthaceae have been recognized from Australia (Barker 1986, 1996), about 160 (including many cultivated ornamentals) were treated as occurring in Java (Backer and Bakhuizen van den Brink 1965), and 168 were recognized earlier this century on the Malay Peninsula (Ridley 1923).

In this study, meiotic chromosome numbers are reported for nine species of Acanthaceae occurring in Papua New Guinea (Table 1). Six of these species (*Calycacanthus magnusianus* K.Schum., *Graptophyllum pictum* (L.) Griff., *Hypoestes floribunda* R.Br., *Jadunia biroi* (Lindau & K.Schum.) Lindau, *Lepidagathis royenii* Bremek., and *Ruellia repens* L.) are indigenous to the region, three (*C. magnusianus*, *G. pictum*, and *J. biroi*) are presumed to be endemic there, and three (*Aphelandra sinclairiana* Nees, *Ruellia tuberosa* L., and *Thunbergia grandiflora* Roxb.) are naturalized introductions. Chromosome counts have been reported previously for at least 20 acanthaceous species that occur in Papuasia. None of these counts, with the probable exception of *Graptophyllum pictum* (see discussion below), was based on plants from New Guinea or the Solomon Islands. They encompass either widespread species that occur indigenously in Papuasia (e.g., *Acanthus ilicifolius* L.) or species that are native elsewhere but which have become naturalized in Papuasia (e.g., *Ruellia tuberosa*).

Materials and Methods

During July and August of 1992, buds, seeds, and herbarium vouchers of Acanthaceae were collected in Madang and Morobe provinces of northeastern Papua New Guinea. Other Acanthaceae were grown in a greenhouse in San Francisco from seed collected in Madang province. Voucher specimens of the latter were made from the cultivated plants and the letters "gh" follow the field-collection numbers for them. Floral buds for chromosomal studies were fixed in absolute ethanol:glacial acetic acid (3:1) for 24 hours and subsequently washed and stored in 70% ethanol until processed. Anthers were macerated in 1% ferric acetocarmine and subsequently squashed on a microscope slide. Chromosomes were studied under oil immersion using a phase contrast microscope at a magnification of 1000x. Counts from at least two cells were made for most collections and all counts were verified by at least three persons. Camera lucida drawings were made of preparations from which counts were obtained. Voucher specimens are deposited at CAS and LAE. Camera lucida drawings are attached to the vouchers at CAS. Representative drawings for each of the species native to Papua New Guinea are illustrated. In the following discussions, all previously published chromosome counts are listed as *n* numbers irrespective of whether they were originally reported as sporophytic or gametophytic numbers. Voucher specimens, if they exist, that document previous counts by other workers have not been examined.

Results and Discussion

Chromosome numbers obtained from these studies are summarized in Table 1. The significance of each count is presented in the following discussions of the genera studied.

Aphelandra R.Br.

Aphelandra is a neotropical genus of about 175 species. The genus is represented in New Guinea by *A. sinclairiana* Nees, a native of southern Central America. This showy species with orange bracts and large, pink corollas is sometimes cultivated for ornament and has become naturalized in Madang Province. Our count of $n = 14$ for this species agrees with previously published counts for it based on plants from neotropical habitats (McDade 1984). This number is also the most widely known number in *Aphelandra* and likely represents the basic number for the genus (Daniel et al. 1990). Close relatives of *Aphelandra* in Lindau's (1895) Aphelandreae (i.e., *Holographis* Nees and *Stenandrium* Nees) both appear to have a basic number of = 13 (Daniel et al. 1984, 1990; Piovano and Bernardello 1991)

Table 1. Meiotic chromosome numbers of some Acanthaceae from Papua New Guinea.

Species	*n*	Voucher
Aphelandra sinclairiana	14	Madang: Daniel & Forster 6523
Calycacanthus magnusianus	16	Madang: Daniel & Jebb 6518
Graptophyllum pictum	21	Madang: Daniel et al. 6525
G. pictum	20	Madang: Daniel et al. 6530
G. pictum	ca 20	Madang: Daniel 6611
G. pictum	21	Madang: Daniel 6624
Hypoestes floribunda	15	Madang: Daniel et al. 6551
Jadunia biroi	ca 16	Morobe: Daniel et al. 6603
Lepidagathis royenii	21	Madang: Daniel & Forster 6522
L. royenii	ca 21	Madang: Daniel et al. 6538
L. royenii	21	Madang: Daniel et al. 6607
L. royenii	ca 21	Madang: Daniel et al. 6609
Ruellia repens	12	Madang: Daniel 6610gh
Ruellia tuberosa	17	Madang: Daniel 6626gh
Thunbergia grandiflora	28	Madang: Daniel 6627

Several authors have suggested that $x = 7$ is primitive for Acanthaceae (Grant 1955; Raven 1975; Piovano and Bernardello 1991; Daniel and Chuang 1993). If so, $x = 14$ likely represents a tetraploid derivative of this primitive basic number, and $x = 13$ has evolved via both polyploidy and dysploidy.

Calycacanthus K.Schum.

Calycacanthus is a unispecific genus endemic to Papuasia. The count of $n = 16$ (Fig. 1) for *C. magnusianus* is the first report of a chromosome number in the genus. *Calycacanthus* was included in tribe Odontonemeae subtribe Odontoneminae by Lindau (1895) and would be included in Bremekamp's (1965) tribe Justicieae subtribe Odontoneminae. Chromosome numbers reported for other genera of Lindau's subtribe comprise $n = 11$, 12, 14, 22, 23, and 28 (for *Siphonoglossa* Oerst., now treated as congeneric with *Justicia* L. of subtribe Justiciinae); $n = 15$ (for *Rhinacanthus* Nees, a genus best treated in subtribe Justiciinae according to Daniel and Chuang, 1998; for information on a dubious and unconfirmable report of $n = 16$ in this genus, see Daniel and Chuang, 1998); $n = 18$ (for *Streblacanthus* Kuntze and *Razisea* Oerst., the latter best treated in subtribe Isoglossinae according to Daniel, 1999); $n = 20$ (for *Ecbolium* Kurz); $n = 21$ (for *Odontonema* Nees, *Oplonia* Raf., and *Pseuderanthemum* Radlk.); and $n = 42$ (for *Mackaya* Harvey). Thus, $n = 16$ is newly reported for the subtribe as delimited by Lindau (1895).

Graptophyllum Nees.

Graptophyllum comprises between 10 and 15 species occurring primarily in the southwestern Pacific region. Barker (1986) noted three species in New Guinea whereas Höft (1992) listed five as occurring in Papuasia. The only previous reports of chromosome numbers in the genus are for the widely cultivated species *G. pictum* (L.) Griff., which has been reported to have been probably derived from Papuasian plants (e.g., Bailey 1949, Barker 1986). My counts from wild population of this species do not agree with previous reports for it, all of which appear to have been based on cultivated plants. Grant (1955) and Govindarajan and Subramanian (1983, without citation of voucher) reported $n = 30$ and Lakshmi and Bapa Rao (1977, without citation of voucher) reported $n = 18$ for *G. pictum*.

Fig 1. Camera lucida drawings of meiotic chromosome preparation. ***Calycacanthus magnusianus*** (*Daniel & Jebb* 6518), metaphase I, n = 16.

During my studies, chromosome counts were obtained from several cells at various stages of meiosis in each of *Daniel* 6624 (n = 21), *Daniel* 6525 (n = 21, Fig. 2A), and *Daniel* 6530 (n = 20, Fig. 2B). Similar differences in meiotic chromosome numbers among different collections of the same taxon are uncommon but not without precedent in the Acanthaceae. For example, both n = 11 and n = 12 have been reported for *Elytraria imbricata* (Vahl) Pers. (Daniel et al. 1990) and *Siphonoglossa ramosa* Oerst. (Hilsenbeck 1983), and both n = 22 and n = 23 have been reported for *S. sessilis* (Jacq.) Oerst. (Hilsenbeck 1983). The single cell with nearly countable chromosomes in *Daniel 6611* can only be estimated to be n = ca 20 because of dark cytoplasmic staining, overlapping of the irregularly shaped chromosomes, and the presence of dark granules.

Lindau (1895) included *Graptophyllum* in his tribe Graptophylleae along with a diverse array of other genera, many of which subsequently have been shown to be more closely related to genera in other tribes. *Graptophyllum* is similar in numerous morphological features (e.g., presence of staminodes, pollen type) to *Pseuderanthemum* and its relatives (see Daniel 1995). This latter assemblage also shares a chromosome number of n = 21. Based on numbers so far reported for *G. pictum*, a basic number of x = 10 is suggested for *Graptophyllum*; however,

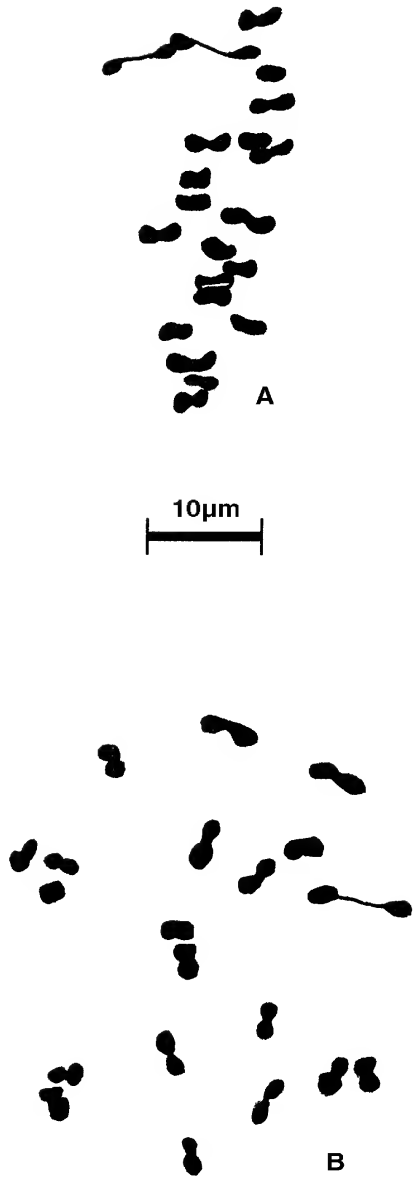

Fig 2. Camera lucida drawings of meiotic chromosome preparation. A. ***Graptophyllum pictum*** (*Daniel* et al. 6525), metaphase I, n = 21. B. ***G. pictum*** (*Daniel* et al. 6530), metaphase I, n = 20.

this number is not currently known in the genus. Determinations of chromosome numbers for other species of *Graptophyllum* will be necessary in order to confirm this or establish another number as basic in the genus.

Graptophyllum pictum has long been assumed to be native, and probably endemic, to New Guinea (see discussion by Barker 1986). My collections of the species from forest habitats in Papua New Guinea differ from cultivated plants (based on collections from Hawaii, Panama, Papua New Guinea, and the West Indies at CAS) by lacking variegated coloring in the leaves, having narrower (less than 1 mm wide vs. usually more than 1 mm wide) and more attenuate calyx lobes, and having fruits present. The cytological and morphological differences between wild and cultivated plants suggest either significant alteration of plants through domestication or the provenance of cultivated plants from another region. Indeed, Fosberg et al. (1993) suggest that *G. pictum* may be native to the Moluccas rather than New Guinea.

Hypoestes Sol. ex R.Br.

This genus consists of about 70 species occurring in the tropics and subtropics of the Old World. Two species of *Hypoestes* are known from New Guinea. The count of $n = 15$ (Fig. 3) for *H. floribunda* R.Br., native to Australia and New Guinea, is the first report of a chromosome number for this species. It agrees with most previously reported counts for other species of *Hypoestes* (Daniel and Chuang 1993, 1998).

Using the key to varieties of *H. floribunda* provided by Barker (1986), *Daniel* et al. 6551 would appear to be affiliated with var. *varia* R.M.Barker. This variety was not reported from New Guinea by Barker (1986). *Hypoestes floribunda* var. *neoguineensis* R.M.Barker was reported by Barker (1986) to occur in the same general region of northeastern Papua New Guinea where *Daniel* et al. 6551 was collected. The pubescent filaments and glandular corolla with a tube 8 mm in length and lobes 11 mm in length readily distinguish *Daniel* et al. 6551 from that taxon.

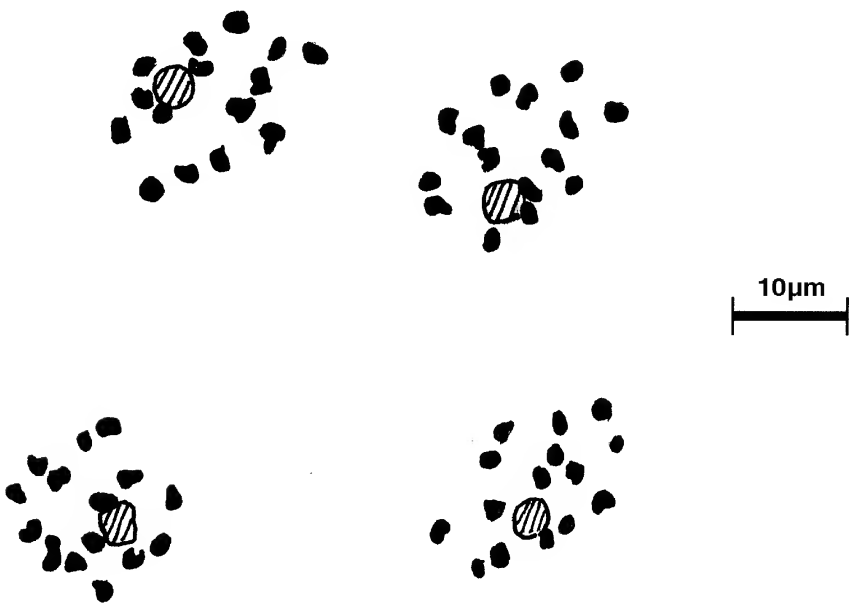

Fig 3. Camera lucida drawing of meiotic chromosome preparation. ***Hypoestes floribunda*** (*Daniel* et al. 6551), late telophase II, n = 15.

The recent report by Daniel and Chuang (1998) of n = 30 for the African species *H. aristata* R.Br. suggests a basic number of x = 15 for the genus. Meiotic complements of n = 15 are also known in both *Dicliptera* Juss. and *Peristrophe* Nees (Daniel and Chuang 1993, 1998), close relatives of *Hypoestes* in Lindau's (1895) tribe Odontonemeae subtribe Diclipterinae.

Jadunia Lindau.

This genus of two species is endemic to New Guinea. Chromosome numbers have not been reported for either of them. Few buds were available for study and only an approximate count of n = ca 16 (Fig. 4A) could be obtained based on a single cell from *J. biroi*. In the preparations from this species, the cytoplasm stained darkly and the chromosomes were not as clearly defined as illustrated.

Jadunia was treated by Lindau (1895) in his subtribe Odontoneminae and he noted affinities with *Calycacanthus*. A chromosome count of n = 16 is noted above for the latter genus.

Lepidagathis Willd.

This genus of 100 or fewer species is mostly paleotropical in distribution. Five species were noted by Höft (1992) as occurring in Papuasia. Previous chromosome counts of n = 9–12, 21, 22, or 42 have been reported for nine species (Daniel et al. 1990, see under *Teliostachya* Nees) of the genus. My counts of n = 21 (Fig. 4B) and n = ca 21 for *L. royenii*, a species known from New Guinea and Queensland, Australia (see Barker 1986), represent the first reports of chromosome numbers for this species. A chromosome number of n = 21 has also been reported for *L. formosensis* C.B.Clarke ex Hayata (Chuang et al. 1963), a species native to Taiwan and the Ryukyu Islands.

Only approximate counts could be obtained for two other collections of *L. royenii*. Because of folded or possibly overlapping chromosomes in the single cells of *Daniel* et al. 6538 and 6609 with nearly countable chromosomes, the exact number of chromosomes (20 vs. 21 or 21 vs. 22 respectively) could not be resolved. In both instances, however, it is likely that 21 bivalents were present. Lindau (1895)

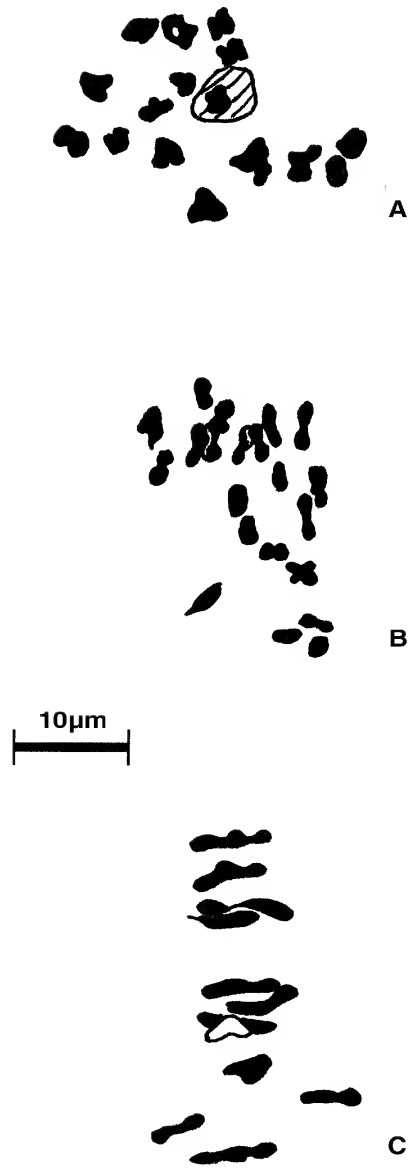

Fig 4. Camera lucida drawings of meiotic chromosome preparation. A. ***Jadunia biroi*** (*Daniel* et al. 6603), diakinesis, n = ca 16. B. ***Lepidagathis royenii*** (*Daniel* et al. 6607), metaphase I, n = 21. C. ***Ruellia repens*** (*Daniel* 6610gh), metaphase I, n = 12.

included *Lepidagathis* in his tribe Barlerieae and Bremekamp (1965) placed the genus "and its nearest allies" into his tribe Lepidagathideae. The only potential relative of *Lepidagathis* for which a chromosome number has been reported is *Barleria*. Daniel et al. (1990) noted that $n = 12$, 15–21 had been reported for that genus with $n = 20$ most prevalent. Given the diversity of chromosome numbers so far reported for *Lepidagathis*, the basic number of the genus is not readily evident.

Morphological variation among collections of this species was noted by Barker (1986). Among the collections from which chromosome counts were determined, *Daniel & Forster* 6522 and *Daniel* et al. 6609 have bracts and bracteoles 3–5 mm long with the abaxial surfaces pubescent with two layers of trichomes (a dense layer of glandular trichomes and a subtending layer of eglandular trichomes); *Daniel* et al. 6607 has bracts and bracteoles 6–6.5 mm long with the abaxial surfaces pubescent with three layers of trichomes (an upper layer of eglandular trichomes, a middle layer of sparse glandular trichomes, and a lower layer of eglandular trichomes); and *Daniel* et al. 6538 has bracts and bracteoles 7.5–9 mm long, apically caudate-awned, and abaxially pubescent with three layers of trichomes (as in *Daniel* et al. 6607).

Ruellia L.

In the broad sense in which this genus is often interpreted, it comprises some 250 species occurring worldwide. Höft (1992) noted that 13 species of *Ruellia* are known from Papuasia. A meiotic complement of $n = 17$ is known for more than 50 species in this morphologically diverse genus (Daniel and Chuang 1998). My count of $n = 17$ for *R. tuberosa,* native to the West Indies and northern South America and naturalized in New Guinea, agrees with the majority of previous counts for this species (e.g., Grant 1955; De 1966; Verma and Dhillon 1967; Gill 1971; Long 1976; Valsala Deri and Mathew 1982) and for other species of the genus (Daniel et al. 1990). However, occasional reports of $n = 16$ have been published for *R. tuberosa* (e.g., Sugiura 1936, without citation of voucher; Ellis 1962, without citation of voucher; Subramanian and Govindarajan 1980; Govindarajan and Subramanian 1983, without citation of voucher).

The chromosome number of *R. repens* L., native to southeastern mainland Asia and insular Malesia, is reported here for the first time as $n = 12$ (Fig. 4C). This number has not been reported previously in *Ruellia* and is the lowest number known for any species of the genus. Recently, Daniel and Chuang (1998) reported $n = 24$ for the Brazilian species *R. macrantha* (Nees) Mart. ex B.D.Jacks. and the paleotropical species *R. prostrata* Poir. The latter species is morphologically similar to *R. repens* and both are sometimes treated in *Dipteracanthus* Nees (e.g., Bremekamp and Nannenga-Bremekamp 1948). It is increasingly apparent that chromosome numbers in *Ruellia* are somewhat more diverse than previously suspected. Based on chromosome numbers now known for this genus, probable basic numbers for it include $x = 12$ and $x = 17$.

Ruellia was treated by Lindau (1895) in his tribe Ruellieae and by Bremekamp (1965) in his subtribe Ruelliinae. Chromosome numbers reported for other genera included in these taxa are $n = 25$ in *Lankesteria* Lindl. (Mangenot and Mangenot 1962) and $n = 15, 17, 19, 21, 22$, and 42 (e.g., Grant 1955, Kaur 1970) in *Eranthemum* L.

Thunbergia Retz.

Thunbergia comprises about 100 species native in the Paleotropics. Numerous species are widely cultivated and some have become naturalized. At least three, and perhaps five, species of *Thunbergia* are known from New Guinea. All but one (i.e., *T. papuana* Bremek., which according to Barker (1986) might be synonymous with *T. arnhemica* F.Muell.) appear to be naturalized there. My count of $n = 28$ for *T. grandiflora* Roxb. (native to southern Asia and apparently introduced and naturalized in New Guinea) agrees with most previous counts for the species (e.g., Daniel and Chuang 1989, 1998; Grant 1955; Kaur 1970, without citation of voucher). Older counts of $n = 14$ (Nanda 1962, without citation of voucher) and $n =$ ca 14 (Darlington and JanakiAmmal 1945, without citation of voucher) have also been reported for the species. If these latter counts

are accurate, then the population I sampled in New Guinea would appear to be tetraploid within the species. Discussions of chromosome numbers in *Thunbergia* were provided by Daniel and Chuang (1989, 1998).

Conclusions

Some of the same chromosomal patterns that were summarized by Daniel and Chuang (1993, 1998) and Daniel et al. (1984, 1990) were observed among Acanthaceae occurring in Papua New Guinea: widely divergent chromosome numbers within a genus (*Ruellia*), dysploidy within a species (*Graptophyllum pictum*), and relatively high (i.e., $n = 14$ or more) haploid numbers for most species. Such chromosomal rearrangements among Acanthaceae have probably led to some of the proliferation in numbers of taxa in this large family.

Four of the genera studied here (*Calycacanthus, Graptophyllum, Hypoestes,* and *Jadunia*) would be included within Bremekamp's (1965) tribe Justicieae subtribe Odontoneminae. The diversity of chromosome numbers encountered among them reflects that reported for other genera of the subtribe from other geographic regions (Daniel and Chuang 1993). Daniel and Chuang (1993) indicated that some of these numbers correlate with other characters and should be useful in recognizing natural groupings within the Odontoneminae. The importance of knowledge of chromosome numbers for discerning systematic relationships among taxa of Acanthaceae has been demonstrated previously (Daniel and Chuang 1993, 1998; Daniel et al. 1984, 1990). Further determinations of chromosome numbers among Papuasian and Australian Acanthaceae should assist in the elucidation of their taxonomy and phylogeny.

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Wahlenbergia celata (Campanulaceae), a new species from central Queensland

Paul I. Forster

Summary

Forster, Paul I. (2000). *Wahlenbergia celata* (Campanulaceae), a new species from central Queensland. *Austrobaileya* 5(4): 661–665. A new species *Wahlenbergia celata* P.I.Forst. is described and illustrated. It belongs to the group of fleshy-rooted, lithophytic *Wahlenbergia* species that is endemic in Queensland and the extreme north-east of New South Wales. Four species are now recognised in this group with new distributional data presented for the previously described species. An identification key to the species in this group is provided.

Keywords: Campanulaceae, *Wahlenbergia*-Australia; *Wahlenbergia celata*, *Wahlenbergia glabra*, *Wahlenbergia islensis*, *Wahlenbergia scopulicola*

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Introduction

A comprehensive revision of the genus *Wahlenbergia* in Australia was provided by Smith (1992) wherein some twenty-six species were recognised, including several new taxa. Smith (1992) did not formalise an infrageneric classification for *Wahlenbergia* but did recognise a number of informal groups based on shared character states.

The first of these groups he called the "*W. scopulicola* Group" and defined it by the shared characters of being "Densely tufted perennials with much-branched stems and short inflorescences, typically with only solitary flowers..."with "deeply campanulate corollas and hemispherical capsules". Three species were included in this group, namely *W. glabra* P.J.Sm., *W. islensis* P.J.Sm. and *W. scopulicola* Carolin ex P.J.Sm., all endemic to southern Queensland, although *W. scopulicola* occurs in New South Wales by about 50 m at Mt Lindesay. An additional shared character state for these three species is the fleshy, tuberous tap-root that anchors the plant into crevices in the rocky substrates inhabited by all of them. Unlike the remaining, generally wide-ranging species of Australian *Wahlenbergia*, the species of this group are restricted endemics in cliffline microsites.

Ongoing fieldwork in Queensland has revealed a number of additional populations of *Wahlenbergia* that can be assigned to Smith's Group 1. One undescribed species is present in this material and is described in this paper. There are now a number of additional collections of the previously described species from new localities not seen by Smith (1992) and data is also presented on these.

Taxonomy

Materials and methods

This revision is primarily based on collections held at BRI (as at early 1999) and CANB (examined prior to 1993). All species have been examined in the field. Description format is derived from that of Smith (1992).

1. Wahlenbergia celata P.I.Forst., **sp. nov.** *W. scopulicola* Carolin ex P.J.Sm. affinis, sed sepalis lineari-lanceolatis 2.5–4 mm longis (adversum sepala angusti-triangularia 1.5–2.2 mm longa), corollae

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lobis multo brevioribus angustioribusque, 2–3 mm×2–2.2 mm (adversum lobos ellipticos ad ovatos et 5–9 mm×2.5–3.5 mm) et lobis stigmaticis longioribus ab ea differens. **Typus**: Queensland. LEICHHARDT DISTRICT: Bluebell Rock, State Forest 34, Ruined Castle Creek catchment, 7 Nov 1998, *P.I.Forster* PIF23930 & *R.Booth & R.Crane* (holo: BRI; iso: BRI, K, MEL).

Perennial herb with a thickened taproot, tufted, many-stemmed. Stems 5–25 cm long, decumbent or pendent, crowded, much-branched, sparsely hirsute; hairs to 0.5 mm long. Leaves alternate, rarely subopposite, elliptic, obovate or oblanceolate, becoming predominantly oblanceolate towards the top of the stems, 4–30 mm long, 0.8–7 mmm wide, apex obtuse to acute, base cuneate, petiolate for up to 2 mm, sparsely hirsute; margins entire or irregularly toothed, slightly recurved. Flowers solitary; pedicels 10–50 mm long, hirsute in lower half, + glabrous in upper half, without bracteoles. Hypanthium hemispherical, 1.5–2.2 mm long, 1.5–1.8 mm diameter, glabrous. Sepals 5, erect to slightly spreading, linear-lanceolate, 2.5–4 mm long, 0.4–1 mm wide at base, with scattered indumentum. Corolla deeply campanulate, blue; puberulous inside at base, otherwise glabrous; tube 4–5 mm long, 3–4 mm diameter, longer than the sepals; lobes 5, triangular, the apex acute, 2–3 mm long, 2–2.2 mm wide at the base. Stamens 5, filaments 1–1.2 mm long, white; anthers 2–2.5 mm long. Ovary 3-locular. Style 4–5 mm long, 3-fid, indistinctly constricted 1/2 to 2/3 below from the stigmatic lobes and covered with pollen presenting hairs above the constriction; 0 or 1 gland below each stigmatic cleft; stigmatic lobes 1.2–1.5 mm long. Capsule hemispherical, 3–5 mm long, 3–4 mm diameter, glabrous. Seeds oblong, 0.4–0.5 mm long, c. 0.2 mm diameter, tan-brown. Fig. 1.

Additional specimens examined: Queensland. LEICHHARDT DISTRICT: [all NW of Taroom] Palmgrove N.P., Nov 1998, *Forster* PIF23734 & *Booth* (BRI, MEL, NSW); S.F.35 [now S.F.50], upper reaches of Sandy Creek, Nov 1998, *Forster* PIF23900 & *Booth* (BRI); Ralphs Big Rock, S.F.34 [now S.F.50], Ruined Castle Creek catchment, Nov 1998, *Forster* PIF23934 et al. (AD, BRI, K, MEL, NSW); Glenhaughton Gorge, Expedition N.P., Sep 1999, *Forster* PIF24792 *et al.* (AD, BRI, MEL); Glenhaughton Gorge, Expedition N.P., Sep 1999, *Forster* PIF24829 *et al.* (BRI, MEL).

Distribution and habitat: *Wahlenbergia celata* has been found to date at five localities with four in close proximity in the Bigge Range north-west of Taroom. Plants grow on heavily weathered sandstone clifflines on large isolated monoliths or in deeply incised gorges. The surrounding eucalypt dominated woodland comprises admixtures of *Corymbia citriodora* (Hook.) K.D.Hill & L.A.S.Johnson, *C. watsoniana* (F.Muell.) K.D.Hill & L.A.S.Johnson, *Eucalyptus apothalassica* L.A.S.Johnson & K.D.Hill, *E. fibrosa* F.Muell., *E. tenuipes* (Maiden & Blakely) Blakely & C.T.White and *Lysicarpus angustifolius* (Hook.) Druce. Species in close

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Key to the fleshy-rooted, lithophytic species of *Wahlenbergia* in Queensland and New South Wales

1. Leaves hairy, petiolate 2
   Leaves glabrous, sessile 3

2. Sepals linear-lanceolate, 2.5–4 mm long; corolla lobes triangular with acute tip, 2–3 mm long, 2–2.2 mm wide at base; stigmatic lobes 1.2–1.5 mm long ..... **W. celata**
   Sepals narrow-triangular, 1.5–2.2 mm long; corolla lobes elliptic to ovate with acute tip, 5–9 mm long, 2.5–3.5 mm wide at base; stigmatic lobes 0.5–1.3 mm long ..... **W. scopulicola**

3. Corolla lobes 5.5–9 mm long; leaves subopposite, narrowly elliptic, 2.5–4 mm wide ..... **W. glabra**
   Corolla lobes 3.5–5.5 mm long; leaves all alternate, linear, < 1.5 mm wide ..... **W. islensis**

association on the rockfaces include *Conospermum sphacelatum* Hook., *Leptospermum sericatum* Lindl., *Logania cordifolia* Hook. and *Mitrasacme oasena* Dunlop. At one locality *W. celata* is closely sympatric with *W. islensis* but seems to be restricted to moister microsites.

Notes: *Wahlenbergia celata* is perhaps most closely allied to *W. scopulicola* that is endemic to the Scenic Rim of south-east Queensland (Forster 1994). The two species are disjunct by c. 500 km and differ primarily in floral characters. *W. celata* has sepals that are linear-lanceolate and 2.5–4 mm long; corolla lobes that are triangular with an acute tip, 2–3 mm long and 2–2.2 mm wide at the base; and stigmatic lobes 1.2–1.5 mm long. By comparison *W. scopulicola* has sepals that are narrow-triangular and 1.5–2.2 mm long; corolla lobes that are elliptic to ovate with an acute tip, 5–9 mm long and 2.5–3.5 mm wide at the base; and stigmatic lobes 0.5–1.3 mm long. Smith (1992) stated that *W. scopulicola* has sepals up to 3 mm long, but I have not seen this extreme on the available material. *Wahlenbergia celata* also has considerably less hairy foliage than plants of *W. scopulicola* from the type locality (Mt Lindesay) and an additional site at Mt Cougal. A population of *W. scopulicola* at Bushrangers Cave near Numinbah has only sparsely hairy foliage and was initially segregated as a separate entity (Henderson 1997), but does not differ in other characters from the type material. Hence the density of foliage indumentum does not appear to be a useful character to differentiate between *W. celata* and *W. scopulicola.*

Etymology: The specific epithet is derived from the Latin word *celatus* (concealed) and refers to the primary habitat of this species in incised sandstone gorges.

Conservation status: The known localities are contained within two National Parks and one State Forest at pristine sites unlikely to be disturbed in the forseeable future. On present knowledge the species is restricted in occurrence but locally abundant. The area is poorly explored and contains many hectares of such habitat and it is highly likely that the species will be found to be quite common in the area. No conservation coding is recommended.

2. Wahlenbergia glabra P.J.Sm., Telopea 5: 113 (1992). **Type:** Queensland MORETON DISTRICT: near the summit of Mt Cordeaux, Dec 1973, *P.J.Smith* 55 (holo: NSW n.v.).

Recent (post 1990) specimens examined: **Queensland**. DARLING DOWNS DISTRICT: The Steamers, E of Emu Vale, May 1990, *Bean* 1539 (BRI, NSW); Mt Huntley, western slopes, Oct 1992, *Forster* PIF11841 *et al.* (BRI, MEL); Condamine Gorge, near Paddys Knob, Mar 1993, *Sparshott* KS41 & *Sparshott* (BRI). MORETON DISTRICT: Mt Mitchell, Cunningham's Gap, Aug 1992, *Forster* PIF11097 & *Reilly* (BRI, MEL, NSW); Mt Cordeaux, Aug 1992, *Forster* PIF11181 & *Reilly* (BRI); Wilson's Peak, Main Range N.P., Oct 1992, *Halford* Q1537 (BRI); Southern summit of Mt Doubletop, Main Range S of Cunninghams Gap, Aug 1994, *Leiper* AQ632132 (BRI).

Notes: *W. glabra* has been found at a number of additional localities within the range as previously described by Smith (1992). It is endemic to the "Scenic Rim" of south-east Queensland (Forster 1994). *Wahlenbergia glabra* does not co-occur with *W. scopulicola* and is found in more westerly parts of the Scenic Rim on trachyte substrates.

3. Wahlenbergia islensis P.J.Sm., Telopea 5: 114 (1992). **Type:** Queensland. LEICHARDT DISTRICT: near Isla Gorge, 13 Sep 1974, *P.J.Smith* 132 (holo: NSW n.v.).

Recent (post 1990) specimens examined: **Queensland**. LEICHARDT DISTRICT: Robinson Gorge N.P. [now Expedition N.P.], Sep 1992, *Forster* PIF11290 & *Sharpe* (AD, BRI, MEL, NSW); Robinson Gorge, Expedition N.P., Sep 1995, *Forster* PIF17787 & *Figg* (BRI); Bluebell Rock, S.F.34 [now S.F.50], Ruined Castle Creek catchment, NW of Taroom, Nov 1998, *Forster* PIF23927 et al. (AD, BRI, MEL, NE, NSW); Bat Cave Gorge, Palmgrove N.P., Sep 1999, *Forster* PIF24728 & *Booth* (BRI, MEL); Turpentine Gorge, Palmgrove N.P., Sep 1999, *Forster* PIF24770 & *Booth* (BRI, MEL).

Notes: *W. islensis* is now known from several more easterly localities in the Expedition and Bigge Ranges than known to Smith (1992). This species has been found only on sandstone clifflines. At Bluebell Rock the species is closely sympatric with *W. celata* but occurs in drier microsites.

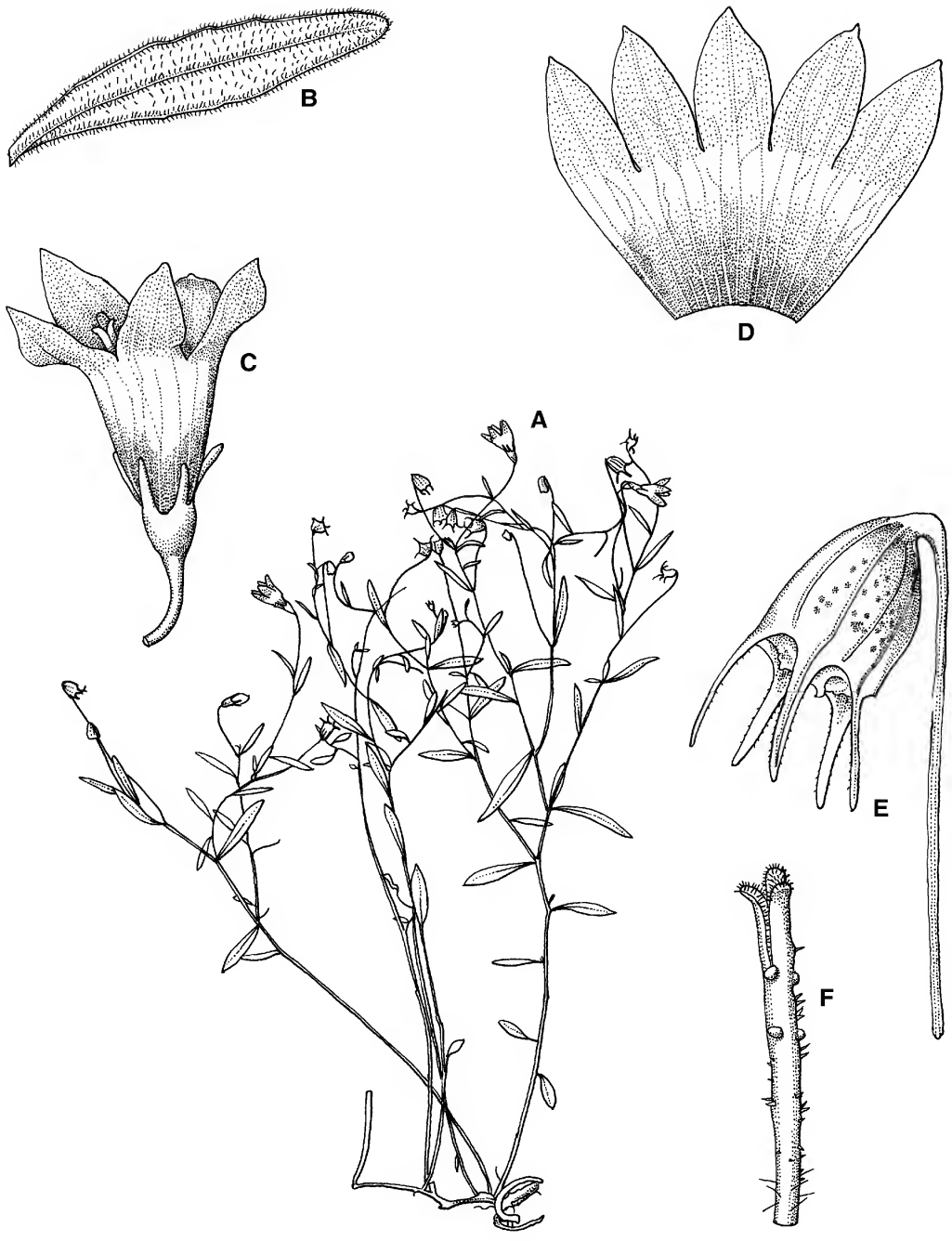

Fig. 1. ***Wahlenbergia celata***. A. habit of flowering and fruiting plant.×0.5. B. single leaf showing indumentum.×5. C. flower.×5. D. expanded corolla.×5. E. fruit.×5. F. style.×10. A,B,E from *Forster* PIF23930 et al.(BRI); C,D,F from *Forster* PIF23934 et al. (BRI). Del. W. Smith.

4. Wahlenbergia scopulicola Carolin ex P.J.Sm., Telopea 5: 111 (1992). **Type:** Queensland/ New South Wales. MORETON/NORTH COAST: Mt Lindesay, 31 May 1959, *R.C. Carolin* 964 (holo: NSW n.v.).

Wahlenbergia sp. (Numinbah P.I.Forster +PIF13868) (Henderson 1997).

Recent (post 1990) specimens examined: **Queensland**. MORETON DISTRICT: The Cougals, Springbrook N.P., Mt Cougal section, Oct 1994, *Forster* PIF15854 & *Leiper* (BRI); Above the "Bushrangers" cave, lower slopes of Mt Wagawn, Nov 1992, *Leiper* AQ548270 (BRI); Bushrangers Cave, 1 km W of Numinbah Border gate, Sep1993, *Forster* PIF13868 & *Leiper* (BRI). **New South Wales**. S. face of Mt Lindesay, Nov 1990, *Halford* 369 (BRI, MEL, NSW).

Notes: *W. scopulicola* is endemic to the Scenic Rim of south-east Queensland (Forster 1994). This species was known to Smith (1992) only from Mt Lindesay, but has now been found at two more easterly localities in the Scenic Rim. *Wahlenbergia scopulicola* occurs on rhyolite substrates and is more easterly in its distribution than *W. glabra*.

Acknowledgements

This paper is dedicated to the late Ralph Crane who was present when this species was first discovered.

Thanks to W.Smith (BRI) for the illustrations and P.Bostock (BRI) for translation of the diagnosis into Latin and comments on the manuscript. Fieldwork in the "Scenic Rim" of Queensland in 1992 was facilitated with a National Estate grant to study montane heathland. Assistance with fieldwork on which materials pertinent to this paper were collected, was provided by R.Booth (BRI), F.Carter (QPWS - Taroom), R.Crane, S.Figg (formerly BRI), G.Leiper, R.Reilly (formerly BRI) and P.R.Sharpe.

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The Identity of *Flindersia pimenteliana* and *F. oppositifolia* (Rutaceae): Evidence from DNA sequences

Kirsten D. Scott, Wayne K. Harris and Julia Playford.

Summary

Scott, Kirsten D., Harris, Wayne K. & Playford, Julia. (2000). The Identity of *Flindersia pimenteliana* and *F. oppositifolia* (Rutaceae): Evidence from DNA sequences. *Austrobaileya* 5(4): 667–669. Nucleotide sequencing of two independent genomic regions has shown that two *Flindersia* species, *F. oppositifolia* F.Muell and *F. pimenteliana* F.Muell were genetically indistinguishable. This coupled with supporting morphological observations by Hartley (1969) and Whiffin (1982) has lead us to reassess the taxonomic status of the two species. The new recombination is *Flindersia pimenteliana* F.Muell. forma *oppositifolia* (F.Muell.) K. D. Scott, W. K. Harris & J.Playford, comb. & stat. nov.

Key words: Rutaceae, *Flindersia pimenteliana, Flindersia oppositifolia* DNA sequences, systematics, Australia

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Introduction

The genus *Flindersia* R.Br. is a predominantly Australian group with one species in the Moluccas, one in New Caledonia and four in New Guinea (Hartley 1969). The genus has 17 species in total, and they are found from rainforest through to semi-arid habitats. During a study on the molecular phylogeny of the genus (Scott *et al.*, in press) it became apparent that *F. oppositifolia* and *F. pimenteliana* were anomalous, in that their nucleotide sequences in two different genomic regions were identical. This coupled with the observations and conclusions of Hartley (1969) that the two species were very closely related and Whiffin's (1982) conclusion that *F. oppositifolia* (F.Muell.) was a 'highly derived montane form' of *F. pimenteliana* F.Muell. has lead us to reassess the taxonomic status of the two species.

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Methods

DNA was extracted from 3 individuals of *F. oppositifolia* and *F. pimenteliana* from both fresh and herbarium material, using the extraction protocol of Scott and Playford (1996). PCR of both the chloroplast and the nuclear DNA fragments was in a 25µl volume containing: 1.5 mM $MgCl_2$, 10 mM KCl, 20 mM Tris-HCl (pH8.7), 10 mM $(NH_4)_2$ SO_4, 5 µl of Qmix (Qiagen, Clifton Hill), 0.2 mM each dNTP, 0.25 µM each primer (chloroplast primers e and f; Taberlet *et al.* 1991: nuclear ITS-1 primers; GN1 - Scott and Playford 1996, and C1–5' TAC GTT CTT CAT CGA TGC GA 3' G.Graham personal communication), 1.25 U *Taq* polymerase (Qiagen, Clifton Hill) and 20 ng DNA. Thermal cycling was in a FTS-1 Thermal Sequencer (Corbett Research, Mortlake) on a program of 94°C for 20 s, 55°C for 20 s, and 72°C for 90 s, for 35 cycles. 3 µl of each reaction were run on a 1% TBE agarose gel to confirm amplification. The remaining PCR product was purified by the addition of an equal volume of

PEG buffer (30% Polyethylene Glycol 8000, 30 mM $MgCl_2$), followed by a 10 min centrifugation at 15 000 g. The pellet was rinsed with 70% ethanol, dried and resuspended in 10 µl of sterile MQ water for sequencing. Sequencing was in a 20 µl volume containing 8 µl of ABI dye terminator chemistry (Perkin Elmer, Melbourne), 0.05 µM of primer and 50 ng of PCR product. The sequencing reaction was in a FTS-1 Thermal sequencer (Corbett Research, Mortlake) with a program of 96°C for 10 s, 50°C for 15 s and 60°C for 4 min, for 25 cycles. Sequences were run on an ABI 373A DNA sequencer. Sequences were aligned using Sequence Navigator (Applied Biosystems Inc, Verl 1994).

Results

Two gene fragments were sequenced in both directions for the construction of a molecular phylogeny of *Flindersia* (Scott *et al.*, in press). The two fragments were the ITS-1 spacer (including 68 bp of 18S rRNA gene and 20 bp of 5.8S rRNA) which is nuclear, and the intergenic spacer between *trn*L-*trn*F of the chloroplast. The ITS-1 being nuclear is biparentally inherited, while the chloroplast *trn*L-*trn*F would be maternally inherited, as chloroplasts are maternally inherited in most plants. Both DNA fragments were able to differentiate every species within the genus, with the exception of *F. pimenteliana* and *F. oppositifolia* (Scott *et al.* in press). The ITS-1 fragment in *F. pimenteliana* and *F. oppositifolia* was 311 base pairs long. Sequence divergence for ITS-1 ranged from 1.2-13.4% between species pairs, with the exception of *F. pimenteliana* and *F. oppositifolia* that were identical. Similar studies using ITS-1 have reported sequence divergences of 5-48.9% between species in the genus *Gentiana* (Yuan *et al.* 1996), and 0.7-21% between species pairs in *Fraxinus* (Jeandroz *et al.* 1997). Given that the resolution of the ITS sequence data has in this case defined all other species within the genus, in addition to describing intraspecific variation in five of the 17 species of *Flindersia*, it would support the assertion that *F. pimenteliana* and *F. oppositifolia* do not constitute discrete taxa.

The second fragment that was sequenced, was from the chloroplast, and was 372 base pairs long. The *trn* fragment, like the ITS fragment was able to distinguish all other species within *Flindersia*, with the exception of differentiating *F. pimenteliana* from *F. oppositifolia*. The chloroplast fragment was less variable than the nuclear fragment with 0.25–4.2% sequence divergence between *Flindersia* species pairs. Sequence divergence between species pairs of *Alnus* have ranged from 0.87–1.52% with divergence values in *Fraxinus* ranging from 0.65–1.14% (Gielly and Taberlet 1994).

The genetic evidence provided from two independent gene fragments, would suggest that *F. pimenteliana* and *F. oppositifolia* do not show a level of genetic diversity which would be indicative of species recognition within *Flindersia*.

Systematics

Whilst different in habit and adult leaf form, both Hartley (1969) and Whiffin (1982) pointed out the similarities between *F. pimenteliana* and *F. oppositifolia* in the characters of the fruit, seed and seedlings and regarded both as being closely similar and Whiffin (*op. cit.*) suggested that *F. oppositifolia* (as *unifoliata*) was a 'highly derived montain form of *F. pimenteliana*' and his figure four showing the phylogeny of the genus places the two species in the one clade. Based on the observations of these authors and the molecular evidence presented above, we believe that the status of *F. oppositifolia* should be reassessed and make the following recombination.

Flindersia pimenteliana F.Muell. **forma oppositifolia** (F.Muell.) K. D. Scott, W. K. Harris & J.Playford, **comb. & stat. nov.**; *Hypsophila oppositifolia* F.Muell., Vict. Nat. 9: 11 (1892). **Type:** [Queensland, Cook District]: Mt Bartle Frere, 1892, *Johnson* (lecto: MEL, *fide* Hartley & Jessup (1982)) *n.v. Flindersia oppositifolia* (F.Muell.) Hartley & Jessup, Brunonia 5: 109 (1982).

Flindersia unifoliata Hartley, J.Arnold Arb. 50: 498 (1969); **Type:** [Queensland, Cook District]: Mt Bellenden Ker, *Sayer 136,* (holo: MEL *n.v.*).

Acknowledgements

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Table 1: Genbank and herbarium accession numbers for ITS-1 and *trn*L-*trn*F

Taxon	Herbarium Accessions or sample origin	ITS-1 Genbank Accessions	*trn*L-*trn*F Genbank Accessions
Flindersia oppositifolia	BRI AQ 522053	AF025500*	AF026021*
	BRIAQ 484238		
	BRIAQ 459477		
Flindersia pimenteliana	BRIAQ 522064	AF025501*	AF026022*
	BRIAQ 522058		
	Australian National Botanic Gardens		

* Note that there is only a single genbank submission for the herbarium accessions, as the sequences for each species were identical.

Cereus uruguayanus (Cactaceae) and its naturalised occurrence in Queensland, Australia

Paul I. Forster & Miriam Schmeider

Summary

Forster, P.I. & Schmeider, M. (2000). *Cereus uruguayanus* (Cactaceae) and its naturalised occurrence in Queensland, Australia. *Austrobaileya* 5(4):671–677. The first records of *Cereus uruguayanus* Ritt. ex Kiesl. as a naturalised weed in Australia are reported. Several populations occur in western Queensland on heavy clay soils in natural and disturbed woodland of brigalow (*Acacia harpophylla* F.Muell. ex Benth.) and belah (*Casuarina cristata* Miq.). Endozoochorial dispersal is thought to be responsible for the spread of this species in natural vegetation and eradication is recommended. It is estimated that at least 3240 individuals occur at one locality near Glenmorgan. Size class structure of this population is described which shows a preponderance of seedling juveniles and large mature plants. The stand is also notable for the high proportion of fasciated (10.9%)and monstrous (20.2%) individuals that occur. This represents the first numerical data on fasciation and monstrousity in a population, albeit naturalised, of Cactaceae.

Keywords: *Cereus uruguayanus,* fasciation, monstrousity, naturalised weeds

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Introduction

Species of Cactaceae have been remarkably successful in colonising the Australian continent with thirty species currently considered as being naturalised (Forster 1996). The majority of naturalised species are from the genus *Opuntia*, although taxa from the genera *Acanthocereus*, *Epiphyllum*, *Harrisia* (syn. *Eriocereus*), *Hylocereus*, *Nyctocereus*, *Pereskia* and *Selenicereus* are also present (Telford 1984; Hosking *et al.* 1988; Forster 1996).

The majority of these naturalised species are shrubby to arborescent, spiny succulents with *Opuntia tomentosa* Salm-Dyck attaining a height of 7 m in some situations. To date, cacti with globular (eg. *Echinopsis* or *Mammillaria*) or candelabra habits (eg. *Cereus* and related genera) have been largely absent from the Australian naturalised cactus flora. Naturalisations of species such as *Echinopsis multiplex* (Pfeiff.) Zucc. have been localised adventives and easily contained (Mann 1970; Hosking *et al.* 1988) and were excluded from recent listings of naturalised cacti (eg. Telford 1984; Forster 1996). In this paper we document an extensive naturalisation of *Cereus uruguayanus* Ritt. ex Kiesl. encountered during a visit in February 1997 to the property "Myall Park" near Glenmorgan. An additional naturalisation has also been found near Tara and another reported from the gemfields at Anakie (J.Higgins pers. comm. 1999).

Cereus uruguayanus is native to Argentina, Brazil and Uruguay but has been widely cultivated around the world since the early 1800's, usually under the name *C. peruvianus* Mill. Kiesling (1982) established that the name *C. peruvianus* was misapplied and renamed the species as *C. uruguayanus* Ritt. ex Kiesl. Hunt (1992) has referred without justification, both the names *C. peruvianus* auct. and *C. uruguayanus* to the synonymy of *C. hildmannianus* and Taylor (1998) has recently recombined *C. uruguayanus* as a subspecies of *C. hildmannianus*. This latter combination was made in a privately published journal series that specialises in automatic tranfers of names with often no justification to support them. In the case of Taylor's new combination there is no explanation offered and until such time as a comprehensive revision of the genus is provided it is more appropriate to follow the nomenclatural lead of Kiesling (1982), a recognised authority on Argentinian cacti.

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In his classic work on the cultivation of cacti, Borg (1937) stated that the species [as *C. peruvianus*] was "Long known in cultivation". Despite its ubiquity in cultivation, there is little ecological or taxonomic information available about this species. Britton & Rose (1920) in their monograph of Cactaceae provide a brief account of both *C. hildmannianus* and *C. peruvianus*, stating that the former occurs in Brazil and the latter in south-eastern South America. Benson (1982) commented that the species (as *C. peruvianus*) was commonly naturalised on Kauai in Hawaii where it was sometimes a pest of pastures. Most contemporary books on cacti omit mention of the species (eg. Barthlott 1979; Andersohn 1983) and accurately identified illustrations are scarce and generally incomplete lacking flowers and fruit (Taylor 1968; Hunter 1988a; Glass & Foster 1989; Innes & Glass 1991; Silva & Sazima 1995). At a locality in south-eastern Brazil, *C. uruguayanus* is stated to occur on rocky outcrops in both forested and deforested areas (Silva & Sazima 1995, as *C. peruvianus*). These authors found that this cactus was predominantly pollinated by hawkmoths and that seasonal flowering coincided with an activity peak for these insects.

Fasciation and monstrosity of the stem is common in naturalised Australian populations of *C. uruguayanus*, hence we also report on its numerical occurrence at one locality. Fasciation in cacti occurs when the apical meristem divides in an abnormal manner forming unusual fan-shaped stems (Synder & Weber 1966; Boke & Ross 1978; Gibson & Nobel 1986) and is thought to be due to several factors, such as external stimuli, disease or heredity (Synder & Weber 1966). Monstrosity in cacti occurs where each shoot loses its vegetative point after producing a few areoles with new growth points produced in an irregular manner. Such fasciated and monstrose clones of cacti are often popular as ornamentals. To the best of our knowledge, there are no detailed studies of fasciation and monstrosity in natural populations of cacti, although the occurrence of isolated individuals in the wild is occasionally reported as a curiosity (eg. Graham 1962; Lindsay 1962; Foster 1965; Synder & Weber 1966; Hunter 1984; Sauleda & Sauleda 1984) and often formally named (eg. Borg 1937; Lindsay 1963; Backeberg 1976). We believe our study to be the first that details the numerical occurrence of fasciation and monstrosity, albeit in a naturalised population.

Materials and Methods

Site Description & History: The study site is situated on the property "Myall Park" (27°12'S, 149° 39'E), near Glenmorgan some 330 km west of Brisbane. "Myall Park" is the site of a private botanic garden "Myall Park Botanic Garden Ltd." that is primarily devoted to Western Australian species and was established in the 1940's by the redoubtable David Gordon (McKenzie 1995). Up until the introduction of the moth *Cactoblastis cactorum* (Berg) in 1933, the area around Glenmorgan was severely infested with `prickly pear' (*Opuntia stricta* (Haw.) Haw.) and would appear to be suitable for the persistence of different sorts of cacti. Several other species of cacti were believed to have been cultivated at the "Myall Park" homestead by the late 1940's (N.Lester, pers. comm. 1997) and it is assumed that the population of *C. uruguayanus* originates from this time. *C. uruguayanus* was semi-commercially available from nurseries by 1936 (Swinbourne 1982) and by the late 1950's was commonly cultivated in Australia (Fuaux 1957; Hayes 1958 [all as *C. peruvianus*]).

At "Myall Park" individuals of *C. uruguayanus* (Voucher: Forster 20334 & Watson: BRI) are concentrated (27° 12' 16"S, 149° 39' 35"E) in c. 6 ha of disturbed, but reasonably intact woodland dominated by *Casuarina cristata* Miq. (belah) and *Acacia harpophylla* F.Muell. ex Benth. (brigalow) on heavy clay alluvium. Brigalow often occurs as 'clumps' as a result of the formation of 'gilgai', which are depressions in the soil that hold water after heavy rain (Johnson, 1980). The cacti are predominantly concentrated in these clumps of brigalow. Scattered individuals occur outside of this area, nearly always in clumps of natural vegetation, and the furthest individual observed was about 1 km away from the main naturalisation (27°12'40"S, 149°40'14"E). A similar distribution of individuals was also

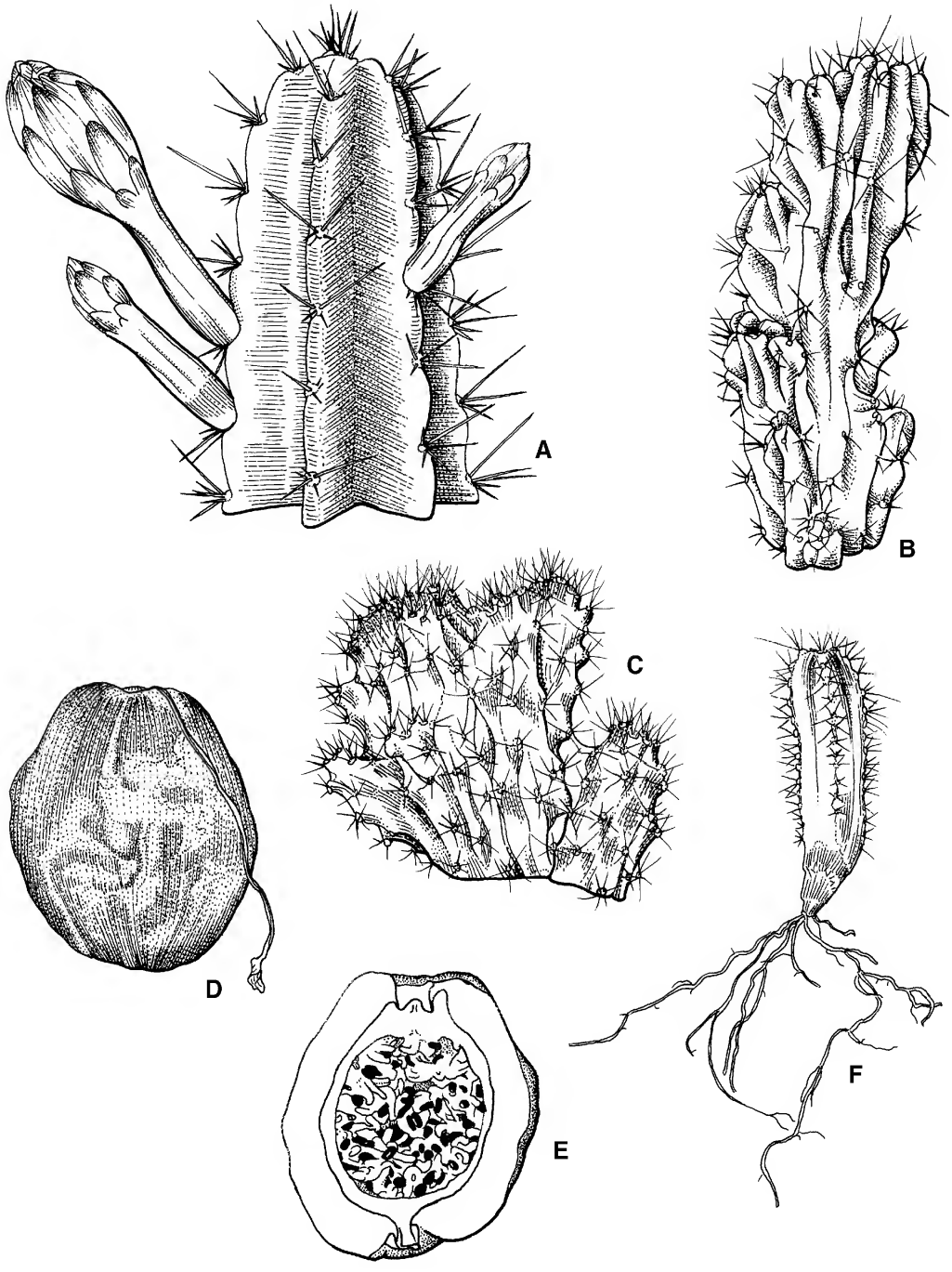

Fig. 1. ***Cereus uruguayanus***. A. budding 'normal' stem. B. 'monstrous' stem. C. 'cristate' stem. D. fruit (whole). E. fruit cross-section. F. seedling. All from Forster 20334 & Watson (BRI). Del. W. Smith.

observed in the population near Tara (Voucher: Forster PIF24959 & Booth, BRI), except that the brigalow community is more disturbed being mainly regrowth.

***Methodology*:** Ten quadrats of 10 × 5 m were placed deliberately within the main concentration of cacti. All individuals of cacti in a quadrat were scored for several features of size class and stem form.

Four size (age) classes of plants were designated -

0-50 cm (classified as juveniles) (Fig. 1E).

50-100 cm (classified as mature as they are capable of flowering and several showed evidence of this).

1-2 m (generally unbranched if with normal stem morphology).

> 2m (generally branched and with a candelabra habit).

Three classes of stem organisation were recognised -

'normal' stems (Fig. 1A) where the 5-7 ribs are not sinuately indented between areoles and are more or less straight.

'monstrous' stems (Fig. 1B) where 7 or more ribs are present with marked indention between areoles and the ribs are rarely straight.

'cristate' stems (Fig. 1C) where it is not possible to accurately ascertain the rib number due to the form of apical cell division where many areoles are densely concentrated and the ribs are never straight.

Spiral stems as illustrated by Hunter (1988a) were not observed nor were cristate flowers as described and illustrated by Müller (1988).

Results: Two hundred and sixty-seven individuals of *C. uruguayanus* were recorded from the 10 quadrats with an average of twenty-seven individuals per plot. Based on this average it is estimated that the total population could be in excess of 3240 individuals. Collectively there was a preponderance of immature seedlings and large (> 1 m) individuals (Fig. 2).

'Normal' individuals make up the bulk of the total population surveyed (68.9%), followed by those with cristate stems (20.2%) and monstrous stems (10.9%) (Fig. 3). 'Cristate' individuals are more frequent in the smaller size classes and for plants over 2 m in height make up only 9.3% of the population (Fig. 2).

Discussion

Natural History

There are few detailed studies available of size class structure in cacti and none for natural populations of *Cereus uruguayanus*. As indicated in the materials and methods, the cacti were noticeably concentrated in natural vegetation of brigalow clumps. In South Africa, Taylor & Walker (1984) found that the closely related *C. jamacaru* DC. [as *C. peruvianus* but see Glen 1997 for correct nomenclature] could only establish on fine-textured soils with a high density of shade trees. The requirement of "prey refugia" and "nurse" plants that create a suitable microclimate for establishment of succulent plants is now well known (Steenbergh & Lowe 1969; Nobel 1988; McAuliffe 1984). The clumped distribution of *C. uruguayanus* at "Myall Park" indicates that a similar process is occurring, but it is likely to be mainly due to "nurse" plant availability rather than "prey refugia". Most of the seedlings observed were not hidden in dense natural vegetation, and predation was noticeably absent on individuals that were otherwise readily accessible. Brigalow clumps may act as a "nurse" plant for *C. uruguayanus* by providing microclimatic conditions suitable for seedling establishment and by acting as foci for seed dispersal.

This cactus is dependent on cross-pollination between different individuals for fruit to be produced (Silva & Sazima 1995). The resultant fleshy fruit with numerous seeds (Fig. 1D) appears suited for endozoochorial dispersal by birds (Bregman 1988). Most of the cacti that are serious pests in Australia are thought to have fruit (and hence seed) that are eaten and dispersed by birds and mammals (Hosking *et al.* 1988). If this is the case for *C. uruguayanus*, it would be worth observing birds that utilise

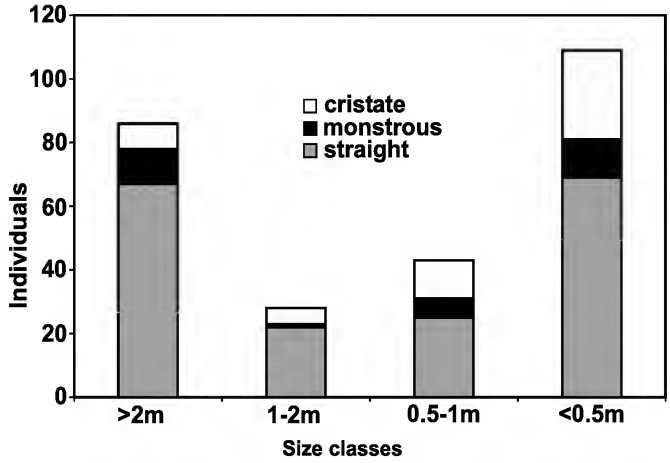

Fig. 2. Total size class distribution for 267 individuals of *C. uruguayanus* in 10 quadrats at "Myall Park". '.

brigalow clumps for roosting to determine those that feed on these fruit and whether they disperse seed over any distance.

As yet this naturalisation is relatively localised, but isolated plants up to a kilometre away would indicate successful endozoochorial dispersal is occurring. The brigalow belt, although widespread in eastern Australia, is now endangered due to clearing for intensive agriculture and cattle grazing and has about 2.2% of its original occurrence conserved in reserves (Young *et al.* 1999). Given the scale of the naturalisation of *C. jamacaru* in South Africa by 1984 (c. 3000 ha), and the success of other cacti as agricultural and environmental weeds in Australia (Hosking *et al.* 1988; Forster 1996), particularly in brigalow communities (McFadyen 1984), it is important that it be successfully controlled.

The size class distribution of individuals at "Myall Park" is different to that found by Taylor & Walker (1984) for *C. jamacaru* as there is a greater preponderance of seedlings and large mature individuals in relation to intermediate sized plants. Such a 'bell' shaped distribution was implied by Taylor & Walker (1984) to indicate unstable populations where stand structure had not yet stabilised and competition between individuals was not restricting seedling establishment. At "Myall Park", seedlings were generally well scattered, although in instances where they were closely situated competition for resources would had to have been a factor. Once established, growth of seedlings of *C. uruguayanus* is rapid and maturity is reached within 3 or 4 years (pers. obs. 1978-1997 on cultivated plants at Didcot). Prior to 1996 the area near Glenmorgan had experienced over 5 years of periodic drought and this may have been responsible for a lack of intermediate sized plants that would have established in that period. The only way to determine these sorts of trends would be to establish permanent plots with tagged individuals; however, in the current situation it would be better if the population was eradicated.

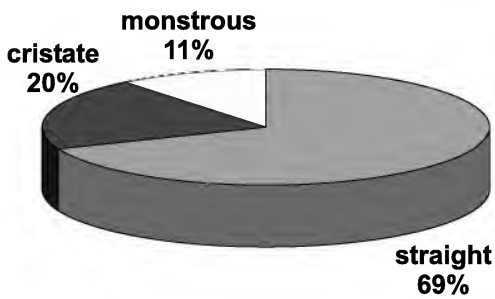

Fig. 3. Total percentage of 'normal', 'cristate' and 'monstrous' individuals of 267 *C. uruguayanus* plants in 10 quadrats at "Myall Park".

Fasciation

Fasciation and monstrosity in *C. uruguayanus* was first documented by de Candolle in 1800 for cultivated material and various infraspecific taxa have been named to encompass these forms (Britton & Rose 1922, Borg 1937; Kiesling 1982). These infraspecific taxa have been mainly described under *C. peruvianus* and none have been transferred to *C. uruguayanus* to date and most discussion of the species still persists under the misapplied name (eg. Hunter 1988a,b; Muller 1988, Machado *et al.* 2000).

This current study demonstrates that fasciation and monstrosity may arise continuously within a population indicating a genetic tendency for this to occur. It has been speculated that somatic cross-overs are a possible mechanism for inducing this variation (Machado *et al.* 2000). Some 'normal' individuals of *C. uruguayanus* were also noted as having the occasional 'monstrous' or 'cristate' branch, hence there is no justification for recognition of such teratological forms as infraspecific taxa as undertaken by Britton & Rose (1922) or Backeberg (1976). Rather, if such forms have to be provided with a name, then selected clones should be designated as cultivars. Given the confused history and doubtful typification of the infraspecific taxa for fasciated individuals described under *C. peruvianus* (Kiesling 1982), it would be wise to arrive at a totally new set of names for such forms of *C. uruguayanus* if so required.

Fasciated individuals of cacti occur rarely in nature (eg. Graham 1962; Lindsay 1962, 1963; Synder & Weber 1966) or cultivation, but seem to be very commonly recorded for *C. uruguayanus* (Kiesling 1982; Hunter 1988a; Müller 1988; Glass & Foster 1989, Machado *et al.* 2000). In the case of the monstrous forms of *Lophocereus schottii* (Englem.) Britt. & Rose described by Lindsay (1963), both were thought to be clones that reproduced vegetatively. Both Graham (1962) and Lindsay (1962) stated or inferred that some populations of cacti tended to have a greater tendency for fasciation than others, but apart from mentioning some localities, did not document numerical occurrence in the wild. This naturalised population of *C. uruguayanus* is probably unusual for the relatively high percentage of such plants but may be a result of the founding individual or individuals carrying genes for this abnormality. Hunter (1988b) stated that seedlings from fruit of the 'monstrose' form of *C. uruguayanus* will be nearly 100% true to form. In the current example, juveniles or small adults of both 'cristate' and 'monstrous' individuals were more common than large mature individuals over 2 m in height.

Acknowledgements

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A revision of *Eucalyptus normantonensis* Maiden & Cambage (Myrtaceae) and its allies

A.R. Bean

Summary

Bean, A.R. (2000). A revision of the *Eucalyptus normantonensis* Maiden & Cambage (Myrtaceae) and its allies. *Austrobaileya* 5(4): 679–685. Descriptions, distribution maps and an identification key are provided for the four species comprising the *E. normantonensis* group, including one new species (*E. provecta*) and one new combination (*E. tardecidens*). All species occur in northern Queensland, with one extending to the Northern Territory.

Keywords: *Eucalyptus, Eucalyptus normantonensis, Eucalyptus provecta*, Myrtaceae, Queensland, taxonomy, new species, key

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Introduction

The box-group of eucalypts, i.e. species with scaly, short-fibred, persistent bark, reniform cotyledons, petiolate juvenile leaves, adnate anthers and terminal, paniculate inflorescences was distinguished by Blakely (1934) as *Eucalyptus* ser. *Buxeales* Blakely. This natural grouping is still recognised today. Within the box-group, members of the *E. normantonensis* group share the following characteristics: rough grey bark at least on lower stems; adult leaves narrow-lanceolate, concolorous, green to grey-green; juvenile leaves ovate to lanceolate, grey-green; fruits 3–5.5 mm long, hemispherical, ovoid or cylindrical, valves included.

E. normantonensis was named by Maiden and Cambage in 1919, and was initially known only from Normanton in north-western Queensland. Subsequently, the name was applied to a wide range of trees and mallees extending from near the east coast of Queensland to the extreme east of Western Australia (Hall & Brooker 1974). Johnson & Hill (1991) recognised the distinctiveness of some of these populations by naming *E. persistens* with two subspecies, from eastern Queensland.

The closest affinity of *E. normantonensis*, and hence of the group as a whole, has never been clear. Maiden originally considered it to be a form of *E. gracilis* F.Muell., a species from southern Australia, which differs fundamentally because of its bisected cotyledons and smaller subversatile anthers. Blakely (1934) placed *E. normantonensis* close to *E. microtheca* F.Muell. and *E. rummeryi* Maiden. Pryor and Johnson (1971) placed it next to *E. largeana* Blakely and *E. lucasii* Blakely. Chippendale (1988) placed it next to *E. tectifica* F.Muell. and *E. chlorophylla* Brooker & Done. A phylogenetic analysis of the 'box'-group will be necessary to determine more precisely, the relationships between the constituent taxa.

Herbarium material of the *E. normantonensis* group is very similar to *E. largiflorens* F.Muell., however *E. largiflorens* is readily distinguished in the field by the linear juvenile leaves, completely rough almost-black bark and alluvial soil habitat. Furthermore, the distribution of *E. largiflorens* does not overlap with any member of the *E.normantonensis* group.

Of the species occurring in the same geographic area, herbarium material of *E. microtheca* and *E. chlorophylla* has been misidentified as *E. normantonensis*, and vice-versa. *E. microtheca* differs by its smaller and thinner-walled fruits, while *E. chlorophylla* differs by the larger obconical fruits and very glossy leaves.

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The individual members of the *E. normantonensis* group (*E. normantonensis, E. persistens, E. tardecidens* and *E. provecta*) often cannot be distinguished in the herbarium if material is incomplete. Nevertheless the differences between the taxa are significant and not merely quantitative (as outlined in the key). All taxa are allopatric, allowing placement of incomplete specimens with accompanying locality data.

Taxonomy

Eucalyptus normantonensis Maiden & Cambage, J. & Proc. Roy. Soc. New South Wales 52: 489 (1919). **Type:** Queensland. BURKE DISTRICT: Normanton, [17° 4–‘ S 141° 0–‘ E], August 1913, *R.H. Cambage* 3930 (holo: NSW; iso: BRI).

E. bicolor var. *xanthophylla* Blakely, Key Eucalypts 232 (1934); *E. largiflorens* var. *xanthophylla* (Blakely) Cameron, Victoria Naturalist 63: 42 (1946). **Types**: Camooweal, Qld, 26 June 1922, *S.A. White s.n.* (syn: ?, n.v.); Barrow Creek, N.T., 3 May 1922, *S.A. White* 244 (syn: NSW; isosyn: AD).

Mallee 2–8 metres high, lignotuberous. Bark box-type on lower stems, mottled light and dark grey, closely adhering; smooth, grey to bronze-coloured above. Juvenile leaves alternate, petiolate, broadly lanceolate to ovate, up to 8×3 cm, dull (internally glaucous). Adult leaves narrowly lanceolate, 8-11.5×0.6-1.4 cm, alternate, leathery, concolorous, dull-yellow to shiny-green; penninerved, lateral veins at 35-50° to the midrib; reticulation dense, incomplete, oil glands intersectional; petioles 0.6-1.0 cm long. Inflorescences pseudo-terminal, paniculate, umbellasters 7-flowered; peduncles thick, more or less terete, 4.5-8 mm long at anthesis. Mature buds obovoid to ellipsoidal, 3.0-4.0 mm long, 2-2.5 mm in diameter, pedicels 1.5-4 mm long. Hypanthium unribbed; operculum scar present; outer operculum shed long before anthesis; inner operculum hemispherical, with or without umbo, smooth, thin; stamens white, in about 4 whorls; inner whorls inflexed, fertile, 0.8-2.0 mm long; outer whorls irregularly flexed, 2.0-3.0 mm long, without anthers. Anthers ovoid, adnate, basifixed, opening by pores. Style terete, 1.6-2.0 mm long, stigma blunt. Ovary 3-4-locular, ovules in 4 longitudinal rows. Fruits hemispherical, hemispherical or shortly cylindrical, 3.0-4.0(-4.5) mm long, 3.0-4.0 mm in diameter, thick-walled, disc annular, descending, valves obtuse, enclosed. Seeds ellipsoidal, finely and evenly reticulate, 0.9-1.2 mm long, not toothed, dark brown; chaff irregular in shape, smaller than seeds, pale brown.

Selected specimens: **Queensland.** BURKE DISTRICT: Normanton, Aug 1936, *Blake* 12477 (BRI); 27.9 km S of Croydon turnoff on Cloncurry road, S of Normanton, Mar 1990, *Brooker* 10425 (BRI, CANB, DNA, NSW); 14.9 km from Mt Isa on Camooweal road, Mar 1990, *Brooker* 10433 (BRI, CANB, MEL); 40 km W of Mt Isa on Barkly Highway, Aug 1984, *Hill* 1041 *et al.* (BRI, CANB, NSW); 20 miles [32 km] SW of Normanton, Aug 1953, *Perry* 3944 (BRI, CANB); 64 miles [102 km] SE of Burketown, Jul 1954, *Speck* 4774 (BRI) GREGORY NORTH DISTRICT: 7.7 km W of Dajarra, on road to Mt Isa, Jul 1988, *Bean* 890 (BRI); 122 km W of Winton, W of Cadell Creek, Mar 1990, *Brooker* 10435 (BRI, DNA, MEL, NSW); Bladensburg N.P., S of Winton, Opalton road, Mar 1998, *Forster* PIF22187 & *Booth* (AD, BRI, CANB, DNA, MEL, NSW); on Standish Ranges, 1 km W of Ibis Bore, 13 km SW of The Monument, Oct 1984, *Neldner* 1524 (BRI); 28 km NNW of ‘Pathungra’, Sep 1977, *Purdie* 1032 (BRI). MITCHELL DISTRICT: 32 km S of Stonehenge on road to Jundah, Aug 1978, *Dick* WQ187 (BRI). Northern Territory. 20 km SW of Barrow Ck, May 1994, *Albrecht* 5864 (BRI, CANB, DNA, NSW, NT); NW of Mt Strezleckii, May 1952, *Bateman* 327 (BRI); 16 miles [26 km] E of Coniston HS., Feb 1955, *Chippendale* 1236 (BRI); near Redbank Gorge, Macdonnell Ranges, Sep 1958, *Chippendale* 4884 (BRI, DNA); Ormiston Gorge, north ridge, Jun 1972, *Dunlop* 2627 (BRI, DNA); Central Mt Stuart, Jun 1969, *Maconochie* 714 (BRI, DNA); 7 miles [11 km] N of Tennant Creek, Apr 1948, *Perry* 570 (BRI).

Distribution and habitat: *E. normantonensis* is distributed in parts of western Queensland as far south as Jundah, and in central parts of the Northern Territory (Map 1). It grows on ridges (sometimes lateritised) with shallow gravelly soil.

Phenology: Flowers are recorded mainly from March to August.

Notes: *E. normantonensis* has the ability to produce flowers and fruits while the leaves are still in an intermediate stage of ontogeny. This accounts for the small proportion of disparately broad-leaved specimens in herbaria.

Buds and fruits of some Northern Territory material are larger than the Queensland material, but the difference is not considered to be sufficient to warrant any taxonomic recognition. Similarly for difference in leaf colour; in plants from the type area they are green and rather glossy, while from inland areas they are glaucous or yellowish and not as glossy.

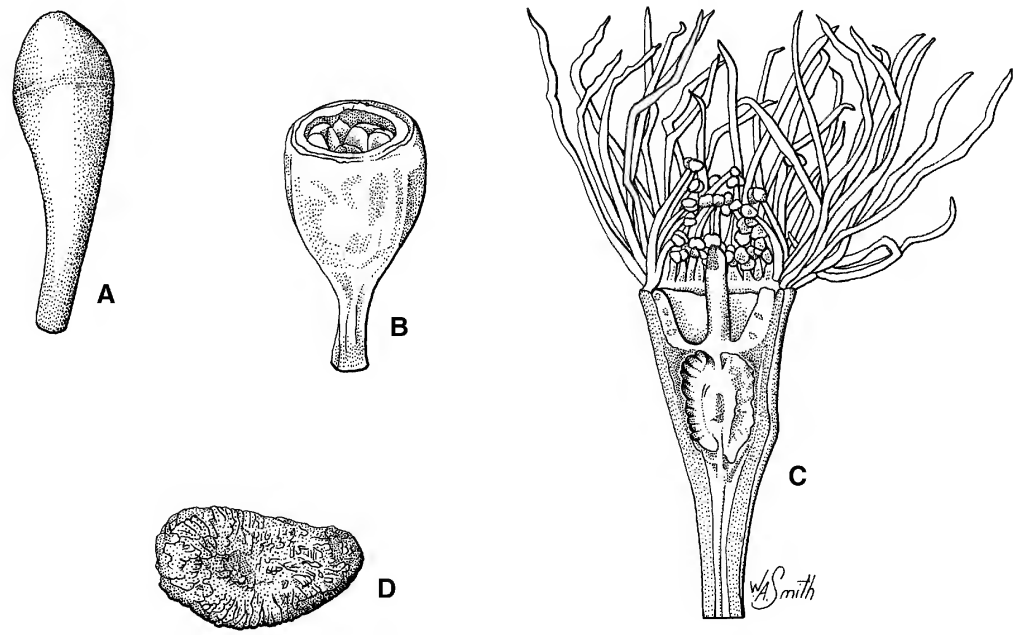


Fig. 1. ***Eucalyptus provecta.*** A. mature bud, with operculum scar × 5. B. fruit, showing enclosed valves × 5. C. longitudinal section of flower, showing inner fertile stamens and outer staminodes ×7. D. seed × 20. All from *Bean* 12245.

Conservation status: Not considered to be rare or threatened.

Eucalyptus provecta A.R.Bean **sp. nov.** affinis *E. normantonensi* a qua habitu arboris, cortice ubique persistenti, petiolis longioribus, filamentis staminalibus in verticillo extimo 4.5–5.5 mm longis differt. **Typus**: Queensland. Cook District: 4.8 km south of 'Wirra Wirra', via Forsayth, 18° 38'S 143° 43'E, 7August 1997, *A.R.Bean* 12245 (holo: BRI; iso: CANB, MEL, NSW, QRS).

Tree to 12 metres high, rarely a mallee, lignotuberous. Bark box-type, persistent throughout, grey, mottled light and dark grey, closely adhering. Juvenile leaves alternate, petiolate, lanceolate to broadly lanceolate, up to 12×3.5 cm, dull (internally glaucous). Adult leaves lanceolate to narrowly lanceolate, 8–13×0.8–1.7 cm, alternate, leathery, concolorous, dull; penninerved, lateral veins at 35–50° to the midrib; reticulation dense, incomplete, oil glands intersectional; petioles 1.0–1.7 cm long. Inflorescences pseudo-terminal, paniculate, umbellasters 7-flowered; peduncles thick, more or less terete or somewhat flattened, 4–8 mm long at anthesis. Mature buds ovoid to obpyriform, 3.5–5.0 mm long, 2.0–3.0 mm in diameter, pedicels 3–6 mm long. Hypanthium unribbed; operculum scar present; outer operculum shed long before anthesis; inner operculum hemispherical, with or without umbo, smooth, thin; stamens white, inner whorls inflexed, fertile, 1.5–2 mm long, outer whorls irregularly flexed, 4.5–5.5 mm long, without anthers. Anthers ovoid, adnate, basifixed, opening by pores. Style terete, 1.7–2 mm long, stigma tapered. Ovary 3–4-locular, ovules in 4 longitudinal rows. Fruits ovoid-

truncate to obconical, 3.5–5.5 mm long, 3.5–5.0 mm in diameter, thick-walled, disc annular, valves obtuse, enclosed. Seeds ellipsoidal, finely reticulate, 0.9–1.5 mm long, not toothed, dark brown; chaff irregular in shape, smaller than seeds, pale brown. Fig. 1.

Specimens examined: **Queensland**. BURKE DISTRICT: Chudleigh Park station, upper reaches of Stawell River, May 1995, *Forster* PIF16503 & *Figg* (BRI, CANB, NSW). COOK DISTRICT: 21.8 km from Forsayth towards Einasleigh, Jun 1987, *Bean* 606 (BRI); Bulleringa N.P., 80 km NW of Mount Surprise, Oct 1992, *Bean 5119* (BRI, CANB, MEL); 0.5 km E of 'Wirra Wirra' HS., east of Forsayth, Aug 1997, *Bean* 12249 (BRI); just S of Beverley Hills HS, SW of Einasleigh, Aug 1998, *Bean* 13765 & *Fox* (BRI, CANB); crest of Newcastle Range, Jul 1954, *Blake* 19525 (BRI); Gulf Development road, c. 15 km W of Mt Surprise, Aug 1979, *Clarkson* 2534 & *Byrnes* (BRI); Mopata H 'Beverley Hills', edge of Red plateau, W of head of Robertson River, Sep 1994, *Godwin* EU589C (BRI, CANB, DNA, NSW); c. 20 km S of Robin Hood station on track to Percy Vale, Aug 1982, *Hill* 1062 & *Johnson* (BRI, CANB, NSW); NW of Werrington Stn, NW of Hughenden, Oct 1978, *Martensz* 1246 (BRI, CANB); 12 miles [19 km] E of Forsayth township, Jul 1953, *Perry* 3848 (BRI); 39 miles [62 km] S of Forsayth township, Jul 1953, *Perry* 3852 (BRI).

Distribution and habitat: *E. provecta* extends from Bulleringa National Park (north of Mt Surprise) to Chudleigh Park station north of Hughenden (Map 1).

Phenology: Flowers are recorded from May to August.

Affinities: *E. provecta* is most closely related to *E. normantonensis*, but differs by the tree habit, bark persistent throughout, petioles 1.0–1.7 cm long (0.6–1 cm for *normantonensis*), filaments in outer whorl 4.5–5.5 mm long (2–3 mm for *normantonensis*) and the mostly larger fruits. *E. provecta* differs from *E. tardecidens* by the flowers with staminodes, the often shorter buds, and slightly longer style. *E. provecta* differs from *E. persistens* by the flowers with staminodes, the style 1.7–2 mm long (2.5–3 mm long for *persistens*) and the larger fruits.

Conservation status: Not considered to be rare or threatened.

Etymology: From the Latin *provecta* - advanced, carried forward, extended; in reference to the rough bark extending throughout, in contrast to *E. normantonensis*.

Eucalyptus persistens L.A.S.Johnson & K.D.Hill, Telopea 4(2): 336 (1991); *Eucalyptus persistens* L.A.S.Johnson & K.D.Hill subsp. *persistens*, Telopea 4(2): 336 (1991). **Type**: Queensland. SOUTH KENNEDY DISTRICT: 4.8 km NE of Shuttleworth bore, 'Lou Lou Park' Station, 22° 15'S 146° 09'E, 21 August 1984, *K.D. Hill* 1182 & *L.A.S. Johnson* (holo: NSW; iso: BRI, CANB, MEL).

Tree to 12 metres high, or sometimes a mallee, lignotuberous. Bark box-type, mottled light and dark grey, closely adhering; persistent throughout. Juvenile leaves alternate, petiolate, ovate, up to 10×4 cm, dull. Adult leaves narrowly lanceolate, 7.5–13×0.9–2 cm, alternate, leathery, concolorous, somewhat shiny; penninerved, lateral veins at 35–50° to the midrib; reticulation dense, incomplete, oil glands intersectional; petioles 0.8–1.7 cm long. Inflorescences pseudo-terminal, paniculate, umbellasters 7-flowered; peduncles thick, more or less terete, 4–8 mm long at anthesis. Mature buds ovoid to obovoid, 4–6 mm long, 2–3 mm in diameter, pedicels (2–)4–6 mm long. Hypanthium unribbed; operculum scar absent; inner operculum conical, smooth, thin; stamens white, inner whorls inflexed, fertile, 1–2 mm long; outer whorls irregularly flexed, 4–5 mm long, fertile. Anthers ovoid, adnate, basifixed, opening by pores. Style terete, 2.5–3 mm long at anthesis, stigma blunt to tapered. Ovary 3–4-locular, ovules in 4 longitudinal rows. Fruits ovoid-truncate to cylindrical, 3–4.5 mm long, 3–3.5 mm in diameter, thick-walled, unribbed; disc annular; valves obtuse, enclosed. Seeds ellipsoidal, finely reticulate, 1.2–1.5 mm long, not toothed, dark brown; chaff irregular in shape, smaller than seeds, pale brown.

Selected specimens: **Queensland.** BURKE DISTRICT: W of "Warang", White Mountains N.P., Jun 1992, *Bean* 4624 (BRI, MEL). NORTH KENNEDY DISTRICT: "Upsan Downs", 2.5 km S of Greenvale, Apr 1990, *Batianoff* 900428 (BRI, CANB, NSW); near Bogie River at "Etonvale", WSW of Bowen, Mar 1992, *Bean* 4245 (BRI, NSW); Flinders Highway, 18.4 km W of Charters Towers, Aug 1997, *Bean* 12291 (BRI, CANB); Valley

of Lagoons, 57 km SW of Mt Garnet, May 1989, *Brooker* 10186 (BRI, CANB, DNA, MEL, NSW); between Wairuna and Minnamoolka, Sep 1996, *Cumming* 15124 (BRI); 2 miles S of Middle Ck, Mt Garnet, Jun 1971, *Hyland* 5073 (BRI, QRS); Charters Towers–Clermont road, 45 miles [72 km] from Charters Towers, May 1960, *Johnson* 1855 (BRI); 1 mile [1.6 km] S of Niall Station, Jul 1954, *Lazarides* 4632 (BRI, CANB); 6 miles ESE of Conjuboy Station, Jul 1953, *Perry* 3745 (BRI). SOUTH KENNEDY DISTRICT: 19 miles [30 km] WNW of "Scartwater" station, May 1964, *Adams* 977 (BRI, CANB); 1.5 miles [2.4 km] W of Carmichael Station, Jul 1964, *Adams* 1175 (BRI, CANB); "Cairo", c. 35 miles [56 km] N of Clermont, Feb 1962, *Besset* E322 (BRI); NNW of Clermont, between Miclere and Brown Creeks, Apr 1945, *Blake* 15688 & *Webb* (BRI); Mt Coolon–Collinsville road, 0.7 km SW of Caves Ck, Jan 1996, *Champion* 1302 & *Pollock* (BRI, CANB, NSW); near the homestead on Moonoomoo Station, Oct 1983, *Henderson* H2788 et al. (BRI); 12.4 km W of Eungella Dam, Aug 1976, *Kleinig* DK297 (BRI, CANB); 3 miles [5 km] S of Cape River on Charters Towers–Clermont road, Jun 1966, *Pedley* 2128 (BRI); MITCHELL DISTRICT: 137 km S of Torrens Creek on road to Aramac, May 1994, *Brooker* 11918 (BRI, CANB); Berricania, Apr 1919, *White* s.n. (BRI); S of Mannya N.P., Aug 1994, *Fensham* 1796 (BRI).

Distribution and habitat: *E. persistens* extends from the White Mountains area to just north of Clermont, and east to Woodstock and Collinsville (Map 2). It often grows on the slopes of lateritic ridges, on pale infertile soils. It may also grow in deep sands or loams in undulating terrain.

Phenology: Flowers are recorded mainly from May to October.

Affinities: It differs from the rest of the group by the persistent outer operculum.

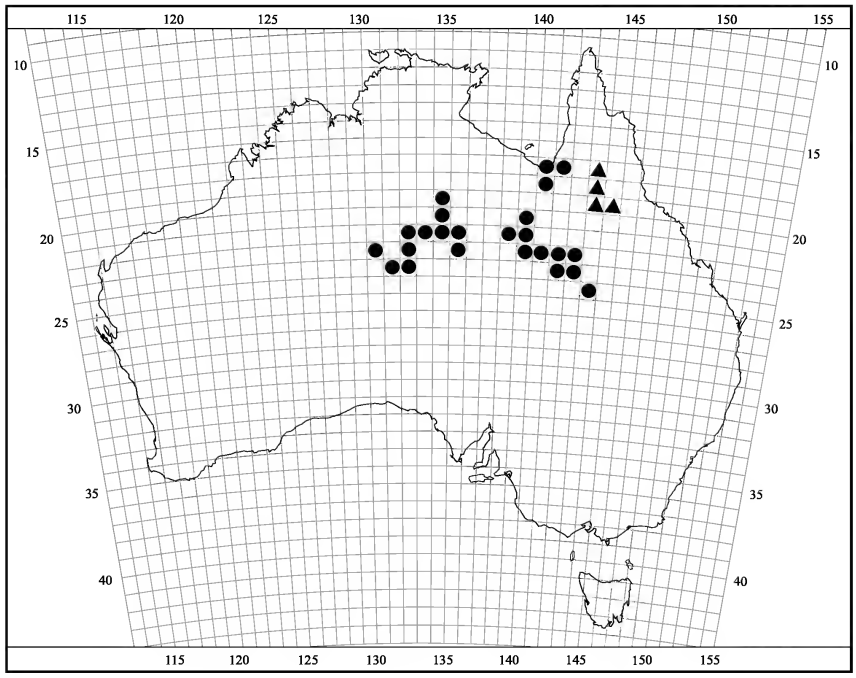
Conservation status: Not considered to be rare or threatened.

Eucalyptus tardecidens (L.A.S.Johnson & K.D.Hill) A.R.Bean **comb**. et **stat. nov.** *Eucalyptus persistens* subsp. *tardecidens* L.A.S.Johnson & K.D.Hill, Telopea 4(2): 337 (1991). **Type**: Queensland. COOK DISTRICT: 5.0 km S of Mt Carbine on Mareeba road, 16°33'S 145° 09'E, 12 August 1984, *K.D. Hill* 1066, *L.A.S.Johnson & D.F. Blaxell* (holo: NSW; iso: BRI, CANB, MEL).

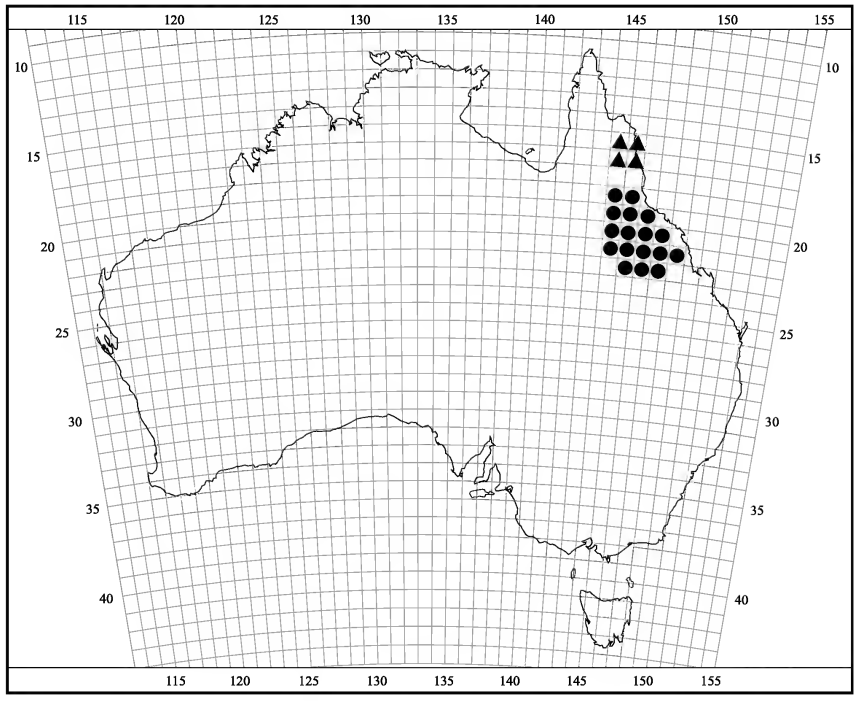
Mallee or tree to 7 metres high, lignotuberous. Bark box-type, mottled light and dark grey, closely adhering, persistent throughout. Juvenile leaves alternate, petiolate, broadly lanceolate, c. 8.5×3.0 cm, dull. Adult leaves lanceolate or narrowly lanceolate, 7.5–15×0.8–2.1 cm, alternate, leathery, concolorous, green, dull to shiny; penninerved, lateral veins at 35–50° to the midrib; reticulation dense, incomplete, oil glands intersectional; petioles 1.0–1.5 cm long. Inflorescences pseudo-terminal, paniculate, umbellasters 7-flowered; peduncles thick, more or less terete or somewhat flattened, 4–9 mm long at anthesis. Mature buds obovoid to obpyriform, 4.5–6 mm long, 2.5–3 mm in diameter, pedicels 3.5–6 mm long. Hypanthium ribbed; operculum scar present; outer operculum shed long before anthesis; inner operculum conical to almost hemispherical, smooth, thin; stamens white, inner whorls inflexed, 1–2 mm long, fertile; outer whorls irregularly flexed, 4.5–5 mm long, fertile. Anthers ovoid, adnate, basifixed, opening by pores. Style terete, 2–2.5 mm long at anthesis, stigma blunt. Ovary 3–4-locular, ovules in 4 longitudinal rows. Fruits ovoid-truncate to cylindrical, 4.5–5.5 mm long, 4–4.5 mm in diameter, thick-walled, faintly longitudinally ribbed; disc annular; valves obtuse, enclosed. Seeds ellipsoidal, finely reticulate, 0.9–1.2 mm long, not toothed, dark brown; chaff irregular in shape, smaller than seeds, pale brown.

Selected specimens: **Queensland.** COOK DISTRICT: 9.4 miles [15 km] by road N of Palmer River towards Cooktown, Aug 1973, *Brooker* 4023 (BRI, CANB); 25.3 km from Mt Molloy towards Mt Carbine, Nov 1992, *Brooker* 11330 (BRI, CANB, NSW); 11.7 km SE of Mt Janet, on survey road along the Dividing Range, Sep 1984, *Clarkson* 5508 (BRI, CANB, NSW, QRS); 7.2 km E of the Peninsula Development road on a track to the West Normanby River, Sep 1984, *Clarkson* 5532 (BRI, CANB, DNA, MEL, NSW); 14.7 km N of Lakeland Downs on track to Bob's Hut, Oct 1993, *Clarkson* 10151 & *Neldner* (BRI, CANB, NSW); 2 km S of Mt Carbine on Mareeba road, Nov 1995, *Forster* PIF18126 & *Spokes* (BRI, QRS); Campbell Creek on Curraghmore Holding, Nov 1971, *Hyland* 5694 (BRI, QRS); 16 km S of Lakeland Downs, Nov 1989, *Jobson* 986 & *Lum* (BRI, DNA, CANB, MEL); Mt Carbine, Oct 1976, *Knowlton* 58 (BRI, QRS); 16 miles WNW of Mt Carbine, Jun 1968, *Pedley* 2601 (BRI); near Kelly St George River, c. 58 miles [93 km] NW of Mareeba, Oct 1962, *Smith* 12053 (BRI); Desailly Range, Jun 1971, *Stocker* 745 (BRI, QRS).

Distribution and habitat: *E. tardecidens* has a restricted distribution in northern



Map 1. Distribution of *Eucalyptus provecta* ▲, E. *normantonensis* ●



Map 2. Distribution of *Eucalyptus tardecidens* ▲, *E. persistens* ●

Queensland, extending from Lakeland Downs to south of Mt Carbine (Map 2).

Phenology: Flowers are recorded mainly from October to February.

Affinities: *E. tardecidens* has the largest fruits of the group. It differs from *E. persistens* by its ribbed hypanthium, shorter style, longer and broader fruits and presence of an operculum scar.

Conservation status: Although the geographical extent of this species is small, it is very common within its area of occurrence. No conservation coding is recommended.

Key to the species in the *Eucalyptus normantonensis* group

1. Stamens all fertile 2
   Outer whorl of stamens without anthers 3

2. Outer operculum shed very early; fruits 4.5–5.5×4–4.5 mm ..... **E. tardecidens**
   Outer operculum retained until anthesis; fruits 3–4.5×3–3.5 mm ..... **E. persistens**

3. Mallees; bark rough at base, smooth above; outer filaments 2–3 mm long; petioles 0.6–1.0 cm long ..... **E. normantonensis**
   Trees; bark rough throughout; outer filaments 4.5–5.5 mm long; petioles 1.0–1.7 cm long ..... **E. provecta**

Acknowledgements

I am grateful to Will Smith for the illustrations, to Les Pedley for the Latin diagnosis, and to the Director of NSW for access to that Herbarium.

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Homoranthus coracinus (Myrtaceae), a new species from Queensland

A.R. Bean

Summary

Bean, A.R. (2000). *Homoranthus coracinus* (Myrtaceae), a new species from Queensland. *Austrobaileya* 5(4): 687–689. A new and rare species of *Homoranthus* with black petals is described and illustrated, and compared to related species.

Key words: *Homoranthus, Homoranthus coracinus*, taxonomy, Queensland flora, Myrtaceae

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Introduction

Byrnes (1981) named a number of new taxa in *Darwinia* Rudge and *Homoranthus* A.Cunn. ex Schauer, distinguishing *Homoranthus* mainly by the presence of laciniate sepals. The circumscription of *Homoranthus* was changed by Craven and Jones (1991), who placed an emphasis on placentation and ovule number. The species described here conforms to their concept of *Homoranthus*. Because of the laciniate sepals, it also fits into *Homoranthus* sensu Byrnes.

The genus contains a high proportion of rare species of restricted distribution, on acidic substrates with little or no soil development. Two such species were described by Hunter (1998) from New South Wales.

Homoranthus coracinus A.R.Bean **sp. nov.** affinis *H. darwinioidi* autem conflorescentia 3–6 flora, foliis applanatis, petalis atris, stylo infra stigma pilis tantum aliquot praedito differt. **Typus:** Queensland. LEICHHARDT DISTRICT: Mt Mooloolong, Ka Ka Mundi National Park, via Springsure, 7 May 1999, *A.R. Bean* 14843 (holo: BRI (1 sheet + spirit); iso: CANB, MEL, NSW, distribuendi).

Prostrate to semi-prostrate shrub, to 0.3 m high and to 1.2 m diameter. Bark grey, fibrous, slightly furrowed. Leaves narrowly-obovate to obovate (as seen when viewed perpendicular to branchlet axis), 3.0–5.5 mm long, c. 0.4 mm wide, and 1.0–1.6 mm thick, mucronate, green or grey-green, margins entire; oil glands scattered, rather obscure. Petioles c. 0.5 mm long. Conflorescence terminal, anauxotelic, 3–6-flowered. Bracteoles cymbiform, 6–7 mm long, 2.4–2.7 mm wide, gland-dotted, apex obtuse, persistent at least until anthesis, enclosing hypanthia; pedicels (anthopodia) absent; peduncles thick, 2–3 mm long. Hypanthium cylindrical, 5.3–6 mm long, 2.8–3.3 mm diameter; puncticulate, yellow, with 4 indistinct longitudinal ribs basally; smooth, pink to red and unribbed distally. Sepals 5, laciniate, 3.2–4.3 mm long, 1.2–1.5 mm wide, erect, white, with 2–5 acute linear lobes, each 1.0–1.9 mm long. Petals broadly obovate, 2.7–3.0×2.2–2.7 mm, black, margin entire. Stamens 10, alternating with staminodes. Staminodes scarcely adnate to the adjacent stamen. Filaments c. 0.8 mm long, terete, tapering. Anthers globose, white, basifixed, dehiscing by small pores. Style 13–16 mm long, glabrous except for a few spreading hairs below the stigmatic area; stigma unexpanded, papillose. Ovules 7–8, collateral in two vertical rows. Fruit indehiscent, not enlarging after anthesis. Fig. 1.

Additional specimen examined: **Queensland.** LEICHHARDT DISTRICT: Ka Ka Mundi section of Carnarvon N.P., Apr. 1999, *Neill, Bouchard & Neill s.n.* (BRI).

Distribution and habitat: Known only from the north-western slopes of Mt Mooloolong

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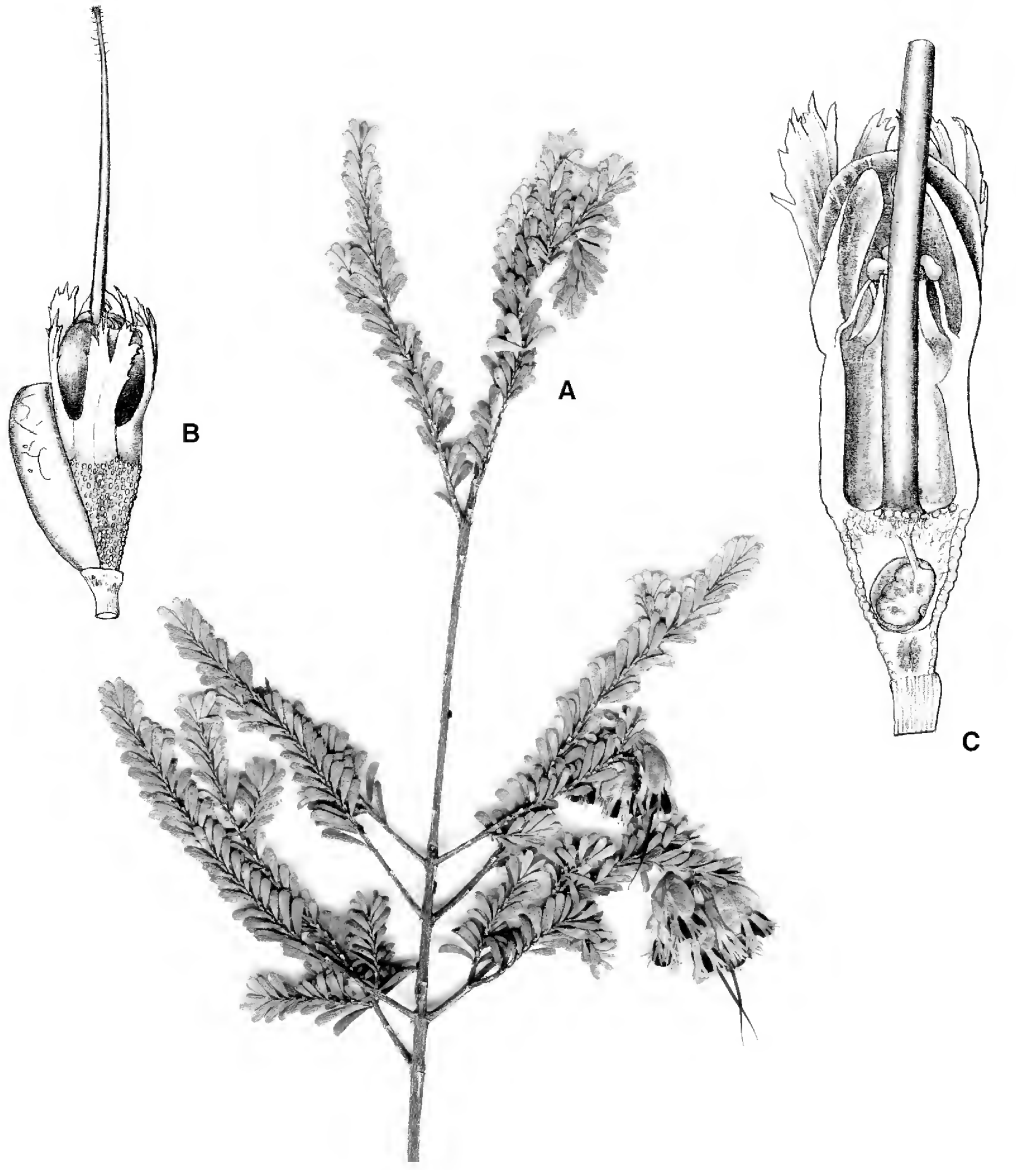

Fig. 1. ***Homoranthus coracinus***. **A.** flowering branch×1. **B**. exterior view of flower at anthesis with one bracteole removed×4. **C**. longitudinal section of flower×8. all from *Bean* 14843.

in Ka Ka Mundi National Park, SW of Springsure. It grows on a sloping shelf of quartzose sandstone with skeletal soil, supporting only scattered shrubs and stunted trees. The associated species include *Eucalyptus trachyphloia* F.Muell., *Leptospermum lamellatum* Joy Thomps., *Leucopogon flexifolius* R.Br. and *Homoranthus zeteticorum* Craven & S.R.Jones.

Phenology: Flowers have been recorded in April and May.

Affinities: *H. coracinus* differs from all other *Homoranthus* spp. (and perhaps from all other

Myrtaceae) by its petals, which are quite black in both fresh and dried material. It is most closely related to *H. darwinioides* and *H. porteri*, both of which also have large persistent bracteoles and laciniate sepals. *H. coracinus* differs from *H. darwinioides* by its 3–6-flowered conflorescence, flattened leaves, black petals and style with only a few hairs below the stigma. *H. coracinus* differs from *H. porteri* by the much shorter leaves, the fewer sepal laciniae, the black petals and the longer hypanthia.

Conservation status: Less than 100 plants are known from the type locality. It is possible that more populations will be found, but its habitat (extensive treeless areas on sandstone slopes) is not common. Applying the guidelines of the IUCN (Anon. 1994), a status of 'endangered' is recommended (Criterion D).

Etymology: From the Latin '*coracinus*' meaning raven-black, in reference to the petals.

To accommodate *H. coracinus*, the key given in Craven & Jones (1991) should be adjusted as follows:

4. Leaves 3–5.5 mm long
   Conflorescence 3–6-flowered; petals black; sepals with 2–5 laciniae..... **H. coracinus**
   Conflorescence 2–flowered; petals white; sepals with 6–10 laciniae..... **H. darwinioides**

4. Leaves 4.5–17 mm long (if less than 6 mm long then sepals with fewer than 5 laciniae)

Acknowledgements

I am grateful for the assistance of Bob Campbell, Queensland Parks and Wildlife Service, to Will Smith for the illustration and to Les Pedley for the Latin diagnosis. Thanks also to Greg Neill and David Bouchard for directions to the site.

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Two new species of *Apatophyllum* McGillivray (Celastraceae) from Queensland

A.R. Bean and L.W. Jessup

Summary

Bean A.R. & Jessup L.W. (2000). Two new species of *Apatophyllum* McGillivray (Celastraceae) from Queensland. *Austrobaileya* 5(4): 691–697. *Apatophyllum teretifolium* and *A. flavovirens*, both endemic to Queensland, are newly described and illustrated. The distribution, habitat and conservation status of each is discussed. Generic distinctions between *Apatophyllum* and *Maytenus* are discussed, including a comparison of the stomatal types possessed by the two genera. A key to all known species of *Apatophyllum* is presented.

Keywords: *Apatophyllum, Maytenus, Gymnosporia, Apatophyllum teretifolium, Apatophyllum flavovirens*, Celastraceae, key, taxonomy, stomata, new species, Australian flora, Queensland.

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Introduction

The genus *Apatophyllum* was described by McGillivray (1971), comprising two species, both rare, from eastern Australia. Since then, a further species has been named from Western Australia (Cranfield & Lander, 1992).

Apatophyllum is closely related to both *Psammomoya* Diels & Loes. and *Maytenus* Molina.

Apatophyllum has been adequately compared and contrasted with *Psammomoya* (McGillivray loc. cit.; Cranfield & Lander, loc. cit.). However, no previous comparisons have been made between *Apatophyllum* and *Maytenus* Molina, except McGillivray's report of an examination of wood structure by C.R. Metcalfe (loc. cit.) where he states that "a comparison [of *Apatophyllum*] with two sclerophyllous Australian species of *Maytenus* did not reveal any ... significant similarities".

Apatophyllum has been distinguished from *Maytenus* (Jessup 1984) by its solitary inflorescence. The discovery of a species with cymose 1–3 flowered inflorescence has therefore somewhat blurred the generic boundary between these genera. *Maytenus* undoubtedly contains a rather heterogeneous assemblage of species, and this is evidenced by the recent reinstatement of *Gymnosporia* (Wight & Arn.) Hook.f. by Jordaan & van Wyk (1999). A review of the whole of *Maytenus* and its allies is needed to establish the phylogenetic relationships of the group, but we feel that the maintenance of *Apatophyllum* as a genus is justified, because of differences in inflorescence structure, leaf venation and stomatal type.

C.R. Metcalfe (in McGillivray loc. cit.) reported paracytic stomata for *Apatophyllum* and *Psammomoya*, which was the first recorded occurrence of that type of stoma for the family. Subsequently Den Hartog & Baas (1978) reported paracytic stomata from several Celastraceae genera, but from only two Australian species (*Hedraianthera porphyropetala* F.Muell. and *Euonymus globularis* Ding Hou). We have examined the stomata of several species of *Apatophyllum* and *Maytenus s.l.*. The results are reported below.

Apatophyllum differs from Australian *Maytenus* by its inflorescences formed strictly in the axils of true leaves, usually solitary; the well developed peduncles and the greatly

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reduced primary inflorescence axis; paracytic stomata; and the parallel leaf venation and pungent leaf apices. *Maytenus*, by contrast, often has inflorescences borne in the axils of small bracts or prophylls; the primary axis is well-developed, giving rise to a pseudo-racemose inflorescence (or, in the case of *M. fasciculiflora* Jessup, both peduncle and primary axis are greatly reduced), usually several-flowered; stomata laterocytic or cyclocytic; and the leaf venation reticulate, even in the narrowest leaves, and leaf apices never pungent.

To accommodate the two new species described below, the generic description for *Apatophyllum* given in Jessup (1984) needs to be amended as follows: leaves opposite, subopposite or alternate, inflorescences 1–3 flowered, cymose, axillary, bisexual; sepals 4 or 5, petals 4 or 5, stamens 4 or 5; ovary + immersed in disc, 2 or 3-locular.

Jordaan and van Wyk (1999) reinstated the genus *Gymnosporia* (Wight & Arn.) Hook.f. We accept this change and agree that the names *Maytenus emarginata* (Willd.) DingHou, *Gymnosporia emarginata* (Willd.) Theu. and *G. senegalensis* (Lam.) Loes. should not be applied to Malesian and Australian specimens *sensu* Hou (1962) and Jessup (1984). We consider that these specimens (including Brass 6229 which was cited by Den Hartog & Baas (1978)), should rightly be called *Gymnosporia inermis* Merr. & Perry.

Stomata

Microscope slides of cleared cuticle were prepared for 4 species of *Apatophyllum* (*A. teretifolium, A. flavovirens, A. constablei* McGillivray, *A. olsenii* McGillivray) and 3 species of *Maytenus* (*M. silvestris* Lander & L.A.S.Johnson, *M. cunninghamii* (Hook.) Loes., *M. disperma* (F.Muell.) Loes. and for *G. inermis*.

Stomatal types were classified using the terminology given in Dilcher (1974), Den Hartog & Baas (1978) and Inamdar et al. (1986). All of the *Apatophyllum* species examined were found to possess paracytic stomata, characterised by the consistent presence of two subsidiary cells adjacent to the guard cells and with the same orientation (Fig. 3A-C). *Maytenus silvestris* and *Gymnosporia inermis* were found to possess laterocytic stomata, according to the terminology of Den Hartog & Baas (1978), where three or more subsidiary cells border onto the lateral sides of the guard cell pair. In *Maytenus disperma* and *M. cunninghamii* the stomata are apparently cyclocytic, where the subsidiary cells are not all arranged laterally to the guard cells. In both the laterocytic and cyclocytic types examined, the subsidiary cells are partially submerged, so that they are not plainly visible when the rest of the epidermis is in sharp focus.

Species	Stomatal type	Voucher
Maytenus silvestris	laterocytic	Halford Q1551 (BRI)
Maytenus cunninghamii	cyclocytic	Grimshaw PG473 (BRI)
Maytenus disperma	cyclocytic	Forster 3235 et al. (BRI)
Gymnosporia inermis	laterocytic	Brass 6229 (BRI)
Apatophyllum olsenii	paracytic	Forster 16341 & Thompson (BRI)
Apatophyllum teretifolium	paracytic	Bean 1401 (BRI)
Apatophyllum flavovirens	paracytic	Bean 2225 (BRI)
Apatophyllum constablei	paracytic	Constable & McGillivray 3061 (BRI)

Taxonomy

Apatophyllum teretifolium A.R.Bean & Jessup **sp. nov.** affinis *A. constablei* autem stipulis brevioribus, fructibus longioribus, floribus pro parte maxima 4-meris, petalis brevioribus differt. **Typus:** Queensland. LEICHHARDT DISTRICT: Lonesome National Park, NNE of Injune, 6 May 1999, *A.R.Bean* 14832 (holo: BRI; iso: AD, K, MEL, MO, NSW, PERTH, distribuendi)

Apatophyllum sp. (Expedition Range E.J. Thompson AQ440723) in Henderson (1997).

Densely branched rounded shrub 25–40 cm high, glabrous. Leaves sessile, opposite to sub-opposite or occasionally alternate, linear, (6–) 8–12 × 0.3–0.5 mm, elliptical in cross-section; venation obscure, longitudinal; apex acute to acuminate, pungent-pointed. Stipules linear, 0.9–1.5 mm long, brown, persistent, mostly broad-based and with 2 or 3 short lateral lobes; apex acute to acuminate. Inflorescence axillary, reduced to a single flower, with 1 or sometimes 2 pairs of empty pherophylls shortly distal to the base of the axis. Anthopodia 1.7–2.5 mm long. Pherophylls cymbiform, 0.9–1.5 mm long, apex acute, margins denticulate. Perianth 4 or 5-merous. Sepals deltate, 0.6–0.7 mm long, persistent on mature capsule; apex acuminate, margins denticulate. Petals deltate, 0.9–1.2 mm long, 0.7–0.9 mm wide at base, white, somewhat persistent beyond anthesis; apex acute, margins entire. Stamens 4 or 5, equal in number to petals, inserted on margin of disc; filaments tapering, 0.4–0.5 mm long, somewhat persistent beyond anthesis; anthers basifixed, 0.3–0.4 mm long and c. 0.4 mm across. Disc fleshy, shallowly cupular. Ovary ovoid, 2-locular, almost completely immersed in disc; ovules 2 per loculus. Style 0.6–0.7 mm long. Capsule compressed obovoid, 2-valved, 5.2–6 × 2.0–2.8 mm, surface smooth or minutely papillose. Seeds ellipsoidal, c. 3.2 mm long, c. 1.4 mm in diameter; testa dark brown, smooth but with fine transverse markings; aril white, clasping base of seed. Fig. 1, 3C.

Specimens examined: **Queensland.** LEICHHARDT DISTRICT: Lonesome N.P., north-east of Injune, Mar 1990, *Bean* 1401 (BRI); Expedition Range, c. 30 km WSW of Bauhinia Downs, Mar 1984, *Thompson* s.n. (BRI). BURNETT DISTRICT: near Panda Lane, Waaje, NW corner of Barakula S.F., via Chinchilla, Mar 1998, *Bean* 13138 (BRI, CANB, NSW, MEL).

Distribution and habitat: *A. teretifolium* is known from 3 localities; the Expedition Range, Lonesome National Park, and the Barakula State Forest near Chinchilla (Map 1). It grows in *Eucalyptus* dominated woodland to low open woodland with a heathy understorey, on shallow sandy soils.

Phenology: Flowers and fruits are recorded for March and May.

Notes: A large proportion of seeds are evidently destroyed by caterpillars. Insect predation is likely to be a limiting factor for regeneration of this species.

A. teretifolium differs from *A. constablei* by the shorter stipules, longer fruits, the predominantly 4-merous flowers and the shorter petals.

Conservation status: Three populations of *A. teretifolium* have been recorded. Applying the IUCN guidelines (Anon. 1994), a category of 'vulnerable' is proposed (Criterion D2).

Etymology: From the Latin *teretifolius*, meaning 'with terete leaves'.

Apatophyllum flavovirens A.R.Bean & Jessup **sp. nov.** affinis *A. olsenii* autem foliis latioribus, stipulis longioribus, inflorescentiis cymosis, pedunculis anthopodiis longioribus, ovario 3-loculari, petalis longioribus differt. **Typus:** Queensland. LEICHHARDT DISTRICT: Bull Creek Gorge, 15 km W of 'Castlevale', W of Springsure, 4 September 1990, *A.R. Bean* 2225 (holo: BRI; iso:AD, DNA, MEL, NSW, PERTH).

Apatophyllum sp. (Bull Creek A.R.Bean 2225) in Henderson (1997).

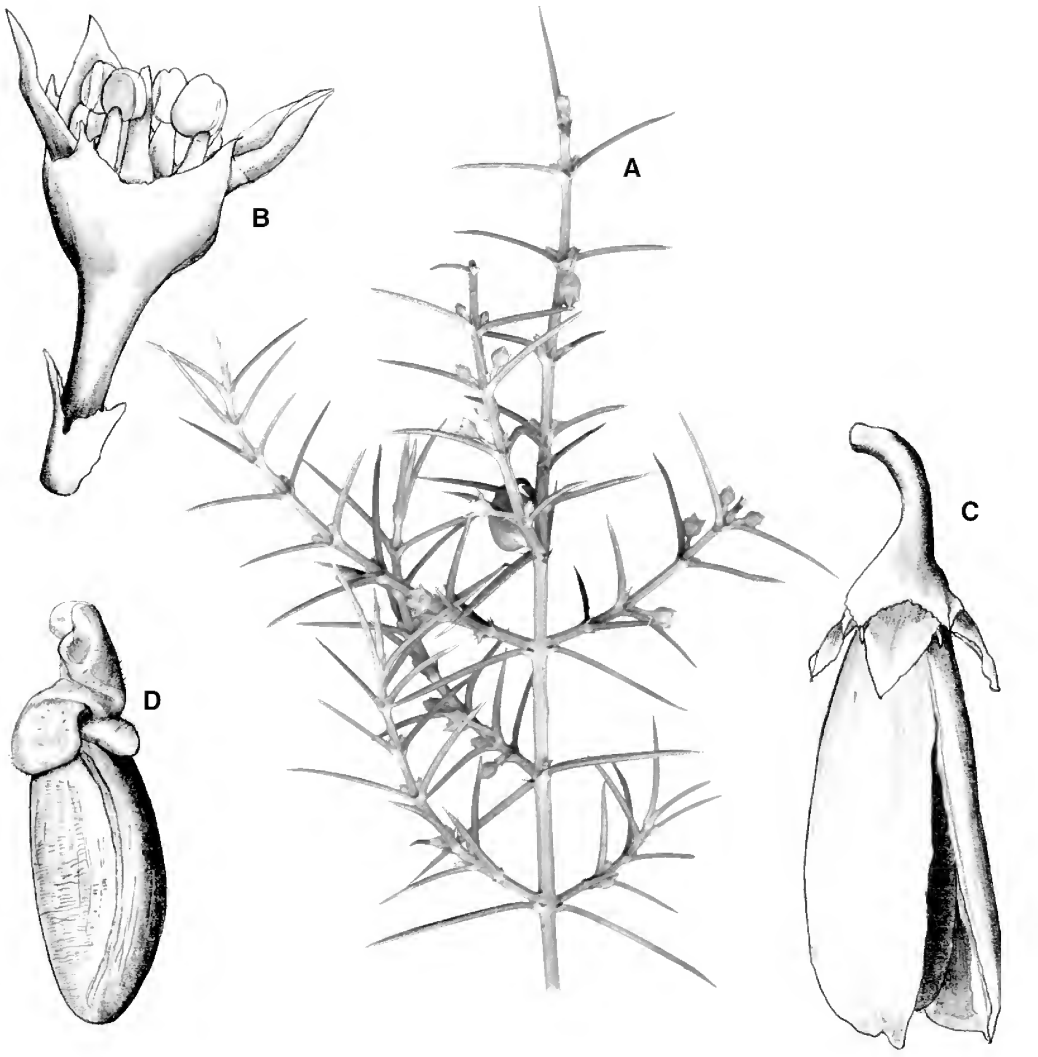

Fig. 1. *Apatophyllum teretifolium.* A. fertile branchlet × 2. B. flower (with one petal removed) and prophylls × 20. C. fruit × 10. D. seed × 10. A-C, *Bean* 14832; D, *Bean* 1401.

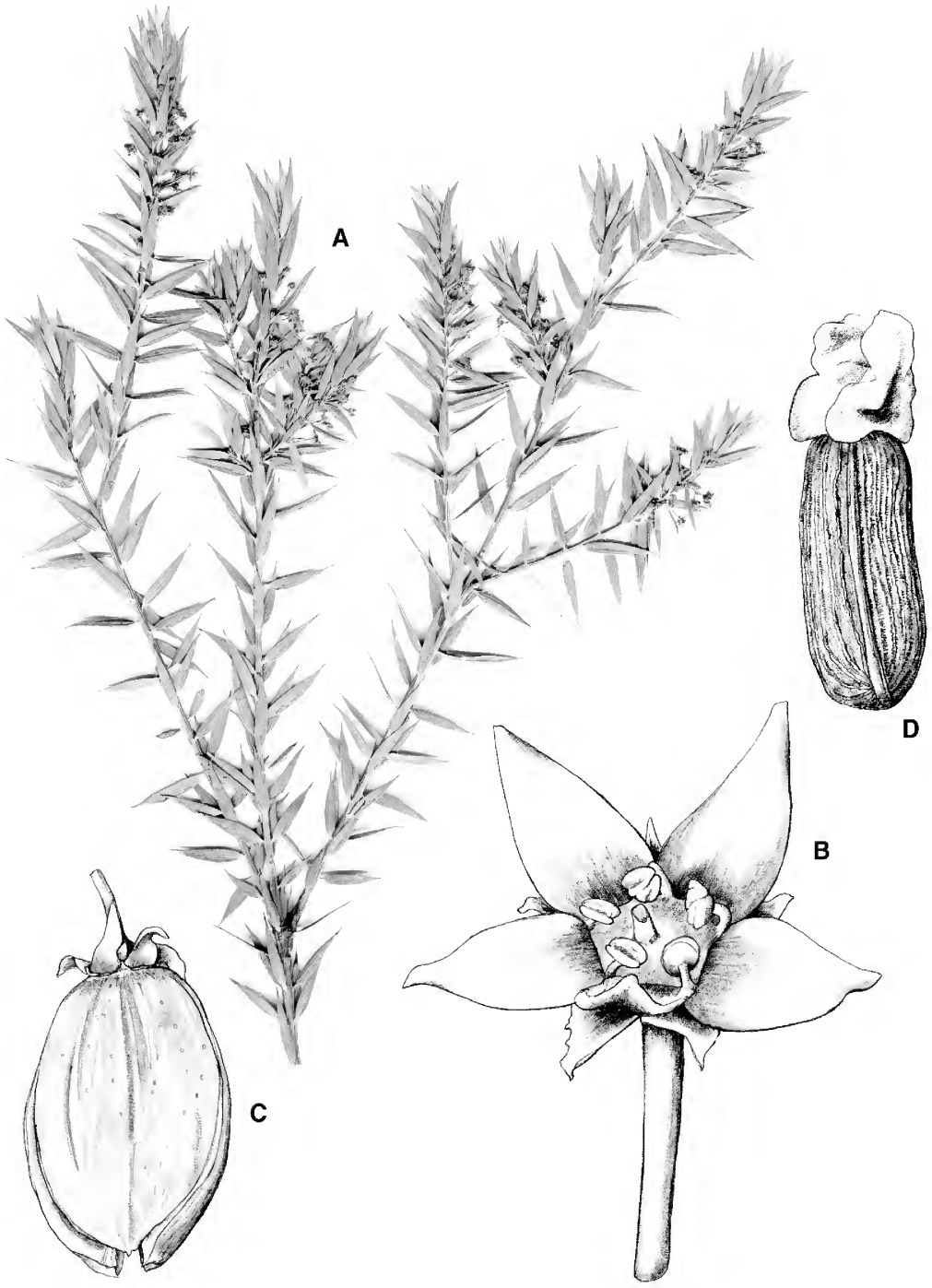

Fig. 2. *Apatophyllum flavovirens*. A. fertile branchlet × 0.8. B. oblique view of flower × 8. C. fruit × 5. D. seed × 10. all from *Bean* 2225.

Branched rounded shrub 100 cm high, glabrous. Petioles 0.5–1 mm long. Leaves alternate, narrowly lanceolate, 9–21 × 1.6–3.0 mm, flat; venation parallel, longitudinal; apex acute to acuminate, pungent-pointed. Stipules linear, 0.3–0.7 mm long, white or yellowish, persistent, entire to obscurely lobed; apex acute. Inflorescence axillary, dichasially cymose with up to 3 flowers or reduced to a single flower, with 1-several pairs of pherophylls. Anthopodia 2.0–4.0 mm long at anthesis. Pherophylls cymbiform, 0.8–1.3 mm long, apex acute, margins entire. Peduncles 2–3.5 mm long. Perianth 5-merous. Sepals deltate, 0.6–0.9 mm long, persistent; apex acute, margins entire. Petals deltate, 1.7–2.0 mm long, 1.1–1.2 mm wide at base, yellow, persistent; apex acute, margins entire. Stamens 5, inserted on margin of disc; filaments tapering, c. 0.4 mm long; anthers dorsifixed, c. 0.3 mm long and c. 0.3 mm across. Disc fleshy, flat. Ovary ovoid, 3-locular, partially immersed in disc; ovules 2 per loculus. Style 0.5–0.6 mm long. Capsule obovoid, 3-valved, 8–9.5 × 6–7 mm, surface smooth. Seeds cylindrical, c. 4.0 mm long, c. 1.7 mm in diameter; testa brown, longitudinally striate; aril white, clasping base of seed. Fig. 2, 3B.

Additional specimen examined: **Queensland.** LEICHHARDT DISTRICT: Bull Creek Gorge, S of Springsure-Tambo road, Sep 1999, *Bean* 15370 (BRI, K, MO, NSW).

Distribution and habitat: *A. flavovirens* is known only from the type locality (Map 1), where it grows on a skeletal sandstone slope (west facing) in open woodland with *Eucalyptus decorticans, Corymbia hendersonii* and *Acacia shirleyi*. Associated understorey species include *Micromyrtus leptocalyx, Triodia mitchellii, Grevillea longistyla* and *Acacia* spp.

Phenology: Flowers and fruits are recorded for September.

Affinities: *A. flavovirens* differs from *A. olsenii* by the leaves 1.6–3 mm wide (0.7–1.5 mm for *A. olsenii*), stipules longer, 0.3–0.7 mm long (vs. 0.2–0.3 mm long for *A. olsenii)*, cymose inflorescence, longer peduncles and pedicels, 3-locular ovary (2-locular for *A. olsenii*) and the longer and wider petals.

Conservation status: *A. flavovirens* is known from only 19 individuals at the type locality. No further plants were discovered during a three day field trip to the area in September 1999. Applying the IUCN guidelines (Anon. 1994), a category of 'critically endangered' is proposed (Criterion D).

Etymology: From the Latin *flavovirens*, meaning yellowish green, in reference to the leaf colour.

Key to the species of *Apatophyllum*

1. Leaves linear, to 0.6 mm wide, terete or almost so 2
   Leaves linear-lanceolate to lanceolate, 0.7–3 mm wide, flat 4

2. Perianth 5-merous; petals 1.2–3.5 mm long 3
   Perianth predominantly 4-merous; petals 0.9–1.2 mm long ..... **A. teretifolium**

3. Petals 1.2–1.5 mm long, margins entire ..... **A. constablei**
   Petals 2–3.5 mm long, margins fimbriate ..... **A. macgillivrayi**

4. Leaves 1.6–3 mm wide; inflorescence cymose; ovary 3-locular ..... **A. flavovirens**
   Leaves 0.7–1.5 mm wide; inflorescence solitary; ovary 2-locular ..... **A. olsenii**

Acknowledgements

We are grateful to Will Smith for the illustrations and map, to Wayne Harris for assistance in preparing the stomatal slides and for photographing them, to Phil Sharpe for a German translation, to Keith McDonald for assistance in the field, and to Les Pedley for the Latin diagnoses.

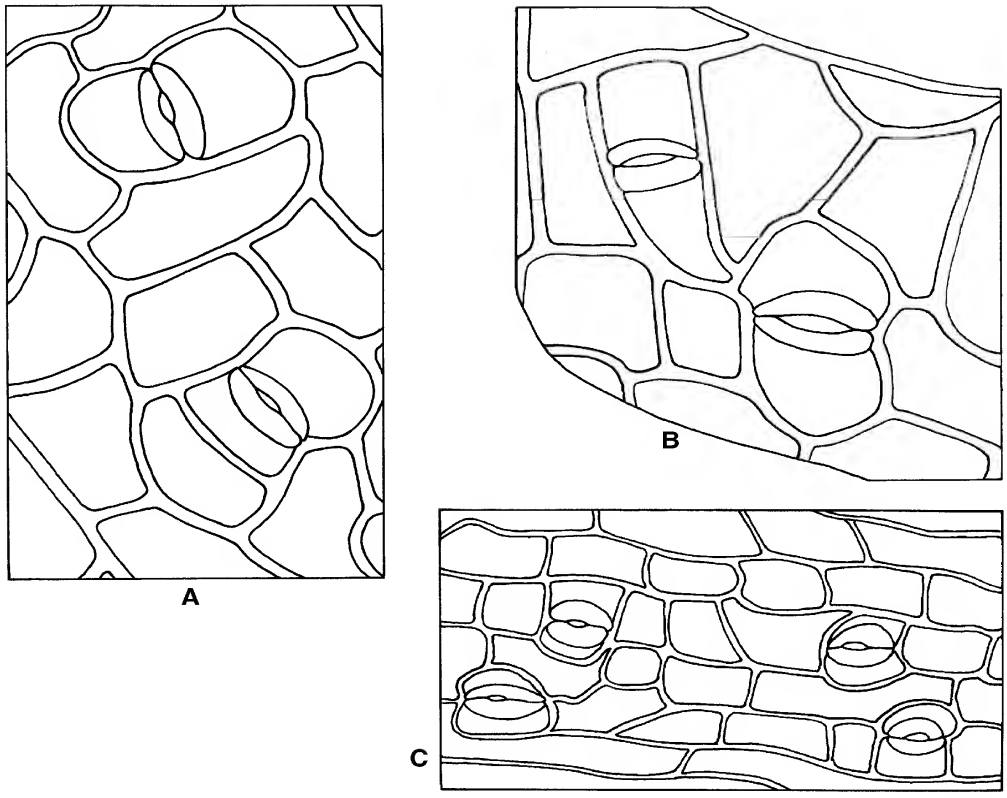

Fig. 3. Stomatal patterns in ***Apatophyllum***. A. *Apatophyllum olsenii* × 500. B. *Apatophyllum flavovirens* × 500. C. *Apatophyllum teretifolium* × 300. A, *Forster* 16341 & *Thompson*; B, *Bean* 2225; C, *Bean* 1401 (all BRI).

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Jasminum domatiigerum subsp. *australis* (Oleaceae), a new subspecies from north Queensland

Wayne K. Harris & William J. McDonald

Summary

Harris, Wayne K. & McDonald, William J (2000). *Jasminum domatiigerum* subsp. *australis* (Oleaceae),a new subspecies from north Queensland. *Austrobaileya* 5(4):699–703. *Jasminum domatiigerum* subsp. *australis* from north Queensland is described as new and is illustrated and compared with other related species from Australia. Previous records of this species are from New Guinea where it occurs in similar habitats. This is the first reported occurrence from Australia. Notes are provided on its distribution, habitat and conservation status. A key to the Australian and New Guinea trifoliolate species of *Jasminum* is provided.

Key words: Oleaceae, *Jasminum domatiigerum*, *Jasminum domatiigerum* subsp. *australis*, Queensland, New Guinea, systematics, ecology, distribution.

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Introduction

The genus *Jasminum* L. in Australia consists of ten species and a number of subspecies and was most recently revised by Green (1984).The genus is widely distributed throughout eastern and northern Australia and two species extend further westwards. *J. calcareum* F.Muell. extends from central Australia through to Western Australia. *J. didymum* subsp. *lineare* (R.Br.) P.S. Green is the most widespread extending west from the Great Divide in eastern Australia through central Australia and into the northern parts of Western Australia south of the Kimberley. *Jasminum* Section *Trifoliolata* DC. is represented by two species and three subspecies. Lingelsheim (1927) described nine species from Papua New Guinea of which two belong to section *Trifoliolata* and one of these is recorded from Australia. *Jasminum domatiigerum* Lingelsh. has a limited distribution in northern Queensland where it occurs as a scrambling climber in the wetter regions in complex notophyll and mesophyll vine forests.

Jasminum domatiigerum Lingelsh. subsp. **australis** W.K. Harris & W.J.McDonald **subsp. nov.** Subspecies *Jasminii domatiigeri* a typo foliolis petiolulisque majoribus, pedicellis longioribus et floribus majoribus (8–15 mm long.) differens; ad North Queensland restricta est. **Typus:** Queensland. Cook District: Forrester Road Malanda, 17° 21'S 145° 34'E; 20 Jul. 1998, *R. Jensen* 0 0 8 8 8 : (holo: BRI).

Description: Evergreen scrambling or twining shrub to about 4 m; stem pubescent to tomentose with orange-brown simple hairs. **Leaves** opposite, trifoliolate; petioles 8–20 mm long channelled on the upper surface, pubescent; lamina coriaceous, ovate to broadly ovate, glabrous to sparsely pubescent on the adaxial surface, glossy, sparsely pubescent on the abaxial surface, slightly discolorous, terminal leaflet (5.5–)6.6–8.0(–8.5) cm long by (3.6–)4.0–5.0(–5.5) cm broad,petiolule(1.3–) 1.4–1.9(–2.2) cm long, lateral leaflets (2.6–)3.4–4.0(–4.5) cm long and (1.7–)1.8–2.6(–3.6) cm broad, petiolules (2–)3.0–5.0(–6.0) cm long; margins entire not thickened, slightly recurved; apex acute to acuminate; base cordate; venation simple, pinnate, on upper surface depressed, on lower surface prominently raised with 3 or 4 secondary veins each side of the midrib. **Inflorescences** to 90 mm long, on axillary side shoots, sub-umbellate, (1–) 3 (–7)-flowered, flowers perfumed, bracts linear subulate, puberulent 3–6 mm long; pedicels 2–9 mm long, pubescent. Calyx pubescent, tube 2–7 mm long

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and 2–2.5 mm in diameter, with 4–5 linear to triangular teeth, 0.8–2.0 mm long. **Corolla** hypocrateriform, white to cream on the outside, white to cream internally, tube 8–15 mm long with 4–6 lanceolate or narrow lanceolate acute lobes, 5–7 mm long. **Stamens** 2; anthers 3.5–4 mm long, on filaments 1.5–2 mm long, attached about midway along the corolla tube, not exerted. **Ovary** 0.8–1.0 mm long; style about 10 mm long, not exerted, heterostyly not observed; stigma slightly bilobed about 1.5 mm long. **Fruit** spherical to slightly ovoid, often paired (or single by abortion), 8–10 mm long by 6–8 mm broad, purple-black. Fig 1, 2.

Phenology: Flowering occurs from May through to July, fruits appearing September to November. Flowers are sweetly fragrant.

***Specimens Examined*: Queensland.** Cook District: Daintree R headwaters, Black Mountain area, Daintree NP, [16°23'S 145°12'E], May 1998, *P.I. Forster + PIF 22968*, (BRI); Herberton Range, SF 194, Mt Baldy, [17°18'S 145°24'E], Oct 1997, *P.I. Forster PIF 21854* (BRI). North Kennedy District: Arthur Bailey Road S of Ravenshoe, [17°40'S 143°31'E], Jun 1995, *P.I. Forster PIF 16749*, (BRI, QRS, MEL ,K); Mt Fox, [18°49'S 145°51'E], Oct 1949, *F. Mull, s.n.* [AQ 073283] (BRI); South Kennedy District: Broken River Track, Eungella NP, Nov 1998, *W.J. McDonald* + 4484 (BRI); Rd along Clarke Range, SF 679 Teemburra c. 8km S of Crediton township, Jun 1994, *W.J. McDonald + 5970* (BRI); Diggings Road Eungella NP, 20°5-'S 148°3-'E, without date, *S. Pearson SP465* (BRI); Broken River, Eungella NP, 21°1-'S 148°3-'E, May 1985, *M.D. Pearson s.n.* [AQ 398226] (BRI).

***Distribution and habitat*:** *J. domatiigerum* subsp. *australis* has been recorded from the northern regions of Queensland from the Daintree River to the Eungella National Park in the south (Map 1). The species is associated with complex mesophyll and notophyll vine forests where it is a slender scrambling climber. Soil types are red and usually derived from granite.

***Diagnostic Features*:** *J. domatiigerum* subspecies *australis* is readily distinguished from the type of the species by its larger flowers (corolla tub 9–12 mm long), longer pedicels (up to 9 mm long), larger leaflets (up to 8 mm long) and longer petiolules (lateral petiolule up to 5 mm long).

Affinities: *J. domatiigerum* has close affinities with *J. didymum* and *J. dallachii*. It differs from the former in having densely pubescent to tomentose branches, petioles and calyces and hairy domatia. *J. dallachii* has smaller leaflets, fewer flowers on a shorter inflorescence and domatia which are formed at the vein intersections by a flap of tissue between the primary and the secondary veins.

Conservation Status: By IUCN (1994) criteria the taxon is Data Deficient (DD).

***Etymology*:** Latin meaning 'of the south' in reference to its occurrence in Australia.

Key to *Jasminum* sect. *Trifoliolata* species in Australia and New Guinea

1. Stems, petioles and leaves pubescent-tomentose 2
   Stems, petioles and leaves glabrous or minutely puberulent 5

2. Terminal leaflets mostly less than 6cm long, inflorescences short, less than 3 cm long mostly 1–5- flowered . . . . . **J. dallachii**
   Terminal leaflets greater than 6 cm long, inflorescence greater than 3 cm long, mostly 5–7- flowered 3

3. Leaves without domatia . . . . . **J. gilgianum**
   Leaves with domatia 4

4. Corolla tube 6–8 mm long . . . . . **J. domatiigerum** subsp. **domatiigerum**
   Corolla tube 9–12 mm long . . . . . **J. domatiigerum** subsp. **australis**

5. Terminal leaflet lanceolate to ovate 6
   Terminal leaflet linear to narrow lanceolate . . . . . **J. didymum** subsp. **lineare**

6. Terminal leaflet more than 4 cm long . . . . . **J. didymum** subsp. **didymum**
   Terminal leaflet less than 4cm long . . . . . **J. didymum** subsp. **racemosum**

Acknowledgements

We thank Dr. G.P. Guymer for provision of facilities at BRI. Peter Bostock provided the Latin diagnosis.

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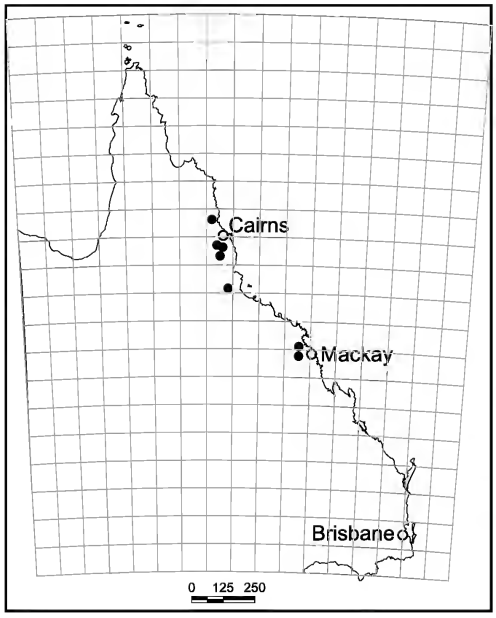

Map 1. Distribution of *J. domatiigerum subsp. australis* in North Queensland

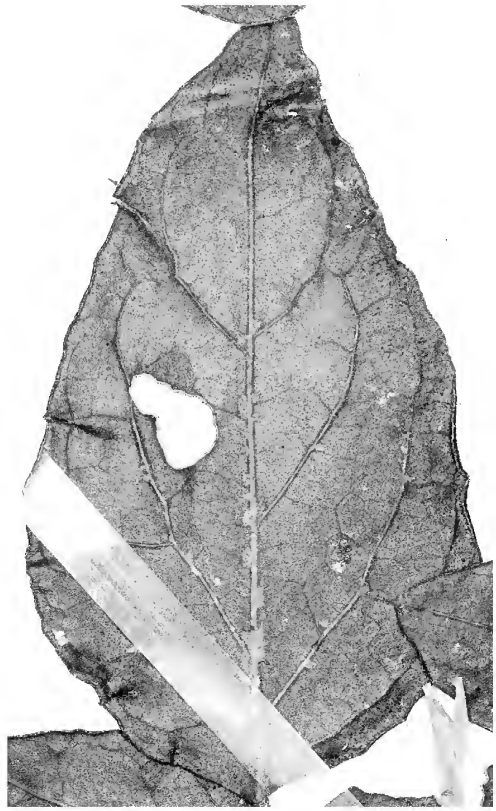

Fig 1. Adaxial leaf surface showing prominent domatia along major veins and at vein intersections. Leaf is c. 3.5 cm broad. *P.I. Forster* PIF 16749 (BRI)

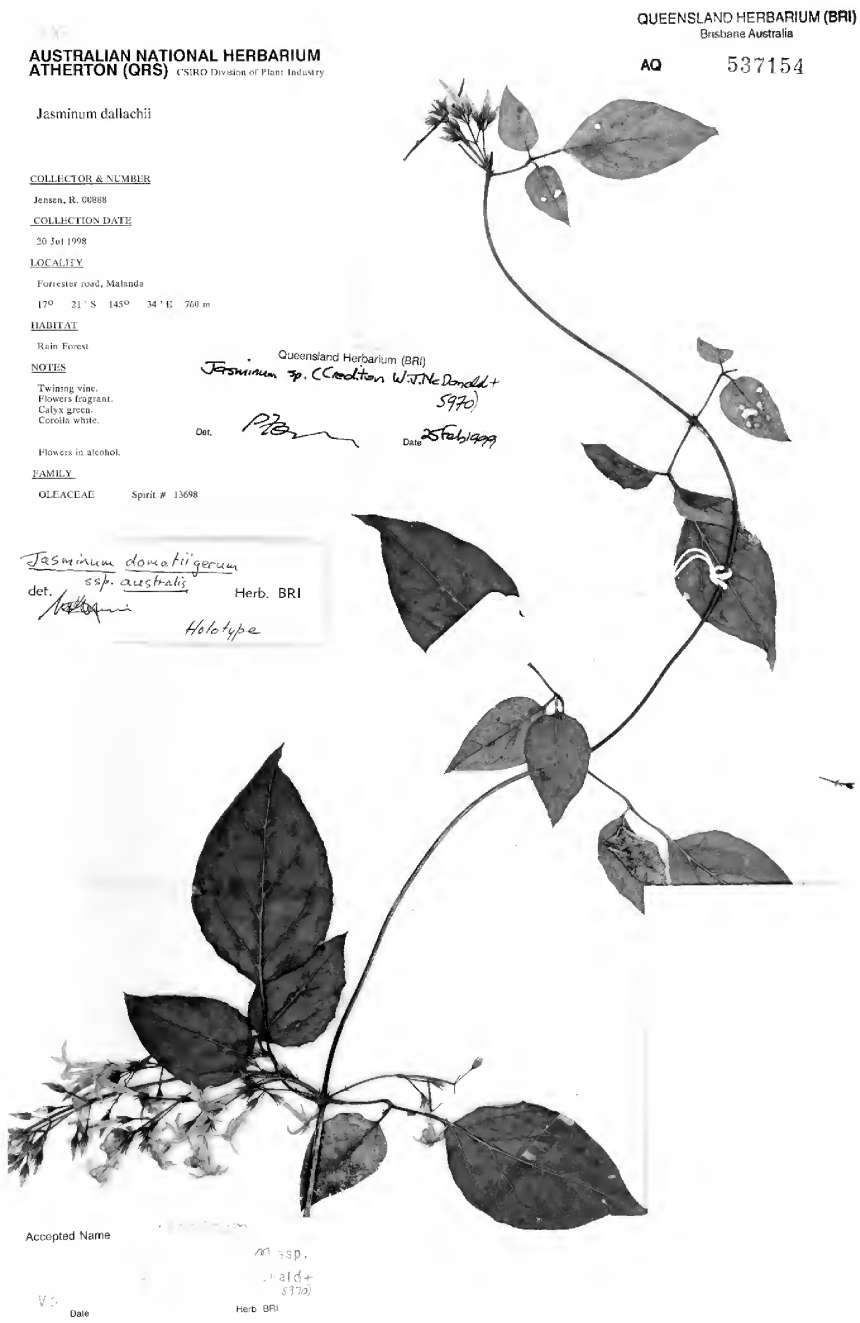

Fig 2. *Jasminum domatiigerum* subsp. *australis* W.K. Harris & W.J. McDonald. Photograph of holotype at BRI. (Approx. half natural size.)

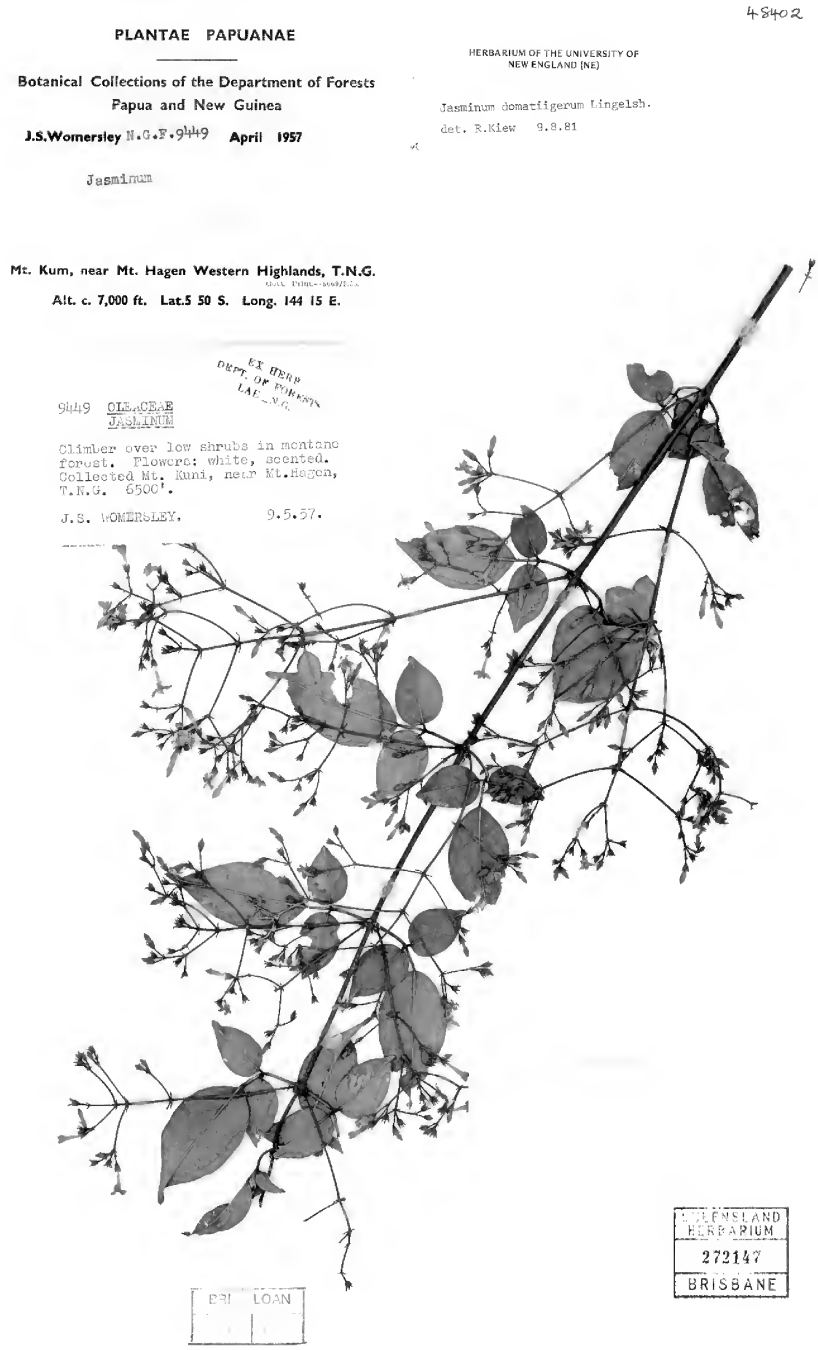

Fig 3. *Jasminum domatiigerum* subsp. *domatiigerum* Lingelsh. J.S. *Womersly* N.G.F. 9449, Mt Kum, PNBG (BRI). (Approx. half natural size)

A new species and lectotypification in Campanulaceae: Lobelioideae

David Albrecht

Summary

Albrecht, D.E. (2000). A new species and lectotypification in Campanulaceae: Lobelioideae. *Austrobaileya* 5(4):705–709. *Pratia puberula* Benth. is lectotypified and *Lobelia leucotos* Albr. described and illustrated, with notes on distribution, habitat and relationships with other species of Lobelioideae.

Keywords: *Pratia puberula*; *Lobelia leucotos*; Campanulaceae; Lobelioideae; Queensland.

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Introduction

A taxonomic treatment of Australian Lobelioideae by the author is progressing. However, it may be some time before completion due to the unresolved problem of generic limits and to species complexes requiring further detailed study. Nevertheless, some undescribed taxa within this subfamily present few problems, and it seems sensible to expedite publication of names for them so that they are available for use. This paper validates the name of a new species from Queensland. A specimen of this taxon, apparently collected at Cooper's Creek, South Australia was cited by Bentham (1868) as a syntype of *Pratia puberula* Benth. In order to extricate this specimen from *Pratia puberula* sensu stricto so that the entity that it represents can be described without confusion, *Pratia puberula* is here lectotypified.

Floral measurements are based on fresh, spirit or rehydrated material.

Typification of *Pratia puberula*

Pratia puberula Benth., Fl. Austral. 4: 133 (1868). **Type**: Victoria, marshes at Cobra [Cobberas Mountains], *F. Mueller* (lecto: K, here selected); probable isolecto: Cobra, Jan 1854, *F. Mueller* (MEL [MEL 1592621]).

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In the protologue of *Pratia puberula*, Bentham (1868) cited the following three collections: New South Wales, Glendon (Leichhardt); Victoria, moist, grassy, and marshy places at Cobra and Mount Barkly (F. Mueller); and South Australia, Cooper's Creek (Bowman). Mueller's cited collection from Victoria actually consist of three specimens, two from the Cobberas Mountains (K and MEL [MEL 1592621]) and one from Mount Barkly Ranges (MEL [MEL 1592622]).

Bentham's protologue includes a description of the fruit and seeds of this species, both critically diagnostic in the Lobelioideae, and as Mueller's specimens from the Cobberas Mountains are the only syntypes with fruit and seed, albeit rather immature, one of them has been selected here as lectotype. Bentham does not appear to have examined Mueller's specimen housed at MEL and must have based his fruit and seed description on the K specimen which is, therefore, here selected as lectotype.

There have been various applications of the name *Pratia puberula* and much confusion between it and *P. pedunculata* (R.Br.) Benth. has resulted. The lectotypification of *Pratia puberula* as undertaken here maintains the prevailing concept of *P. puberula* in South Australia (Toelken, 1986) and in Victoria, where *P. puberula* is regarded as a synonym of *P. pedunculata* (Willis 1973, Albrecht 1999). Further study of the *P. pedunculata* - *P. puberula* complex is required to determine

whether or not more than a single taxon warrants recognition within it. Clarification of the typification of *P. pedunculata* is also required.

Whilst all of Mueller's specimens cited by Bentham represent the one entity here defined as *Pratia puberula*, Bentham's other syntypes of this name are not of this species. Leichhardt's specimen from Glendon (MEL 1592620) is *Pratia purpurascens* (R.Br.) E.Wimm., while Bowman's specimen is of the species described here as *Lobelia leucotos*. There is some uncertainty about the origin of Bowman's collection as the specimen has two labels. The smaller of the two labels gives the location "Cooper Creek" and is numbered 228, while the larger label gives the location "Capes River" in Mueller's hand with a further annotation by J.H.Willis indicating the collector as 'Bowman'. It is highly unlikely that Bentham's citation "South Australia, Cooper's Creek" is correct for this specimen as *Lobelia leucotos* is not known to occur in this part of Australia. There is a Cooper Creek, west-south-west of Mackay, Queensland, which is closer to, but still slightly to the south of, the known range of *L. leucotos*. The most likely location of collection of Bowman's specimen is Cape River, Queensland. This location is to the south of Charters Towers and within the known range of *Lobelia leucotos* (*Cumming* 9589 (BRI) is from near this location). Bowman collected specimens of other species (e.g. *Eremophila debilis* (Andrews) Chinnock and *Rhynchospora pterochaeta* F.Muell.) from the Cape River area of Queensland (J. Clarkson pers. comm.).

Taxonomy

Lobelia leucotos Albr., **sp. nov**. *Lobeliae stenophyllae* Benth. affinis sed floribus unisexualibus, lobis corollae in latitudine subequalibus, tubo corollae fisso profundiore, hypanthio puberulo dense, alveolis seminibus elongata plerumque differt. **Typus**: Queensland. Cook District: Mareeba on the property of J. Clarkson on La Spina Road, 17°01'S, 145°24'E, 9 March 1993, *J.R. Clarkson* 9788 (holo (functionally male): BRI [AQ 580063]; iso: DNA, K, L, MBA, MEL; para (functionally female): ditto, *J.R. Clarkson* 9787, BRI [AQ 580062]; iso para: DNA, K, L, MBA, MEL, MO, NSW, PERTH).

Herbaceous dioecious perennial. Stems prostrate or decumbent, puberulous, rarely almost glabrous, rooting at the nodes. Leaves distichous, sometimes purple-tinged below, lanceolate or elliptic to ovate or obovate, 4–44 mm long, 2–15 mm wide, puberulous, with margins toothed, apex acute to obtuse, and base cuneate or occasionally obtuse; petiole ill-defined or rarely to 3mm long. Flowers solitary, axillary. Bracteoles 0.1–0.6 mm long. Pedicels 3–35 mm long, puberulous or rarely almost glabrous. Hypanthium obconic, ellipsoid or obovoid and 1–2.5 mm long in functionally male flowers, ovoid to obovoid and 2–4.5 mm long in functionally female flowers, puberulous externally. Calyx lobes erect, triangular, 1–2.2 mm long, puberulous, at least some toothed towards base. Corolla zygomorphic, 2-lipped, 4.5–8 mm long, generally slightly smaller on female plants, white throughout or occasionally with a slight green or purplish tinge externally, + puberulous externally; lobes lanceolate-triangular to narrowly elliptic, glabrous on inner surface, acute; upper lobes two, 3.5–5 mm long, 0.6–1.2 mm wide, slightly more deeply cut than the lower lobes, erect; lower lobes three, 2.5–4 mm long, 0.6–1.3 mm wide, spreading or recurved, with a green zone at the base; tube 2–4 mm long, split to within 0.8–1.5 mm of the base, puberulous internally. Stamens with filaments 2.5–4 mm long, adnate to the corolla tube for 0.5–1.5 mm above the distal edge of the hypanthium, distally connate for up to c. 0.5 mm, the dorsal three evenly tapered, green becoming purplish distally, glabrous or puberulous on inner surface, the ventral two distally broad, thickened and white tinged purple (these features less pronounced in functionally female flowers), tapering rather abruptly to a narrower green lower part, puberulous on inner surface. Anther tube 1.4–2 mm long in functionally male flowers, 0.8–1.4 mm long in functionally female flowers, glabrous on the exterior surface, two ventral anthers each with a seta 0.15–0.3 mm long, dorsal anthers lacking apical setae. Style glabrous to puberulous; stigma protruding from the orifice of sterile anther tube in mature

functionally female flowers. Capsule ovoid to ellipsoid, slightly compressed, 4–9.5 mm long, 3–5 mm diameter, puberulous; apical valves raised 0.5–1.5 mm above base of calyx lobes. Seeds brown, ellipsoid to broadly ellipsoid, sometimes asymmetrical, slightly compressed, 0.4–0.6 mm long, 0.3–0.4 mm wide; testa reticulate, alveolae all elongate or elongate and + isodiametric. Fig. 1A-G

Specimens examined: **Queensland.** BURKE DISTRICT 16.4 km N of Hughenden, Sep 1988, *Ingleby* QHW 38 (NSW). COOK DISTRICT: c. 50 m N of Barron Falls railway station, Jan 1993, *Albrecht* 5210 *& Jobson* (MEL); E Side of Kennedy Hwy, c. 1.5 km S of Mareeba, Jan 1993, *Albrecht* 5211 *& Jobson* (MEL); Black Rock (Lynd), Apr 1988, *Horsup* 89 (BRI); Mareeba, Apr 1962, *McKee* 9066 (BRI, CANB, NSW); Goldmine Creek, 19 km from Mareeba towards Kuranda along Hwy, May 1972, *Wrigley & Telford* NQ 272 (CBG). NORTH KENNEDY DISTRICT: Cape River, no date, *Bowman* [MEL 1592619](MEL); Mt Fox, Dec 1949, *Clemens* [AQ 417048] (BRI); 22 km N of Burra microwave tower, towards Poison Valley, W of Pentland, Apr 1990, *Cumming* 9589 (BRI); Herberton, Jan 1936, *Flecker* 1317 (AD); Hellhole Creek, near Taravale Homestead, 15km along Taravale road from Ewan road turnoff, May 1994, *Jobson* 2990 *& Dixon* (MEL); Herberton, Jan 1912, *Kenny* [AQ 27373] (BRI); Nigger Creek, Herberton, no date, *Kenny* [AQ 27374] (BRI); c. 45 miles SE of Mt Garnet, Jan 1968, *Morain* 282 (BRI); Herberton, Jun 1905, *Ringrose* [AQ 27380] (BRI); "Lansdown", c. 25 miles S of Townsville, Mar 1971, *Robertson* T211 (BRI); Townsville, no date, *Simmons* 283 (BRI).

Distribution and habitat: *Lobelia leucotos* is endemic in north Queensland. The species is known from scattered populations in the Cook and North Kennedy Pastoral Districts and from a single collection in the Burke Pastoral District. The known latitudinal range of the species is from approximately 16 °S to 21°S. Most collections have been made in grassy woodlands on heavy basalt-derived soils, with fewer collections on sandy or skeletal substrates. Some populations are likely to experience regular burning (J. Clarkson pers. comm.).

Phenology: Flowering specimens have been collected between January and June. Fruiting specimens have been collected in March and April.

Notes: Without supplementary water plants die back during dry periods and resprout after rains. Plants are known to occur in gardens and under such conditions will remain leafy throughout the year (J. Clarkson pers. comm.).

Lobelia leucotos and *L. stenophylla* Benth. (s. str., which occurs from southern Queensland to northern New South Wales) share two diagnostic character states that are absent or extremely rare in other Australian Lobelioideae. In both species, the two ventral staminal filaments are broad and thickened distally, and narrow and attenuate proximally (Fig. 1C). In *L. leucotos* these features are more accentuated in functionally male flowers than in functionally female flowers. The two ventral anthers in both species also lack penicillate hairs at the apex, though each have a single apical seta (Fig. 1D). This feature is otherwise known only in *Hypsela tridens* E.Wimm. *Lobelia leucotos* differs from *L. stenophylla* in a number of important floral features set out in the following synopsis:

L. leucotos: Flowers functionally unisexual; corolla lobes white on inner surface, subequal in width or occasionally the upper pair slightly narrower; corolla tube split to within 0.8–1.5 mm from its base; hypanthium densely puberulous externally; seed alveolae predominantly elongate.

L. stenophylla: Flowers bisexual; corolla lobes white, blue or mauvish on inner surface, the upper pair less than half the width of the lower 3 lobes; corolla tube split to within 2–4 mm from its base; hypanthium glabrous or rarely sparsely puberulous externally; seed alveolae predominantly + isodiametric.

Lobelia leucotos occurs in coastal and inland locations between the latitudes of c. 16°S to c. 21°S, whilst *L. stenophylla* occurs predominantly in near-coastal areas and has a more southerly distribution between c. 20°S and c. 32°S.

Specimens of *Lobelia leucotos* have previously been determined as *Lobelia quadrangularis* R.Br., *Pratia purpurascens* (R.Br.) E.Wimm. or *P. puberula* Benth. All those three species differ from *Lobelia leucotos* in having penicillate hairs subtending the seta at the apex of the ventral two anthers, and in having all staminal filaments

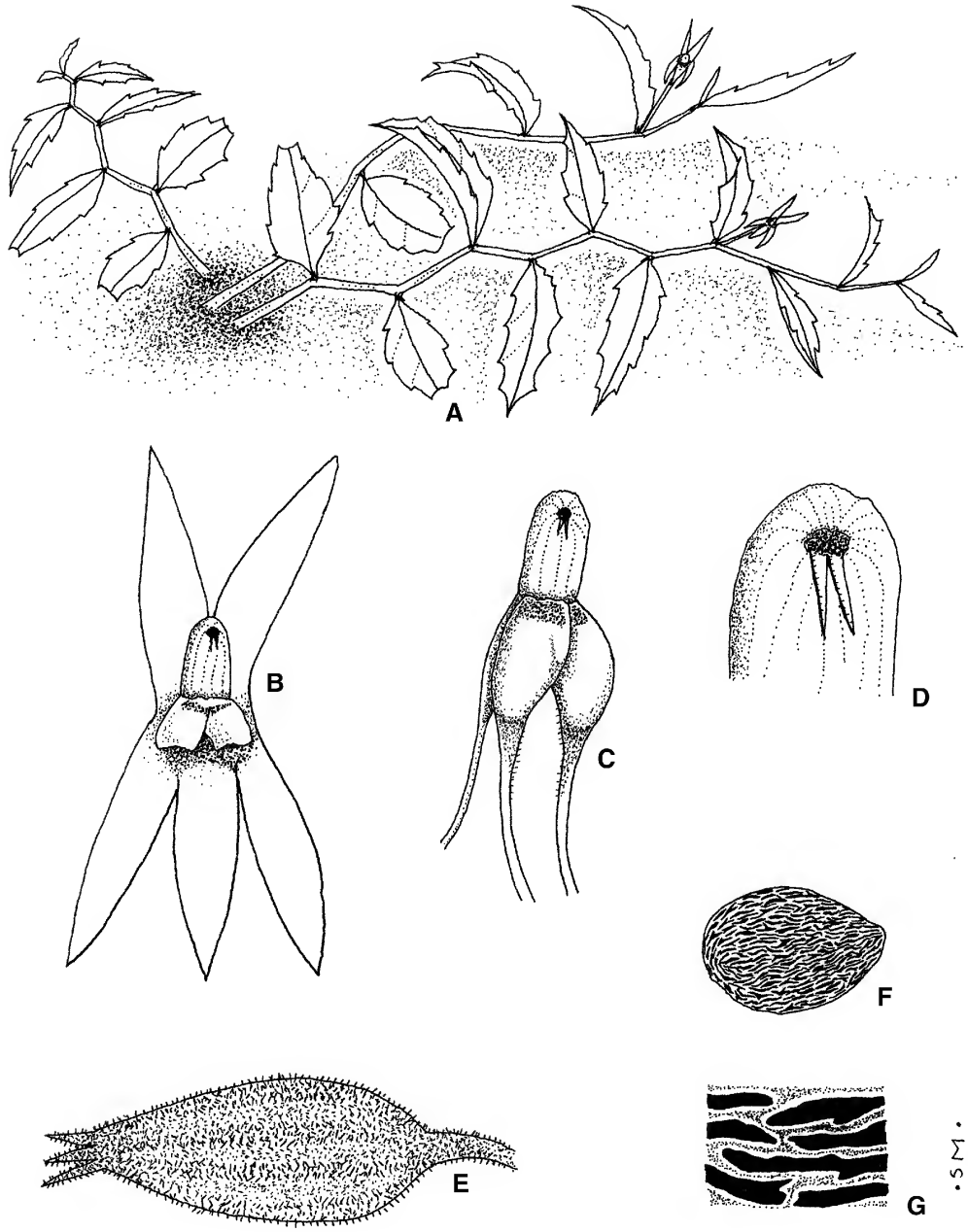

Fig. 1. ***Lobelia leucotos*****:** A. Habit, × 1. B. Functionally male flower, × 8.C. Androecium of functionally male flower showing anther tube, two ventral staminal filaments and one of three dorsal staminal filaments, × 10. D. Anther tube orifice of functionally male flower, × 40. E. Fruit, × 6. F. Seed, × 50.G. Seed ornamentation showing elongate alveolae, × c. 400 A-G - drawn from cultivated material originating from type locality, *J. Clarkson* s.n.

evenly textured and tapering more or less gradually from apex to base. *L. quadrangularis* also differs from *L. leucotos* in having bisexual flowers with blue to mauve corollas and anther tubes with short fine hairs on the dorsal exterior surface. *P. purpurascens* also differs from *L. leucotos* in having glabrous or almost glabrous hypanthia, the upper corolla lobes markedly narrower than the lower lobes, and larger seeds > 0.7 mm rather than < 0.6 mm long. *P. puberula* also differs from *L. leucotos* in having more deeply split corolla tubes split to <0.7 mm rather than 0.8–1.5 mm from the base and indehiscent rather than dehiscent fruit.

Specimens of *L. leucotos* show considerable variation in leaf size, shape and prominence of marginal toothing. Corolla size and plant indumentum, on the other hand, exhibit low variability within the species. Very few ripe fruit of this species have been preserved in herbarium specimens. In those studied, the narrow summit of the fruit expands to 0.5–1.5 mm above the distal edge of the hypanthium and separates into two valves when fully mature. The calyx lobes persist and remain erect, often obscuring the summit of the fruit (Fig. 1E). This cryptic dehiscence is similar to that found in *L. darlingensis* (E.Wimm.) Albr. (Albrecht, 1994).

Conservation status: This taxon is not considered rare or threatened.

Etymology: The specific epithet is derived from Greek *leucon-*, white-, and *Otion*, auricle or little ear, in reference to the upper corolla lobes in this species, which bear some resemblance to erect rabbit ears.

Acknowledgements

I am most grateful to John Clarkson for collecting live material of *Lobelia leucotos* and for providing information on habitat and collecting localities; to Peter Jobson for his generous help with fieldwork; to the nursery staff of the Royal Botanic Gardens Melbourne, and Alice Springs Desert Park for their attentive care of cultivated plants; to Neville Walsh for the Latin diagnosis; to Philip Short and Don Foreman for checking types at K and BM for me; to Clyde Dunlop for comments on the manuscript; to the Directors of BRI, NSW, SYD and MEL for loans and access to their collections; and to Sally Mumford for preparing the illustration.

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Chamaesyce ophiolitica (Euphorbiaceae), a new and endangered species endemic to serpentine vegetation in central Queensland

Paul I. Forster

Summary

Forster, Paul .I. *Chamaesyce ophiolitica* P.I.Forst. (Euphorbiaceae), a new and endangered species endemic to serpentine vegetation in central Queensland. *Austrobaileya* 5(4):711–714 (2000). The new species *Chamaesyce ophiolitica* is described and illustrated. Information is provided on its distribution, habitat and conservation status. Its affinities are with the *C. drummondii* complex. *C. ophiolitica* is restricted to serpentine soils north of Rockhampton in central Queensland. The species is known from three extant localities and fulfils the criteria to be listed as an Endangered species.

Keywords: *Chamaesyce ophiolitica,* Euphorbiaceae, serpentine.

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Introduction

Revisions of the Australian species of *Chamaesyce* S.F.Gray and *Euphorbia* L. were undertaken by Hassall (1977a), although only the latter was formally published (Hassall 1977b). New combinations in *Chamaesyce* were published by Hassall (1976) and for some additional Queensland species by Forster & Henderson (1995) to enable use of the generic name in the most recent census of Queensland plants (Forster & Henderson 1997). Unfortunately no overall revision of the Australian species of *Chamaesyce* has been published.

The species that is the subject of this short paper was first collected in 1920 by Bill Francis at the Warren State Farm north of Rockhampton and his specimen was annotated by Hassall as being of affinity to *Chamaesyce petala* (Ewart & L.R.Kerr) P.I.Forst. & R.J.F.Hend., a species that occurs in northern Australia in the Northern Territory. Apart from a collection in 1960, this plant was only really brought to attention with a number of collections in the late 1980's that coincided with an increase in attention to the floristics and vegetation communities that occur on serpentine soils and rocks in central Queensland (Batianoff & Specht 1992; Batianoff *et al.* 1990, 1991, 1997, 2000).

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At least eighteen species of plants are endemic to the serpentine vegetation of central Queensland with a number of these being of significance for conservation and listed as rare or threatened taxa (Batianoff et al. 2000). The species described here has been rarely collected and is directly threatened by changes to the serpentine landscape due to mining and agriculture. It is formally named in this paper to expedite efforts to ensure its conservation and to draw attention to an otherwise obscure existence.

Taxonomy

Chamaesyce ophiolitica P.I.Forst., **sp. nov.**, a *Chamaesyce petala* (Ewart & L.R.Kerr) P.I.Forst. & R.J.F.Hend. folii lamina cordato-elliptica usque obovata (adversum laminam oblongam), cyathii bracteis truncatis usque oblongo-truncatis (adversum bracteas spathulatas), stipulis infirme evolutis et sparse ramosis (adversum stipulas bene evolutas et valde fimbriatas) et seminibus multo majoribus (1.7–1.8 mm longis × 1–1.1 mm latis × 1–1.1 mm crassis contra circa 1 × 0.7 × 0.7 mm) differt. **Typus**: Queensland. PORT CURTIS DISTRICT: west of Canoona, 1 March 1994, *P.I.Forster* PIF15042 & *A.R.Bean* (holo: BRI; iso: AD, DNA, MEL).

Herbaceous annual, monoecious, of prostrate habit and up to 5 cm high and 20 cm across, with white latex. Stems branching divaricately, lower stems up to 2 mm diameter, upper leaf-bearing stems up to 1 mm diameter, glabrous or with sparse to dense erect trichomes to 0.3 mm long; interpetiolar stipules deeply divaricate to subulate, 0.4–0.8 mm long, glabrous. Leaves discolorous; petioles 0.8–1 mm long, 0.3–0.4 mm wide, channelled on top, glabrous or with sparse trichomes; lamina cordate-elliptic to obovate, often unequal at base, 2–12 mm long, 1.3–11 mm wide, glabrous, or with scattered to sparse trichomes on upper surface and sparse to dense trichomes on the lower surface, glaucous blue-green above, paler below; margins entire or very weakly serrulate; apex acute to rounded; base unequal, cordate to lobate. Cyathia solitary or occasionally paired; peduncles 0.2–1.5 mm long, 0.5–0.7 mm diameter, glabrous or with scattered to dense trichomes. Cyathium 2–2.5 mm diameter; bracts 4 or 5, truncate to oblong-truncate, irregularly fimbriate, 0.4–0.8 mm long, 0.9–1 mm wide, white; glands 4 or 5, elliptic to oblong-reniform, 0.4–0.5 mm long, 0.7–1 mm wide, green; trichomes sparse to dense and up to 0.5 mm long. Male flowers: filament 1.5–1.7 mm long, c. 0.3 mm wide, flattened, anther reniform, c. 0.4 mm long and 0.3 mm wide. Female flower: ovary trilobed, up to 1 mm long and 1.2 mm diameter, with dense trichomes; styles 3, 0.5–1 mm long, bilobed for 0.2–0.5 mm with the tips recurved, with sparse trichomes. Fruit trilobed, c. 3 mm long and 3 mm diameter, with dense trichomes. Seeds obconical-trigonous, 1.7–1.8 mm long, 1–1.1 mm wide and 1–1.1 mm thick, fissure 1.5–1.6 mm long, pale brown. Fig. 1.

Other specimens examined. **Queensland.** PORT CURTIS DISTRICT South Percy Island, 50 km NE of Arthur Point, Shoalwater Bay, Oct 1989, *Batianoff* 11422 et al. (BRI); W of Canoona, Jan 1988, *Forster* PIF3393 (BRI); Warren State Farm, Mar 1920, *Francis* AQ202944 (BRI); On Rockhampton - Marlborough road, May 1960, *Johnson* 1720 (BRI); Mt Wheeler, Rockhampton, Jan 1989, *Specht* 3 & *Reeves* (BRI).

Notes: *Chamaesyce ophiolitica* is compared to *C. petala* which appears to be the most similar species on morphological characters. *C. ophiolitica* differs from *C. petala* in the leaves being cordate-elliptic to obovate (versus oblong), the cyathial bracts more truncate to oblong-truncate (versus spathulate), the poorly developed stipules are little-branched (versus well developed stipules that are fimbriate) and much larger seeds (1.7–1.8 × 1–1.1 × 1–1.1 mm versus c. 1 × 0.7 × 0.7 mm). A comparison may also be made to the widespread *C. drummondii* (Boiss.) D.C.Hassall which differs in the oblong leaves, well developed stipules (0.8–2 mm long), poorly developed stipules with an uneven margin and smaller seeds (c. 1 × 0.7 × 0.7 mm).

The whole species complex which includes *Chamaesyce drummondii* is in need of a critical biosystematic revision. This was undertaken in part by Hassall (1977a) but is now in need of updating. The distribution of *C. ophiolitica* is allopatric to that of *C. petala* and it is perhaps more likely that the new species is derived from the widespread *C. drummondii*.

There is some interesting variation in the limited material to hand of *C. ophiolitica.* Within the same population it is possible to obtain individuals that are either glabrous or with dense coverage of trichomes on the foliage and some floral parts. These individuals appear to grow in close proximity to one another and further study is required to ascertain whether this is a simple case of a single character switch or is correlated with more fundamental differences. Serpentine soils present a relatively severe environment for plants and it has been demonstrated elsewhere that morphologically distinct races of the same species can coexist and maintain their distinctive nature over time (Rajakaruna & Bohm 1999).

Distribution: *Chamaesyce ophiolitica* has been collected from four localities in central Queensland north of Rockhampton. However, only three of these collections occurred within the last 40 years.

Habitat: This new species is restricted to upper slopes and sides of low ridges on soils derived from serpentine rocks and occurs in stony situations in open woodland dominated by tree species such as *Eucalyptus fibrosa* subsp. (Glen Geddes M.I.Brooker 10230) and *Corymbia xanthope* (A.R.Bean & Brooker) K.D.Hill & L.A.S.Johnson . These serpentine

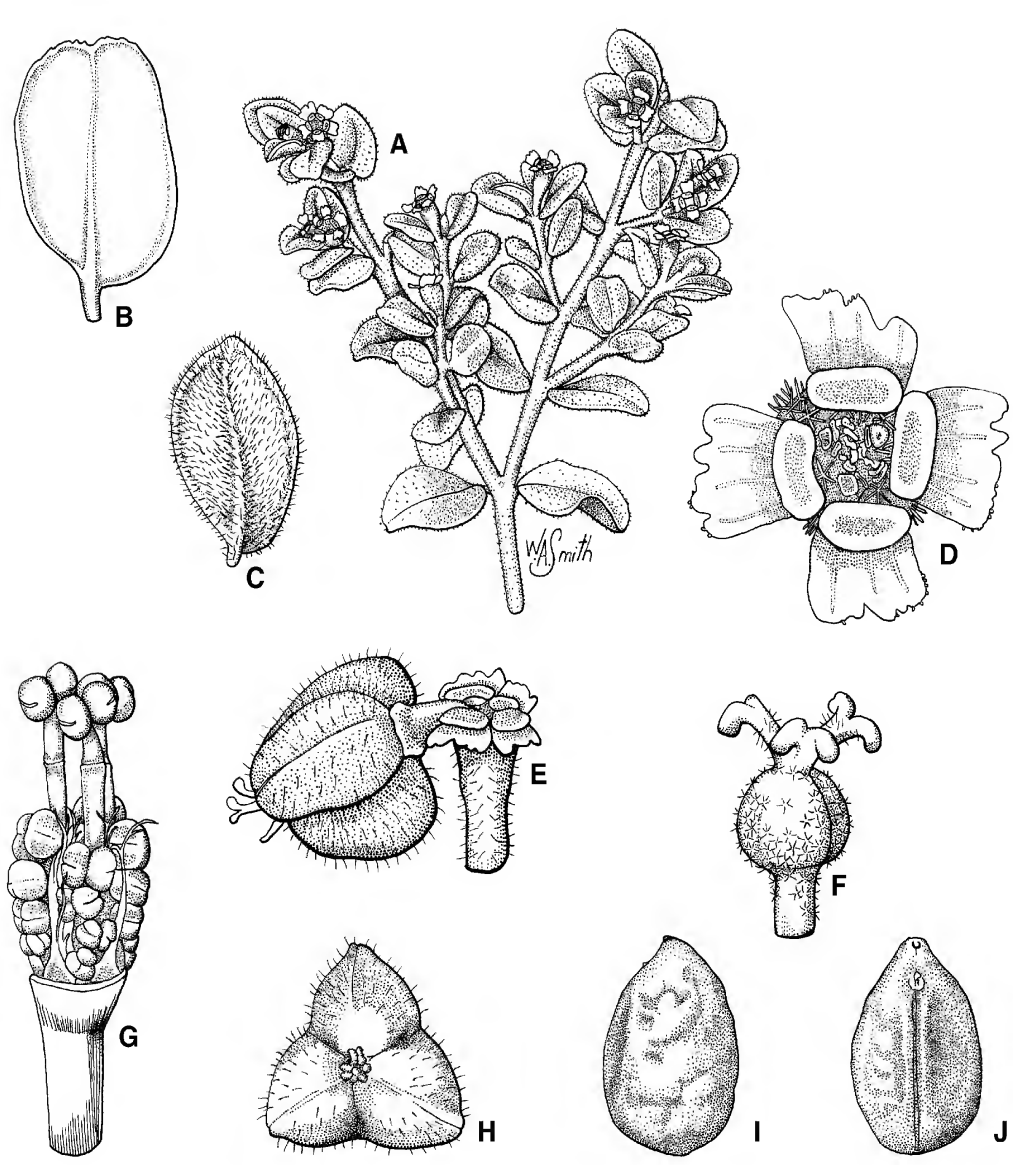

Fig. 1. ***Chamaesyce ophiolitica***. A. habit of flowering shoot. × 2. B. undersurface of glabrous leaf. ×4. C. undersurface of pubescent leaf. ×8. D. cyathium from above.×16. E. cyathium and fruit from side. ×8. F. female flower from side. ×16. G. cyathium with cyathial bracts and glands removed showing male flowers. ×16. H. face view of fruit. ×8. I. side view of seed. ×16. J. ventral view of seed. ×16. All from *Forster* 15042 (BRI). Del. W. Smith.

landscapes cover c. 1000 km^2 in central Queensland (Batianoff et al. 2000).

Conservation Status: *Chamaesyce ophiolitica* is currently known from only three localities, one (South Percy Island) that is National Park. Using the IUCN Red List categories this species can be classified as Endangered on the criteria - B. Extent of occurrence estimated to be less than 5000 km^2 or area of occupancy estimated to be less than 500 km^2, and estimates indicating any two of the following:

1. Severely fragmented or known to exist at no more than five locations.
2. Continuing decline, inferred, observed or projected, in any of the following: (a) extent of occurrence, (b) area of occupancy, (c) area, extent and/or quality of habitat, (d) number of locations or subpopulations.

C. Population estimated to number less than 2500 mature individuals and either: 1. An estimated continuing decline of at least 20% within 5 years or 2 generations, whichever is longer.

C. ophiolitica is a very insignificant annual herb and it is likely that further populations may be found. As yet, the effects of fire and other disturbances on its ecology are unknown. It should be noted that the vegetation on serpentine soils has now been intensively studied (work of Batianoff and collaborators) and that this species has been shown to be sparsely distributed in the area. A relevant comparison may be made with the recently described *Bursaria reevesii* L.Cayzer & M.D.Crisp, a small shrub that is only known from a handful of localities on the serpentine (Cayzer et al. 1999).

Etymology: The specific epithet refers to the occurrence of this species on soils derived from serpentine.

Acknowledgements

Thanks to Will Smith for the illustrations, to George Batianoff for the latest information on the serpentine vegetation of central Queensland and to Peter Bostock for translation of the diagnosis into Latin and for comments on the manuscript.

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Clausena smyrelliana (Rutaceae: Aurantioideae), a new and critically endangered species from south-east Queensland

Paul I. Forster

Summary

Forster, Paul.I. (2000). *Clausena smyrelliana* (Rutaceae: Aurantioideae), a new and critically endangered species from south-east Queensland. *Austrobaileya* 5(4): 715–720. *Clausena smyrelliana* is described and illustrated. Information is provided on its distribution, habitat, phenology and conservation status. The species is currently known from one extant individual in the wild and a conservation status of Endangered is recommended.

Keywords: *Clausena, Clausena brevistyla*, *Clausena smyrelliana,* Rutaceae

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Introduction

In 1992 Greg Smyrell, then of Maryborough, brought to my attention a single individual of a small Rutaceous tree that he had encountered in a remnant patch of littoral microphyll vineforest near Dundowran north of Hervey Bay in south-east Queensland. Subsequent collections of flowers and fruit led to the conclusion that this individual could be classified in the genus *Clausena* and the material was allocated a code name, segregated in the holdings at BRI in November 1995 and listed in the census of plants for Queensland (Forster 1997). All of this material was sent on loan to NSW in 1996 for examination by D.J.Mabberley who has prepared an account of this group of Rutaceae for the Flora of Australia. On return of this loaned material in 1997, some of the specimens were redetermined as *Micromelum minutum* (G.Forst.) Wight & Arn. and one as Anacardiaceae indeterminate. Admittedly the *Clausena* species does resemble *Euroschinus falcata* Hook.f. superficially, and examination of the BRI holdings of this species did reveal a further collection of *Clausena.* However, if a more than cursory examination of material is made, then the Rutaceous nature of the material (obvious oil glands in the foliage) is evident.

A monograph of the genus *Clausena* Burm.f. has been recently published wherein some fifteen species were recognised with *C. brevistyla* Oliver native to Australia (Molino 1994). Only *C. brevistyla* var. *brevistyla* was considered to occur in Queensland, with both *C. brevistyla* var. *brevistyla* and *C. brevistyla* var. *papuana* (Lauterb.) J.F.Molino considered to occur in New Guinea and parts of Indonesia. The Queensland distribution of *C. brevistyla* var. *brevistyla* is from the tip of Cape York south to the Goodnight Scrub National Park west of Booyal. The other species of *Clausena* grow in Africa, mainland Asia and other parts of Malesia. *Clausena brevistyla* was included in *Clausena* section *Clausena* together with *C. excavata* Burm.f. from Malesia and Asia, *C. kanpurensis* J.F.Molino from India, *C. harmandiana* (Pierre) Pierre ex Guillaumin from south-eastAsia, *C. lansium* (Lour.) Skeels from southern China and *C. poilanei* J.F.Molino from Vietnam.

Several species of *Clausena* have economic significance. *Clausena lansium* ("Wampi") from southern China is commonly cultivated for the large edible fruit. Some species such as *C. anisata* (Willd.) Hook.f. ex Benth. from Africa and *C. heptaphylla* (Roxb.) Wight & Arn. ex Steudel from India have aromatic foliage rich in essential oils (Lockwood 1984; Okunade & Olaifa 1987). The foliage and roots of *C. anisata* are also used for a range of folk remedies (Coates Palgrave 1977; Beentje 1994). Other species such as *C. sanki* (Perrottet) J.F.Molino are also occasionally cultivated (as *C. anisum-olens*: Merrill 1912; Madulid 1995). In Queensland there are records of cultivated plants of *C. lansium*, but otherwise no additional species have been recorded.

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Examination of the essential oils of the leaves of the *Clausena* species from Dundowran revealed similarities to the oils found in *Clausena brevistyla* as found in Queensland, and total dissimilarity to that found in *Micromelum minutum* (J.J.Brophy unpubl.). The leaf essential oils of both *Clausena brevistyla* and the species from Dundowran are predominately monoterpenoid in content with less than 10% of sequiterpenes, whereas that of *Micromelum minutum* is predominately sequiterpenoid in content with less than 10% of monoterpenes. The *Clausena* species from Dundowran (Voucher: P.I.Forster PIF17928) has a leaf essential oil mainly composed of alpha-pinenene (73%), beta-caryophyllene (9%) and caryophyllene oxide (4%). *Clausena brevistyla* (Vouchers: P.I.Forster PIF25985, PIF21850, PIF25006 respectively) has a leaf essential oil composed mainly of alpha-pinene (67–73%), beta-pinene (5–13%), beta-caryophyllene (4–7%), bicyclogermacrene (2–3%), or 3-carene (7–31%) and limonene (56–84%), or purely alpha-pinene (91%).

Seedlings of the *Clausena* species from Dundowran are reputedly dissimilar to those of *Clausena brevistyla* (G.Smyrell pers. comm. 1995) with the two taxa easily distinguished on leaf characters. While it was obvious that an additional species of *Clausena* was represented, it was also necessary to determine if more than a single individual was extant and to collect adequate material of flowers and fruit to enable comparison with the taxa enumerated by Molino (1994).

Visits during 1999 and 2000 to both Mon Repos Conservation Park (last sighting 1984) and the Baffle Creek district (last sighting 1920) were unsuccessful in relocating populations of the *Clausena,* however, these historical records reinforce the existence of this taxon in natural vegetation at more than a single locality. Nearly all of the suitable vegetation type (Regional ecosystem 12.2.2.: Mixed microphyll/ notophyll rainforest on Quaternary coastal dunes and beaches) in these areas has been destroyed for housing or agriculture and is considered as endangered (Young & Dillewaard 1999). A relatively intensive survey of this vegetation type and similar vegetation on basalt has been undertaken in the Bundaberg area and around Hervey Bay (mostly unpublished since the compilation of Forster et al. 1991) and the *Clausena* has not been located in any of the fifteen additional localities examined.

The recent collection of flowering material of the *Clausena* at the Dundowran locality has enabled its status to be assessed. Based on the keys and sectional descriptions of Molino (1994), this material can be placed in *Clausena* section *Clausena.* It does not appear to correspond to any of the six described species in this section and is formally described herein.

Clausena smyrelliana P.I.Forst. **sp. nov.**; *Clausenae brevistylae* affinis, foliolis superne nitidis marginibus integris (adversum foliola obscure viridia marginibus dentatis usque crenatis), floribus 5-meris (adversum flores 4- rare 5-meros), alabastris oblongis (adversum alabastra globosa), petalis lanceolatis (adversum petala ovata usque lanceolato-ovata) et staminibus 10 (adversum 6 vel 8 rare 10) differt. **Typus:** Queensland. WIDE BAY DISTRICT: Dundowran, 8 Nov 1999, *P.I.Forster* PIF25182 (holo: BRI [1 sheet + spirit]; iso: A, K, L, MEL, QRS).

Shrub or small tree to 4 m high. Bark smooth, greenish-brown with irregular longitudinal strips of cream-yellow lenticels; blaze yellowish with strong citrus-scent; wood yellow-straw. Leaves alternate, pinnate; rachis up to 170 mm long; leaflets 6–10, alternate, conspicuously dotted with oil glands and with a slight citrus-like scent when crushed, petiolules 4–7 mm long, yellow to pink; blades elliptic or ovate, often unequal, 20–100 mm long, 10–68 mm wide, glossy above, dull and somewhat glaucous below; lateral veins 7–9 per side of midrib and visible on both surfaces, interlateral veins more visible below; apex acute-retuse or acuminate-retuse, rarely mucronate; base obtuse to oblique; margin entire, glandular, glabrous. Inflorescences a terminal panicle, up to 90 mm long. Flowers 5-merous, c. 10 mm long and 10 mm in diameter; pedicels 3–4 mm long, 0.8–1

mm in diameter, with conspicuous oil glands and dense uniseriate trichomes; calyx 5 lobed, 1.1–1.5 mm long, irregularly ciliate; petals 5, imbricate in bud, lanceolate and strongly recurved, 7–7.5 mm long, 1.8–2 mm wide, glabrous, cream. Stamens 10, filaments dilated basally, 4–6 mm long; anthers c. 1 mm long and 1 mm wide, longitudinally dehiscent; style c. 6 mm long and 1.2 mm in diameter with an obtuse tip; gynophore well developed, but not markedly distinct from the ovary, c. 1 mm long and 1 mm diameter; ovary 4–5 locular, c. 1 mm long and 1 mm in diameter, ovules 2 per locule. Fruits baccate, depressed-globose, soft-fleshy, 8–9 mm long, 10–11 mm in diameter, white, with conspicuous oil-glands. Fig. 1.

Other specimens examined. **Queensland**. PORT CURTIS CREEK DISTRICT: Baffle Creek District, Apr 1920, *C.T.White* AQ152118 (BRI). WIDE BAY DISTRICT: Dundowran, Oct 1995, *Forster* PIF17928 & *Smyrell* (BRI); ditto, Jan 2000, *Forster* PIF25307 (BRI, MEL, QRS); ditto, May 1992, *Smyrell* AQ542962 (BRI); ditto, Nov 1992, *Smyrell* AQ563892 (BRI); ditto, Sep 1991, *Telford* 11337 (BRI; BISH, CANB, NSW n.v.[distributed as *Euroschinus falcata*]); Mon Repos Environmental Park [now Conservation Park] s.dat. [?1984], *Randall* 409 (BRI).

Notes: *Clausena smyrelliana* is compared to *C. brevistyla*, the only other species in this genus in Australia. The two species are easily distinguished by the dentate-margined, dull green foliage of the latter and the entire-margined glossy green foliage of the former. Other differences include *C. smyrelliana* having yellow to pink petiolules, 5-merous flowers, oblong buds, lanceolate petals and 10 stamens, whereas *C. brevistyla* has green petiolules, 4-merous flowers (although 5 have been rarely noted by Molino 1994), globose buds, ovate to lanceolate-ovate petals and (6) 8 (10) stamens.

Clausena smyrelliana may possibly be confused with *Micromelum minutum* and this species is present in two of the localities that the former has been recorded from. *M. minutum* has dull green foliage with irregularly crenate margins to the leaflets, yellowish lateral nerves on the underside of the leaf, linear-subulate filaments and on maturity has orange-red hard-fleshy, ovoid fruit, whereas *C. smyrelliana* has glossy green foliage with entire margins to the leaflets, green lateral nerves on the underside of the leaf, basally dilated filaments and on maturity has white, soft-fleshy, depressed-globose fruit. *C. smyrelliana* may also be confused with *Euroschinus falcata* Hook.f. (Anacardiaceae); however, the former has conspicuous oil glands in the leaf which are lacking in the latter.

The single individual of *C. smyrelliana* at Dundowran has flowered and fruited profusely nearly every year since 1992 (G.Smyrell pers. comm. 1999 & pers. obs.). The fruits contain viable seeds and many hundreds of seedlings have been propagated from these. The seedlings produce saplings that are indistinguishable from the parent tree, although their own potential viability is as yet unknown. Presumably this species is bird dispersed and why it is not more common both at Dundowran and throughout the species range is a mystery. Perhaps it is one of these species that requires an exceptionally wet year for seedlings to establish, as this also seems to be the case for *Alectryon ramiflorus* where recruitment in the wild is infrequent. Most of the 1990's were drought effected in south-east Queensland and may have influenced the establishment of seedlings of many vineforest plants.

Distribution: Three localities have been recorded for *Clausena smyrelliana*, over a longitudinal distance of 110 km between Baffle Creek in the north and Dundowran in the south. Only the Dundowran locality is currently known to have an extant population.

Habitat: *Clausena smyrelliana* grows in littoral microphyll vineforest within close proximity to the sea (100–200 m distance). The canopy of the vineforest at the type locality is uneven, but more or less closed with no emergents. Common canopy species include *Alectryon coriaceus*, *Argyrodendron* sp. (Kin Kin W.D.Francis AQ81198), *Cleistanthus cunninghamii*, *Diospyros fasciculosa* and *Sterculia quadrifida*.

Phenology: *Clausena smyrelliana* has been recorded in flower from November to January and ripe fruits have been collected in May.

Conservation Status: *Clausena smyrelliana* may be regarded as critically endangered under the IUCN categories of A. Population reduction

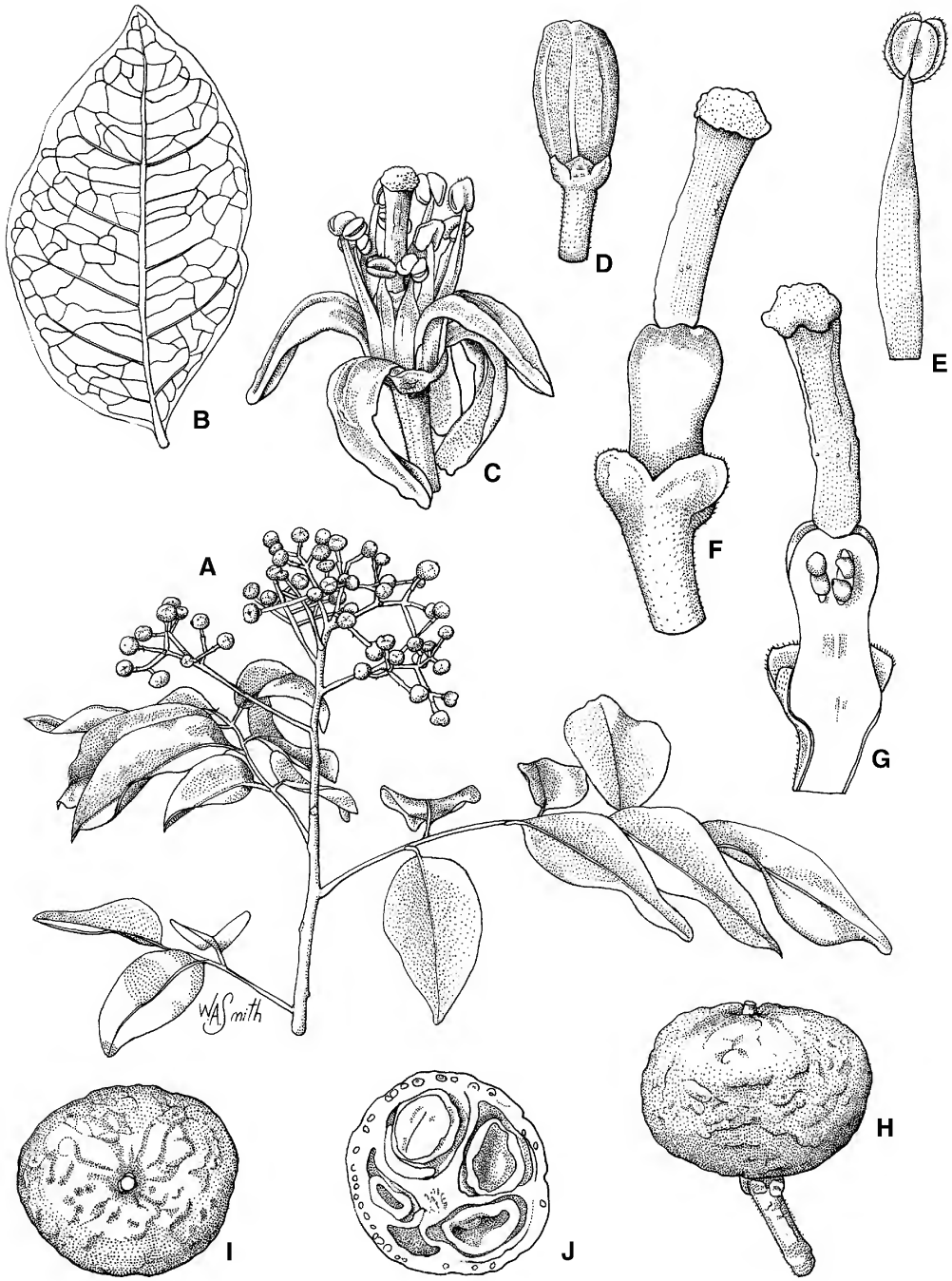

Fig. 1. ***Clausena smyrelliana***. A. branch with immature fruit. ×0.4. B. undersurface of leaf showing lateral and interlateral venation. ×0.8. C. flower from side. × 4. D. bud from side. × 4. E. stamen. × 8. F. upper part of pedicel, calyx and gynostegium. ×8. G. cross-section of gynophore and ovary showing ovules. × 8. H. fruit from side. × 3. I. fruit from above. × 3. J. cross-section of immature fruit showing 5 locules. × 4. A & J from *Forster* PIF25307 (BRI); B from *Forster* 17928 & *Smyrell* (BRI); C-G from *Forster* PIF25182 (BRI); H & I from *Smyrell* AQ542962 (BRI). Del. W. Smith.

in the form of either of the following: 1. An observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer, based on (and specifying any of the following: (C) a decline in area of occupancy, extent of occurrence and/or quality of habitat. B. Extent of occurrence estimated to be less than 100 km^2 or area of occupancy estimated to be less than 10 km^2, and estimates indicating any two of the following: 1. Severely fragmented or known to exist at only a single location. D. Population estimated to number less than 50 individuals. It is recommended that the conservation coding of Endangered is given to this species and that a Recovery Program is initiated to conserve the species.

Clausena smyrelliana may be the most threatened vascular plant species in Queensland at this time. At least two other rainforest species in south-east Queensland are in similar, although less dire straits. *Alectryon ramiflorus* S.T.Reynolds from the Childers area (slightly inland from the localities for *C. smyrelliana*) is known from 37 trees in the wild (Barry & Young 1997) and *Acronychia littoralis* T.Hartley & J.B.Williams from littoral rainforest further south, is known from less than 20 trees in the wild in Queensland (W.McDonald, pers. comm. Feb 2000). In both instances, concerted searches in recent years have added further localities and individuals to the known populations of both these species. It would be worthwhile to search for further individuals of *C. smyrelliana* throughout the known range of the species, and perhaps further to the north around Deepwater and Eurimbula National Parks where similar vegetation is still extant.

Etymology: The species is named for Greg Smyrell, an enthusiastic amateur botanist with a long standing interest in rainforest conservation, who brought this species to attention.

Economic Uses: The leaf essential oil of *Clausena smyrelliana* is unlikely to have economic potential (J.J. Brophy pers. comm. Jan 2000). *Clausena smyrelliana* is an attractive shrub or small tree and has potential as a garden plant, especially because of the prolonged fruiting period.

Acknowledgements

Thanks to Greg Smyrell for persisting with his belief in the validity of this species, Maureen Schmitt for assistance in the surveys around Bundaberg, Mon Repos and Baffle Creek, Peter Bostock for comments on the manuscript and translation of the diagnosis into Latin, Will Smith for the illustrations, Aileen Wood for some French translation and Joe Brophy for unpublished data on the leaf essential oils.

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The first botanical record for Australia

John F. P. Windolf

Summary

Windolf J.F.P. (2000). The first botanical record for Australia. *Austrobaileya* 5(4): 721–723. Notes on the first identification and written record of a botanical species, *Ximenia americana,* in the Commonwealth of Australia on 21st September 1606, probably at Long Island, Torres Strait, as well as the historical background of the circumstances of its notation.

Key words: Prado, *Ximenia americana*, Torres Strait, Queensland, Australia

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Introduction

Throughout the botanical world the initial record of a particular species in any defined geographical or ecological region is a matter of some importance, from both the scientific and historical point of view. When such an event relates to the first record of any kind for an entire continent it takes on a much more significant role. Australia is fortunate in that many of the log books and diaries of early European expeditions to this continent have been preserved, and that their writers were men of sufficient intellect to take a genuine interest in the area's natural science and to record what they saw.

Historical background

The first proven European sighting of what is now known as Australia was made by the Dutchman Willem Jansz and his crew in March 1606 on the west coast of Cape York Peninsula. Although a map relating to their activities is still in existence, and we know from secondary sources that they landed in several places and explored a considerable section of coastline, there is no known contemporary written account of the expedition (Sharp 1963:17 & Whittaker et. al. 1975:196), and it is necessary to examine subsequent voyages to determine who was the first to leave a record of his exploits in the Australian region.

Some six months after Jansz, in September 1606, the Spanish navigator Luis Vaez de Torres traversed the strait separating Australia and New Guinea, now named in his honour. Torres was originally the second-in-command to Pedro Fernandez de Quiros in what is generally referred to as the 1606 Spanish South Seas Expedition. The prime purpose of the expedition was to continue the search for the supposed southern continent then believed to exist in the South Pacific. After crossing the Pacific from Callao, Peru, and spending some time in Espiritu Santo, Vanuatu, the fleet became separated. Quiros returned to Acapulco, Mexico, in the San Pedro y San Pablo while Torres set out for Manila in the Philippines with the other two ships, the San Pedro and a smaller vessel called Los Tres Reyes, during which time he sailed along the south coast of New Guinea, discovering the strait now named after him in the process.

There are two extant manuscripts describing this section of the expedition: a formal letter that Torres wrote to King Philip III of Spain soon after his arrival in Manila on 22 May 1607, and an extensive relation penned by an entretenido, or "gentleman volunteer", named Don Diego de Prado y Tovar (Don Diego de Prado y Tovar orig. ms.. Stevens 1930 & Windolf in prep.) who was on board the San Pedro during this period, and it is in this account that we find the first record of an identifiable botanical species from what is now Australia. Prado had no known officially designated capacity on board, but he was an astute observer of many aspects of the natural world, and made numerous notes on his observations.

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Dating and location of the observation

The expedition had entered what is now Australian territory on or about 11 September 1606 (Gregorian dating). They spent the next three weeks finding a way through the maze of islands, reefs and sandbars that fill Torres Strait before exiting into the Arafura Sea on 4 October 1606. This dating is based on the date in Peru carried westward without any correction for crossing the International Date Line, and as such is one day behind Australian Eastern Standard Time (AEST). It can be independently verified due to an eclipse of the moon, which Prado recorded. The details of this eclipse have been calculated, and it occurred on 16 September GMT, or 15 September Ship Time (Kelly 1966:255). It is a relatively simple matter to assign dates to their day-to-day activities at this time in relation to this eclipse, and we find that the relevant botanical discovery took place in the late afternoon of Thursday 21 September 1606 AEST.

Several researchers have attempted to plot the expedition's route through the strait, but due to a variety of reasons no universal consensus has been arrived at. Prado named the island concerned Isla de Vulcan (Volcan) Quemado, because of the amount of pumice stone that they saw there, the English translation of the Spanish name being "Island of Extinct Volcano". (Stevens 1930:163 & Windolf in prep.). Unbeknown to them, this pumice had nothing to do with the geology of the island itself, having been borne there on ocean currents. The best known attempt to identify individual islands is that by Brett Hilder (Hilder 1980), who thought that Volcan Quemado was probably Long Island (Hilder 1980:81). However, because of the topographical similarities between many of the islands in central Torres Strait, and the often less than comprehensive description of their appearance given by Prado, the present author considers that the exact identification of Volcan Quemado remains unresolved. Identification of the general area, however, presents no problem, and there is no doubt that the site of the observation is well within the boundaries of the State of Queensland.

The species

The species noted by Prado is identified as *Ximenia americana* L. It is widespread in tropical regions (Willis 1973:1232) and in the Americas is often referred to as the Nicaraguan Plum. This is an important point in its identification when relying on Prado's own words describing the plant:

...hallamos...muchos arboles de siruelas que llaman de nicaragua, son de grande guesco y poco carne.

(Prado, orig. ms. & Stevens 1930:162).

This is translated as: "...we found...many plum trees that are named after Nicaragua: they have large stones and little flesh." (Windolf in prep.).

Ximenia americana is a scrambly shrub or small tree up to 5 m tall, the fruit being a typical plum-like, pyriform or globular drupe, yellow in colour. On islands, and near the coast, it tends to grow on sand dunes and in forests on the landward side of mangroves (George 1984:15-16). Long Island (10 02'S 142 51'E) itself is generally low and swampy, but heavily wooded. The main island lies on the northwestern end of the Long Island Reefs complex and there are a number of small mangrove-covered islets along the northern and northeastern sides of the reefs (NP15 1973:233). The species has been collected from three islands in Torres Strait (Dauan, Yorke and Murray) in modern times as well as from numerous localities in tropical Queensland and New Guinea (Pers. comm. Queensland Herbarium).

The fruit is considered edible, but is reported as sometimes being purgative. It contains appreciable quantities of oil rich in ximenic acid (George 1984:16). Cribb states that the fat extracted from the seeds is used as a substitute for ghee in parts of India (Cribb 1982:46). It is not known whether it was used for this purpose in the Americas, or whether the Torres Strait Islanders or Australian Aborigines used it as a food source.

The genus is named after Francisco Ximenes, a Spanish naturalist who wrote extensively on the subject of medicinal plants in the early sixteen-hundreds.

This species is relatively common in tropical America and Prado was probably familiar with it there. Given the confidence of his statement, the correlation between his description and the actual appearance of the fruit, and the ecological and geographical affinity with sites where *Ximenia americana* is known to occur, there seems no reason to question the correctness of his identification.

Conclusions

It is considered proven that the first recorded identification of any botanical species in the Commonwealth of Australia was that of *Ximenia americana* L., made by Don Diego de Prado y Tovar on Thursday 21 September 1606 AEST (Gregorian dating) in Torres Strait, possibly on Long Island, in the botanical district of Cook, Queensland.

Acknowledgements

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Rediscovery of *Dischidia torricellensis* (Schltr.) P.I.Forst., an unusual epiphytic asclepiad from New Guinea

Paul I. Forster

Summary

Forster, P.I. (2000). Rediscovery of *Dischidia torricellensis* (Schltr.) P.I.Frost., an unusaul epiphytic asclepiad from New Guinea. *Austrobaileya* 5(4):725–728. An amplified description and illustrations are provided for *Dischidia torricellensis* (Schltr.) P.I.Forst.. The first collection in over 60 years is reported from a new locality in Chimbu Province in Papua New Guinea.

Keywords: *Dischidia torricellensis*, Asclepiadaceae, New Guinea.

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Introduction

Many of the Asclepiadaceae that occur in Papuasia are poorly known, having been collected only once or not more than a few times. At least 192 species are considered to naturally occur in the region, with some 164 endemic species (Forster 1996). A great number of these have yet to be adequately illustrated and patterns of variation remain to be rigorously documented for nearly every single species. One such poorly known species is *Dischidia torricellensis* (Schltr.) P.I.Forst. last collected in 1939 (Forster 1990).

Much of the early documentation of the asclepiad flora of New Guinea was undertaken by the remarkable Rudolf Schlechter (Nicholas 1992). Many of the plants that he found and later described are still only known from his original collections or have been rarely collected since. Schlechter went to the then German New Guinea to search for sources of rubber or rubber substitutes, but spent much of his time collecting plant specimens, particularly of Orchidaceae, but also of other plants including Asclepiadaceae. InApril 1902 Schlechter was in the Torricelli Mountains of northeastern New Guinea (now in Madang Province of Papua New Guinea). His collection numbered 14445 represented an unusual epiphytic subshrub and he subsequently described it as the new genus and species *Spathidolepis torricellensis* Schltr. (Schlechter 1905). Schlechter considered his new plant to be allied to *Dischidia* but differing in the small coronal lobes and thin, leathery leaves.

In more recent times I came to examine his work and this particular species and made the conclusion that *S. torricellensis* could be adequately accommodated within *Dischidia* R.Br. (Forster 1990). There is considerable variation in *Dischidia* s.l. and while there are recent regional accounts for the Malay Peninsula (Rintz 1980) and Australia (Forster & Liddle 1996), there is no monograph available for the group. Despite this, the basic patterns of morphological variation are reasonably well known. Perhaps having overlooked the transfer of *Spathidolepis* into *Dischidia*, Johns (1995) listed *Spathidolepis* as being one of two endemic genera of Asclepiadaceae present in New Guinea.

Dischidia torricellensis is an unusual species within *Dischidia* for a number of reasons. Firstly the leaves are herbaceous (Fig. 1A), whereas most species have fleshy to succulent leaves. Secondly the corolla lobes are distinctive in the way the edges are strongly reflexed (Fig. 1C). Thirdly the pollinaria are not typical for the majority of *Dischidia* species in the + unwinged nature of the caudicles (Fig. 1F); however, at least one other species (*D. superba* Rintz) also has this feature (Rintz 1979).

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A recent (1997) excellent collection (including spirit material) of *D. torricellensis* has enabled re-examination of the floral structure (Fig. 1) and prompted the present contribution. Data from this collection have confirmed my previous conclusions as to the generic placement of this species but have enabled a few additional observations to be made. Firstly the staminal corona lobes of *D. torricellensis* are not particularly small (as mentioned by Schlechter 1905), but can be quite well developed and markedly fleshy structures (Fig. 1D,E). They are not similar to the staminal corona lobes found in many species of *Dischidia* that are generally membranous and with incurved upper lobes (e.g. *D. bengalensis* Colebr. or *D. subulata* Warb.). On the other hand they are somewhat similar, albeit fleshier, to those illustrated for *D. parvifolia* Ridl. from Malaysia (Rintz 1980). Many species of *Dischidia* have very poorly developed staminal coronal lobes (e.g. *D. imbricata* (Blume) Steud.), thus demonstrating that there is not only considerable variation in this feature, but that it varies from being virtually non-existent to well developed. Such a gradation is repeated in other asclepiad groups (e.g. *Marsdenia* R.Br. s.l. Forster 1995; or various Stapelieae) and can be interpreted as being more useful at the specific level rather than generic. Rintz (1980) has quite clearly illustrated that there is a complete gradation from those species where the staminal coronal lobes are poorly developed to those where the lobes are prominent and often incurved, hence Schlechter's justification for recognition of *Spathidolepis* on the basis of the small coronal lobes is unwarranted.

Dischidia torricellensis also is unusual within the genus in not being an obvious climber or twiner. In the previous description (Forster 1990) it was stated that the species was a 'liana', presumably based on the "small root climber" label data of Brass 12915. The collection of Takeuchi 11736 dispels this notion. This species seems to have a habit akin to that found in some species of the closely allied genus *Hoya* R.Br. where a small number of species have either pendent non-twining stems, or erect, non-twining stems as opposed to the majority that are twiners (Forster et al. 1998) or in the allied *Micholitzia* N.E.Br. from south-east Asia (Goyder & Kent 1994).

The arrangement of the hairs in the corolla tube of *D. torricellensis* fits the pattern of Group C (corolla throat only pubescent) of Rintz (1980). Whether or not Rintz's groups based on the arrangement of hairs on the corolla are natural remains to be seen. Certainly in terms of foliage and pollinaria, *D. torricellensis* does not closely resemble the Malayan species of Rintz's Group C and its position within the genus must be viewed as being isolated. These hairs are antrorse near the corolla mouth but retrorse just above the staminal column. In *D. torricellensis*, these hairs effectively block access to the staminal column and nectar source at the base. This arrangement tends to indicate that a specialised pollination syndrome is involved and that *D. torricellensis* is similar to the majority of *Dischidia* species in this respect. Pauw (1998) has recently speculated that this type of asclepiad flower (a closed tube with access restricted by hairs) is adapted to bird pollination, based on this syndrome being observed in the morphologically similar flowers of *Microloma* species from southern Africa. To date there are no available observations on the pollinators of any species of *Dischidia*. Similar sized, but open mouth campanulate flowers in *Marsdenia cymulosa* Benth. are visited and possibly pollinated by small chloropid flies (Forster 1992) and perhaps similar sized insects, rather than birds pollinate flowers of *Dischidia*.

Dischidia torricellensis (Schltr.) P.I.Forst., Austrobaileya 3: 288 (1990). *Spathidolepis torricellensis* Schltr., in K.Schum. & Lauterb., Nachträge Fl. Schutzgeb. Südsee 356 (1905). **Type:** Papua New Guinea [Kaiser-Wilhemsland]. MADANG PROVINCE: Torricelli-Gebirges, April 1902, *R.Schlechter* 14445 (lecto: K (photo at BRI!); isolecto: BO!), fide Forster (1994: 515).

Epiphytic subshrub, branches up to 50 cm long and with white latex; indumentum on foliage comprising simple, uniseriate trichomes. Stems cylindrical, up to 3 mm diameter, with antrorse indumentum; internodes up to 90 cm long. Leaves petiolate, herbaceous, lanceolate-elliptic, 3–9 cm long, 1–3.2 cm wide; apex caudate to cuspidate, obtuse at tip; base cuneate; lateral venation comprising 16 to 18 veins per side of the midrib, largely indistinct, interlateral venation reticulate and largely indistinct; upper surface medium green, midrib sunken, glabrous; lower surface glaucescent, midrib raised, glabrous or with scattered, antrorse indumentum on margins and midrib; colleters 2 at lamina base. Inflorescence persistent, an umbelliform raceme up to 8 mm long; bracts triangular, 0.5–1 mm long, 0.5–1 mm wide, with sparse indumentum; peduncle up to 10 mm long and 2 mm diameter. Flowers urceolate, (3) 4–5.5 mm long, (2) 4–5 mm diameter at base and (2.5) 3–4.5 mm diameter at mouth; pedicels 2–4 mm long, 0.5–1 mm diameter, with sparse to dense indumentum; sepals oblong to obtuse-ovate, 0.7–2 mm long, 0.9–1 mm wide, ciliate and with 1 or 2 glands at base of each sinus. Corolla fleshy, green when immature, white at anthesis; tube (2) 3.5–4 mm long, (2) 4–5 mm diameter, externally glabrous or minutely papillose, internally glabrous or with a few isolated hairs; lobes erect, triangular-ovate, fused for two-thirds of length, each strongly jointed in middle and with margins strongly reflexed, 1.8–2 mm long, 2–2.2 mm wide, externally glabrous, internally with dense hairs to 1 mm long blocking entrance to tube. Staminal corona (1) 2–2.5 mm long, (2) 3–3.5 mm diameter, attached at bottom of staminal column and comprising 5 separate lobes; each lobe spathulate-obovate and recurved or winged towards base on either side, the entire lobe (0.75) 2–2.5 mm long, (0.75) 1.5–1.7 mm wide, the wings (0.3) 0.4–0.6 mm wide. Staminal column 1.5–2 mm long, 1–2 mm diameter; anther appendages oblong-obtuse, 0.5–0.8 mm long, 0.2–0.3 mm wide; fissure between anther wings 0.6–0.8 mm long. Style-head oblong-conical, 0.7–0.8 mm long; ovaries 1–1.5 mm long, glabrous. Pollinaria c. 0.6 mm long and 0.4 mm wide; pollinia held erect, oblong, 0.35–0.4 mm long, 0.1–0.2 mm wide, yellow; corpusculum oblong, 0.2–0.3 mm long, 0.1–0.2 mm wide; caudicles somewhat winged near pollinia, 0.15–0.18 mm long, c. 0.1 mm wide. Follicles fusiform (immature), 110–120 mm long, c. 2 mm diameter, glabrous. Fig. 1.

Specimens examined: **West Papua**. Jayapura: 6 km SW of Bernhard Camp, Idenburg River [3° 28'S, 139° 08'E], Feb 1939, *Brass* 12915 (BRI; A n.v.); Rouffaer River [not localised], Sep 1926, *Docters van Leeuwen* 10275 (BO, L). **Papua New Guinea.** CHIMBU PROVINCE: Crater Mountain Wildlife Management area, east of Haia Village, 6°43'S, 145° 00'E, Mar 1997, *Takeuchi* 11736 (BRI; LAE n.v.).

Typification: Schlechter's original collection of this plant would have been deposited at B although he did not specify this (Schlechter 1905, 1913). This particular specimen is not extant having been destroyed in the firebombing of B in World War II. A duplicate of his number 14445 present at K was selected as lectotype and a further duplicate at BO as an isolectotype for the name (Forster 1994). Further duplicates of this number have not been located in the herbaria A, CANB, L, MEL, NSW, SING, WRCL where some New Guinean Schlechter material is extant.

Distribution: *Dischidia torricellensis* has now been recorded from four places. Three of these collections predate 1940. One of these is obscure and the type locality is very broadly defined. The Takeuchi collection confirms the continued existence of this species in the wild after an interval of 60 years and extends the range considerably eastwards. It is not inconceivable that this species has a broad distribution in suitable habitats between 700 and 1200 m over much of upland New Guinea.

Habitat: This plant has been collected from midmontane rainforest at altitudes between 700 and 1200 m. It occurs as an epiphyte on branches.

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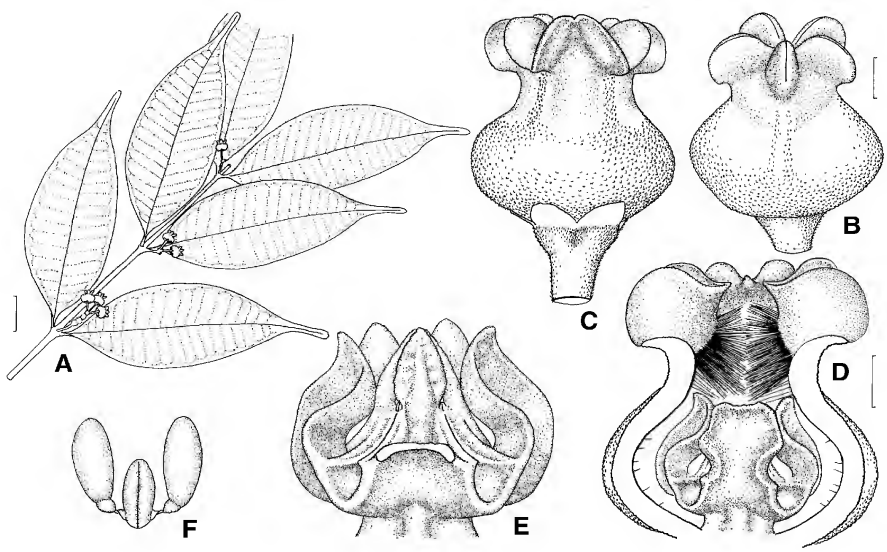

Fig. 1. ***Dischidia torricellensis***. A, flowering branch. B, bud. C, side view of flower. D, side view of dissected flower. E, side view of staminal column and staminal corona with one corona-lobe removed. F, pollinarium. Scale bars: A, 10 mm; B, C, 1 mm (at B); D, 1 mm; E, 0.5 mm (at B); F, 0.25 mm (at D). All from *Takeuchi* 11736 (BRI). Del. P.V.Bruyns.

Note

Cryptolepis papillata P.I.Forst. & *Sarcolobus porcatus* P.I.Forst. (Asclepiadaceae), newly recorded from West Papua

Systematic collection of the flora of the Birds Head Peninsula of West Papua on the island of New Guinea is currently being undertaken by staff of the National Herbarium of the Netherlands, Leiden branch and the Herbarium Bogoriense (Veldkamp et al. 1997). Amongst a number of Asclepiadaceae sent for routine identification are two collections that represent the first records for those particular species from West Papua. As both species have been rarely collected it is felt worthwhile to formally document these records.

Cryptolepis papillata P.I.Forst., Austrobaileya 3: 277 (1990).

West Papua. Birds Head Peninsula, surroundings of Ayawasi, 1°09'S, 132° 29'E, Sep 1995, *Ave* 4059 (BRI; L n.v.).

Previously known from Papua New Guinea in Morobe Province. This new collection extends the known range considerably westward. Three species of *Cryptolepis* (*C. papillata*, *C. perakensis* (Gamble) P.I.Forst., *C. lancifolia* P.I.Forst.) have now been recorded for West Papua (Forster 1990, 1991a, 1993a, 1996).

Sarcolobus porcatus P.I.Forst., Austrobaileya 3: 353 (1991).

West Papua. Birds Head Peninsula,surroundings of Ayawasi, 1°09'S, 132°29'E, Mar 1996, *Ridsdale* 2321 (BRI; L n.v.).

Previously known from Papua New Guinea in Morobe Province. This new collection extends the range considerably westward. Four species of *Sarcolobus* (*S. porcatus*, *S. retusus*, K.Schum., S. *secamonoides* (Schltr.) P.I.Forst., *S. vittatus* P.I.Forst.) have now been recorded for West Papua (Forster 1990, 1991b, 1993b, 1996).

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Acknowledgement

Thanks to M. Polak (L) for sending the material for identification.

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Austrobaileya 5(4): 731 (2000)

Note

A new combination in *Morinda* L. (Rubiaceae) for Australia

As a result of the publication of *Queensland Plants: Names and Distribution* (Henderson 1997), it has come to our attention that there is a nomenclatural problem regarding the eastern and northern Australian species recorded therein under Rubiaceae as *Morinda acutifolia* F.Muell.

George Bentham (1867) published the name *Coprosma acutifolia* for material collected by Goodwin and Dallachy at Durandoo, New South Wales, and sent to him in 1856 by Ferdinand Mueller in Melbourne. This material had been labelled *Coprosma acutifolia* by Mueller.

Unfortunately, by 1867 the name *Coprosma acutifolia* had already been published by Joseph Hooker for a different species of *Coprosma* from New Zealand (Hooker 1857). Thus, Mueller's name, when published by Bentham, was a later homonym and hence illegitimate under Article 53.1 of the International Code of Botanical Nomenclature (ICBN) (Greuter *et al.* 1994).

Mueller was aware of the problem with the binomen *Coprosma acutifolia* F.Muell. ex Benth. for he published (Mueller 1869) a brief note on this and provided the new name *Coprosma canthoides* F.Muell. for the Australian species concerned.

However, he apparently overlooked this note and combination when he named this species in *Morinda* as *M. acutifolia* F.Muell. (Mueller 1875). There he cited the name *Coprosma acutifolia* F.Muell. ex Benth. as a synonym but did not mention *C. canthoides* F.Muell. By including *Coprosma acutifolia* F.Muell. ex Benth. (as 'F.M. in Bentham'), *nom. illeg.*, in his protologue, Mueller is taken as providing a new name for the species dating from 1875 (ICBN Art.58.3) but the type of his name is the type of *Coprosma acutifolia* F.Muell. ex Benth. (ICBN Art.7.3).

As the type of *Coprosma acutifolia* F.Muell. ex Benth. is automatically the type of *C. canthoides* F.Muell. (ICBN Art.7.3), and is also the type of *Morinda acutifolia* F.Muell., according to Article 52.1 of the ICBN , Mueller in 1875 published an illegitimate name which is to be rejected. The name that Mueller ought to have provided for the species he circumscribed as *Morinda acutifolia* is *M. canthoides*.

Accordingly, the necessary new combination is now provided.

Morinda canthoides (F.Muell.) Halford & R.J.F.Hend. **comb. nov**. *Coprosma canthoides* F.Muell., Fragm. 7: 45 (1869); *Coprosma acutifolia* F.Muell. ex Benth., Fl. Austral. 3: 429 (1867), *nom. illeg.* non Hook.f., J. Linn. Soc. 1: 128 (1857); *Morinda acutifolia* F.Muell., Fragm. 9: 179 (1875), *nom. illeg.* **Type**: [Australia, New South Wales.] Durandoo, undated, Hb. *F. Mueller* (holo: K *n.v.*; BRI, photo).

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Austrobaileya 5(4): 733-734 (2000)

Note

A new combination in *Prostanthera* Labill. (Lamiaceae)

In 1904, F.M. Bailey named *Hemigenia clotteniana*, based on a specimen from "Herberton" (Bailey 1904). He gave a detailed description of the plant, including the following "leaves opposite, simple, or on the branchlets often in threes, 6 to 9 lines [12–18 mm] long, scarcely exceeding 2 lines [4 mm] in width" and later "calyx 2-lipped, lips entire; upper one deep purple, about 4 lines [8 mm] long". An examination of the type showed that it possesses 4 perfect stamens, each with 2 anther cells.

In the following year (Bailey 1905), he described *Prostanthera atroviolacea*, again from "Herberton". His description included the following "leaves opposite, not exceeding 1 inch [25 mm] long and 2 lines [4 mm] broad" and later "calyx silky-hairy, the upper lip 5 lines [10 mm] long, ... deep-violet outside".

Bailey did not compare *P. atroviolacea* with *H. clotteniana*, saying merely that "the nearest ally of this plant [*P. atroviolacea*] appears to be *P. lithospermoides*".

Between the years 1905 and 1999, only one collection of either 'species' was added to the Queensland Herbarium. That specimen, collected by Michael Lockyer in 1974, was identified as *Prostanthera atroviolacea*.

In April 1999, K.R. McDonald sent to BRI two labiaceous specimens, collected from the rocky hills west of Ravenshoe. The process of identifying these specimens led to a closer examination of *Hemigenia clotteniana* and *Prostanthera atroviolacea*, and it was soon realised that the two are synonymous. There is some variation in the stamens; some flowers have two perfect stamens while others have four. This may have prompted Bailey to place his two collections into different genera.

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The correct genus is undoubtedly *Prostanthera*, because the stamens always have two perfect cells, and the calyx is 2-lobed. Hence, a new combination is necessary, as follows:

Prostanthera clotteniana (F.M.Bailey) A.R.Bean **comb. nov.**

Hemigenia clotteniana F.M.Bailey, Queensl. Agric. J. 15: 493 (1904). **Type**: Herberton, undated, *J. Stirling* (holo: BRI).

Prostanthera atroviolacea F.M.Bailey, Queensl. Agric. J. 16: 190 (1905). **Type**: Herberton, undated, *R.C. Ringrose* (holo: BRI), **syn. nov.**

Illustration: F.M. Bailey, Comprehensive Cat. of Qld Pl. p. 393 (1913).

Additional specimens examined: **Queensland.** North Kennedy District: W of Ravenshoe, Dec 1974, *Lockyer* s.n. (BRI); TR245 W of Ravenshoe, Apr 1999, *McDonald* 22, 32 (BRI); TR 245 near Ravenshoe, May 1999, *Thompson & McDonald* (BRI).

Conservation status: *H. clotteniana* was listed as presumed extinct (X) on the schedules of the Queensland Conservation Act, while *P. atroviolacea* was listed as rare (R). A re-assessment of the conservation status of *Prostanthera clotteniana* is now obviously necessary. It is known only from a few rocky hilltops in State Forest near Ravenshoe. Three stands are known with 1, 7 and 1 individuals in each (K. McDonald pers. comm.). Applying the criteria of the IUCN (Anon. 1994), a category of 'critically endangered' is proposed (Criterion D).

Acknowledgements

I am grateful to Keith McDonald whose dogged efforts to debunk the 'X' status of *Hemigenia clotteniana* have finally paid off.

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Austrobaileya 5(4): 735-736 (2000)

Note

A new combination in *Corymbia* 'section Politaria': *C. citriodora* subsp. *variegata* (Myrtaceae).

Introduction

Hill and Johnson (1995) informally established *Corymbia* section '*Politaria*' to comprise four species: *Corymbia citriodora* (lemon-scented gum), *C. maculata* (spotted gum), *C. henryi* (large-leaved spotted gum) and *C. variegata* (spotted gum). However, a recent study by McDonald et al. (2000) has shown that the taxonomic status of *C. variegata* warrants reappraisal. They presented evidence that *C. citriodora* and *C. variegata* could not be distinguished by either allozymes or morphology. They found that the main attribute distinguishing them was leaf oil composition (citronellal is the main leaf oil in *C. citriodora* and a-pinene in *C. variegata*). The two 'species' were thus considered to represent a single taxon comprising two chemotypes. Following field and herbarium studies (particularly by ARB) we concur with McDonald et al. (2000) and here formally subsume *C. variegata* under *C. citriodora* at subspecies rank. This will continue to allow a distinction between the two entities, while more accurately reflecting the closer relationship of *C. variegata* to *C. citriodora* than to *C. maculata*.

Most phytogeographical references on eucalypts, e.g. Blakely (1934), Boland et al., (1984), Chippendale (1988), Brooker et al. (1997) and Brooker and Kleinig (1999), treated *C. citriodora* subsp. *variegata* as the northern extension of *C. maculata*., although Chippendale (l.c.) lists *Eucalyptus variegata* as a synonym of *E. citriodora*. The presence of lemon-scented leaf oils, rather than morphological attributes, appears to have preoccupied the taxonomic approach of these authors. This is despite the findings of Maiden (1920), McKern (1954) and Larsen (1965), who also considered the two represented a single taxon comprising two chemotypes.

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McDonald et al. (2000) also concluded that the two other 'Politaria' species, *C. maculata* (Hook.) K.D.Hill & L.A.S.Johnson and *C. henryi* (S.T.Blake) K.D.Hill & L.A.S.Johnson, represented vicariads as they were genetically and morphologically allied, while genetically distinct from the *C. citriodora-C.variegata* alliance. However, we consider that little would be gained by a change to infraspecific rank for these species as their relationship is well established and the nomenclatural change unnecessarily disruptive.

Taxonomy

Corymbia citriodora (Hook.) K.D.Hill & L.A.S.Johnson subsp. **variegata** (F.Muell.) A.R.Bean & M.W.McDonald **comb. et stat. nov.**

Eucalyptus variegata F.Muell., J. Linn. Soc., Bot. 3: 88 (1859); *Corymbia variegata* (F.Muell.) K.D.Hill & L.A.S.Johnson, Telopea 6: 389 (1995). **Type**: Queensland. Burnett River, 1856, *F. Mueller* (holo: MEL; iso: K).

Corymbia citriodora subsp. *variegata* extends south of the Springsure-Maryborough region in Queensland to near Coffs Harbour in New South Wales and has foliage that lacks a lemon scent when crushed. *C.citriodora* subsp. *citriodora* extends north from the Springsure-Maryborough region in central eastern Queensland to the Atherton Tableland in north Queensland and has lemon-scented foliage when crushed. Further details on the two taxa (as *C. citriodora* and *C. variegata*) are given in Hill and Johnson (1995).

Within *C.citriodora* subsp. *citriodora*, McDonald et al. (2000) also noted morphological differences between northern populations (Mt Janet south to the White Mountains region) and southern populations (Mackay region south to the Springsure-

Maryborough region). The northern form differs in having narrower and more densely hairy juvenile leaves, narrower adult leaves and bark with fewer mottles compared to the southern form. The taxonomic significance of these differences requires further study.

Key to taxa in *Corymbia* 'section Politaria'

1 Adult leaves broad-lanceolate to lanceolate, to 4.5 cm wide **2**
Adult leaves narrow-lanceolate, to 2.8 cm wide **3**

2 Juvenile leaves to 9.0 cm wide, fruit to 2 x 1.5 cm (from near Grafton, NSW to the Brisbane region, Qld)..... **C. henryi**
Juvenile leaves to 5.5 cm wide, fruit to 1.4 x 1.1 cm (from Taree to Eden in NSW and Mottle Range, Vic.) ..... **C. maculata**

3 Leaves lemon-scented (N of Maryborough-Springsure to Atherton Tableland, Qld)..... **C. citriodora** subsp. **citriodora**
Leaves not lemon-scented (S of Maryborugh-Springsure to NW of Coffs Harbour, NSW)..... **C. citriodora** subsp. **variegata**

Acknowledgements

Ian Brooker and Andrew Slee provided useful comments on a draft of this paper.

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Index of new names published in *Austrobaileya* 5(4)

Referees consulted for Volume 5

Acceptance of papers has depended on the outcome of review by referees. Apart from a few who did not wish to be listed those consulted during the past four years are listed below. Several were consulted on more than one occasion. Sincere thanks are extended to all these people whose expertise has helped to maintain journal standards.

Barker, R.M.
Bean, A.R.
Bergstrom, D.
Bostock, P.
Brooker, M.I.H.
Bruhl, J.J.

Clayton, W.D.
Conn, B.J.
Cowie, I.D.
Craven, L.A.
Cribb, P.J.
Crisp, M.D.

Dawson, J.W.
Dixon, D.
Dunlop, C.R.
Duretto, M.F.

Eggli, U.

Fensham, R.J.
Forster, P.I.

George, A.S.
Goyder, D.J.
Gross, C.L.
Guymer, GP.

Harden, G. J.
Harris, W.K.
Henderson, R.J.F.
Hill, K.D.
Holland, A.E.
Hunter, J.T.
Hyland, B.P.M.

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Jessup, L.W.
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Keighery, G. J.
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Makinson, R.O.
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Reynolds, S.T.

Schrire, B.
Simon, B.K.
Short, P.S.
Snow, N.

Toelken, H.R.

Weiller, C.M.
Welzen, van P.C.
Weston, P.H.
Wiecek, B.
Wilson, Peter G.

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Manuscripts must be submitted in duplicate to The Editor, *Austrobaileya*, Queensland Herbarium, Meiers Road, Indooroopilly, Qld 4068, Australia. They must be double-spaced typewritten, with 2.5 cm margins in the first instance. After refereeing, the corrected manuscript should be submitted on an MSDOS disk as an unformatted ASCII file (DOS Text File Format), and in your word processing package format, or as a Rich Text Format file. Manuscripts may be e-mailed to the editor as an attached file (Laurie.Jessup@env.qld.gov.au). All illustrations should be submitted with the text. One set of proofs will be sent to authors.

For style and layout the most recent number of *Austrobaileya* should be followed, particularly in the use of subheadings for distribution, etymology, etc. A detailed guide may be obtained from the editor. Papers must be concise and illustrations should make economical use of available space.

Where possible illustrations should be submitted in a size suitable for reproduction without reduction in size. The maximum size of a printed illustration is 13.5 cm x 18.5 cm. Do not put lettering on the illustration but indicate separately on a photocopy or overlay. Illustrations should be cited in the text. Typed captions should be supplied on a separate page with the text and also adhered to the overlay or photocopy of the illustration. All illustrations, both line drawings and photographs are to be numbered as figures in a common sequence. Published illustrations remain the property of the Queensland Herbarium.

Tables should be as simple as possible. Long and/or complicated tables should be avoided. The tables should be numbered consecutively and each should be cited in the text.

Standard Abbreviations

Titles of journals cited in the nomenclatural sections of the text should be abbreviated according to *Botanico-Periodicum-Huntianum* (Hunt Botanical Library, 1968) while names of books should be abbreviated in accordance with F.A. Stafleu and R.S. Cowan, *Taxonomic Literature*, edn 2 (W. Junk, 1976--1988). In the 'References' section the titles of both journals and books should be given in full. All entries in the 'References' are to be referred to in the narrative text and all references to papers or books in narrative text are to be included in the 'References' section.

Author abbreviations should follow the *Draft Index of Author Abbreviations compiled at the Herbarium, Royal Botanic Gardens, Kew* (HMSO, 1980). Acronyms used for herbaria cited in the text should be in accordance with P.K. Holmgren, N.H. Holmgren and L.C. Barrett (eds), *Index Herbariorum Part 1: The Herbaria of the World*. New York: New York Botanical Garden (1990).

Other abbreviations which may be used in citing specimens are S.F. (State Forest), S.F.R. (State Forest Reserve), L.A. (Logging Area), T.R. (Timber Reserve) and an AQ number. This number refers to the computerised collection number situated on the sheet and/or on the label of specimens housed in the Queensland Herbarium (BRI). It is distinct from the BRI number which is a framed sheet number associated with the name 'Queensland Herbarium Brisbane', stamped on the sheet.

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New names are in **bold**, all others are in *italics*. Page numbers in **bold** refer to the principal description, those in *italics* refer to an illustration. **Pages 369-404 do not exist in Volume 5 due to a pagination error.**

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Queensland Herbarium

Publications for sale

A Key to Australian Grasses by B.K.Simon (1993), 2nd edition 206pp., card cover.

Ferns of Queensland by S.B.Andrews (1990), 427pp., illustrated, hard cover.

Flora of South-eastern Queensland by T.D. Stanley and E.M.Ross.

Volume 1 (1983), 545pp., illustrated, card cover
Volume 3 (1989), 532 pp., illustrated, hard cover.

Vegetation Survey of Queensland: South West Queensland. Queensland Botany Bulletin No. 4 by D.E.Boyland (1984), 151pp., illustrated, including a map, card cover.

Vegetation Survey of Queensland: South Central Queensland. Queensland Botany Bulletin No.3 by V.J.Neldner (1984),291pp., illustrated, including a map, card cover.

Vegetation Survey of Queensland: Central Western Queensland. Queensland Botany Bulletin No.9 by V.J.Neldner (1991), 230pp., illustrated, including a map, card cover.

Vascular Plants of Western Queensland. Queensland Botany Bulletin No.11 by V.J.Neldner (1992), 176pp., illustrated, card cover.

Vegetation of the Sunshine Coast: Description and Management. Queensland Botany Bulletin No.7 by G.N.Batianoff and J.A.Elsol (1989), 107pp., illustrated, including maps, card cover.

Vegetation Map and Description, Warwick, South-eastern Queensland. Queensland Botany Bulletin No.8 by P.A.R.Young and T.J.McDonald (1989), 47pp., illustrated, including a map,card cover.

Vegetation Survey and Mapping in Queensland: Its Relevance and Future, and theContribution of the Queensland Herbarium. Queensland Botany Bulletin No.12 by V.J.Neldner (1993), 76pp., card cover.

Suburban Weeds, Third edition by H.Kleinschmidt, A.Holland and P.Simpson (1996), 98pp., illustrated, card cover.

Poisonous Plants - a field guide by R.M.Dowling and R.A.McKenzie (1993), 175pp., colour illustrations and maps, card cover.

The Flora of Girraween and Bald Rock National Parks by Bill McDonald, Colleen Gravatt, Paul Grimshaw and John Williams (1995), 100pp., colour and line drawing illustrations and maps, card cover.

Wildflowers of South-eastern Queensland by B.A.Lebler.

Volume 1 (1977) 108pp., illustrated, soft cover.
Volume 2 (1981) 83pp., illustrated, soft cover.

Enquiries regarding the cost and ordering of these publications should be directed to Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens Mt Coot-tha, Mt Coot-tha Road, Toowong Queensland 4066, Australia.

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