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A re-assessment of the varieties recognised in *Verticordia plumosa* (Myrtaceae: Chamelaucieae)

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Abstract

Harris, A.M. & Rye, B.L. A re-assessment of the varieties recognised in *Verticordia plumosa* (Myrtaceae: Chamelaucieae). *Nuytsia* 23: 163–170 (2013). The seven varieties of *Verticordia plumosa* (Desf.) Druce are re-assessed in the light of recent collections. *Verticordia plumosa* var. *pleiobotrya* A.S.George is reduced to a synonym of *V. plumosa* var. *brachyphylla* (Diels) A.S.George. A key and distribution maps are provided for the six remaining varieties, two of which have conservation priority.

Introduction

Verticordia DC. is a Western Australian genus belonging to the subtribe Chamelauciinae (DC. ex F.Rudolphi) Arn. of Myrtaceae tribe Chamelaucieae DC. Its type species is the extremely variable *V. plumosa* (Desf.) Druce. George (1991) recognised seven varieties for *V. plumosa*, but noted that most of the varieties were linked by intermediate specimens and that this taxonomically difficult complex needed further study. Four of the varieties are widespread and known from numerous populations in the south-west of Western Australia. The other three, var. *ananeotes* A.S.George, var. *pleiobotrya* A.S.George and var. *vassensis* A.S.George, are restricted to a strip along the west coast between Perth and Augusta. These three varieties have conservation priority (Smith 2012), making it particularly important that their delimitation is clear.

Recent surveys of *V. plumosa* var. *pleiobotrya* populations have revealed greater morphological variation than was previously known for the taxon and the collectors had difficulty distinguishing it from the more common and widespread var. *brachyphylla* (Diels) A.S.George. In this paper, var. *pleiobotrya* is reduced to synonymy and the other six varieties are assessed to determine how distinctive they are and to provide additional information to assist with their identification.

Published descriptions, keys and illustrations

Brief descriptions and a key to the seven varieties of *V. plumosa* were given in George (1991: 353–354). The same key was included in George and Pieroni (2002), with some additional notes and also beautiful colour illustrations of all the varieties. In these publications, var. *ananeotes* was distinguished from

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the other six varieties in being lignotuberous, while var. *vassensis* and var. *pleiobotrya* were described as having smaller flowers than the other five varieties and distinguished from one another by their sepal and petal width as well as the arrangement of their flowers. Variety *pleiobotrya* was recorded as having narrower sepals and petals than all the other varieties.

Distributions of the varieties and intermediate specimens

In George (1991), three of the varieties of *V. plumosa*—var. *plumosa*, var. *incrassata* A.S.George and var. *vassensis*—were depicted as being geographically separated on Map 37, although var. *plumosa*, which is shown by solid, inverted triangles, was omitted from the caption. Map 44 showed var. *brachyphylla* and var. *grandiflora* (Benth.) A.S.George, again as being geographically separated, while the remaining two varieties were shown on Map 43 (var. *pleiobotrya*) and Map 39 (var. *ananeotes*) respectively. Intermediates were noted between:

1. var. *brachyphylla* and var. *incrassata* (some var. *incrassata* specimens from Fitzgerald River National Park having a tendency towards var. *brachyphylla*);
2. var. *brachyphylla* and var. *vassensis* (e.g. Darkin Reserve and Bowelling);
3. var. *grandiflora* and var. *incrassata* (intergrading from Scadden southwards);
4. var. *grandiflora* and var. *plumosa* (Cape Riche);
5. var. *plumosa* and var. *vassensis* (e.g. near Manjimup and Scott River).

Maps in George and Pieroni (2002) showed a greater overlap in the ranges of the varieties, partly as a result of the greater number of specimens available by that time, and by 2012 the distribution maps of the varieties in *FloraBase* (Western Australian Herbarium 1998–) showed even greater overlaps. In addition to the intermediates listed above, some of the current specimens have been identified as being intermediates between:

1. var. *ananeotes* and var. *vassensis* (Ruabon), with some specimens labelled as being hybrids, i.e. *Verticordia plumosa* var. *ananeotes* × *vassensis*, a name which also appears on *FloraBase*;
2. var. *brachyphylla* and var. *grandiflora* (Fitzgerald River National Park);
3. var. *brachyphylla* and var. *plumosa* (Mt Frankland area).

Of particular concern in the above list is the large number of intermediates recorded involving the rare *V. plumosa* var. *vassensis*, with some of the intermediates occurring far outside the recorded range of the variety.

Recent collections and germination studies

Cochrane *et al.* (2001) measured seed production and germination rates in the three rare varieties of *V. plumosa*. They found the lowest proportion of seed set (5.4%) in the lignotuberous (resprouter) var. *ananeotes*, and also the lowest germination rate (26%) based on a sample of 63 seeds obtained from a single large population visited five times between March 1994 and February 1999. Only one visit, in February 1995, was made to a much larger population of the non-lignotuberous var. *pleiobotrya*, which had a much higher seed set (24%) and a higher germination rate (72%) from a similar-sized sample of seeds. Five populations of the other non-lignotuberous variety, var. *vassensis*, were visited

between February 1997 and February 1999; this taxon had a low seed set (7.7%) and an intermediate germination rate (46%) was obtained from 176 seeds. Hence, var. *vassensis* may be the most at risk of the three varieties since it is unable to regenerate from a lignotuber and also appears to have a low seed set.

Andrew Crawford collected fruiting samples from two known populations of var. *pleiobotrya* in December 2007. One of us, Anne Harris, collected specimens from two other known populations in December 2011. However, some of these specimens were later identified as var. *brachyphylla*, and when the specimens from the Swan Coastal Plain housed under these two varietal names were compared in February 2012 there appeared to be no consistency in the determinations. Alex George (pers. comm.) identified all the December 2011 collections as being of var. *pleiobotrya*, which he still considered to be sufficiently distinct to maintain as a separate variety although he agreed that the recent specimens had increased the morphological variation known within it.

As can be seen from Table 1, the greater range of variation now known for the characters previously considered to separate var. *pleiobotrya* from var. *brachyphylla* means that there is a considerable overlap in each of them. Even when measurements were taken only from the few specimens known by 1991, these characters were found to be more variable than recorded in George (1991), with some overlap in each character. As there are now no reliable characters available to distinguish the two varieties, the decision has been made to reduce var. *pleiobotrya* to a synonym of var. *brachyphylla*.

Among the large number of recent collections from populations of *V. plumosa* within the mapped range of var. *vassensis*, there is a similar confusion of identifications, in this case involving three other varieties, var. *ananeotes*, var. *brachyphylla* and var. *plumosa*. Outside this area, in the Darling Range, several specimens previously identified as being intermediate between var. *brachyphylla* and var. *vassensis* have been re-identified in the current study as var. *brachyphylla*. The greater variation

Table 1. Comparison of the morphological characters as recorded in George (1991) for two varieties of *Verticordia plumosa* with the current range of measurements recorded from the more numerous specimens now available on the Swan Coastal Plain. Note that the methods used to obtain the measurements in 2012 were different from those used in 1991 in that only the longest, fully mature peduncles were measured on each specimen and only the longest, i.e. outermost, sepals were measured.

	V. plumosa var. **pleiobotrya**		**V. plumosa** var. **brachyphylla**	
	1991	2012	1991	2012
Peduncles				
length	1.5–3(–8) mm	2–8 mm	7–11 mm	5–12 mm
Sepals				
length	2.3–2.5 mm	2.3–3.3 mm	2.5–3.5 mm	2.5–3.5 mm
lobes	narrow	narrow to broad	narrow to broad	narrow to broad
Petals				
length	2–2.4 mm	2–3 mm	2.2–3 mm	2.2–3.2 mm
width	1.1–1.5 mm	1.3–2.2 mm	not given	1.5–2.2 mm

in flower size now accepted in var. *brachyphylla* as a result of including var. *pleiobotrya* within it has meant that the specimens labelled as intermediate with var. *vassensis* are now a good match for var. *brachyphylla s. lat.*

Methods

Type material was examined at NSW and PERTH. All PERTH specimens were examined and redeterminations made for a number of specimens; this led to reductions in the number of intermediates recognised, the number of disjunct records for some of the varieties and the number of specimens that had not been identified down to the varietal level. Measurements were then taken of all the varieties from the dried material. Variation in the measurements was kept to a minimum by scoring the largest leaves on each specimen and taking care to measure the inflorescence and floral organs when they were fully mature. Distributions were plotted, using DIVA-GIS Version 5.2.0.2, from data obtained from *FloraBase* (Western Australian Herbarium 1998–), on maps showing the version 6.1 Interim Biogeographic Regionalisation for Australia (IBRA) regions (Department of the Environment, Water, Heritage and the Arts 2008).

Key to the varieties of *Verticordia plumosa*

This new key should help with the identification of the remaining six varieties of *V. plumosa* but will not be completely reliable owing to the difficulty of this complex.

1. Shrub with a small lignotuber and several to many simple or sparsely branched stems, up to 0.4 m high. Longest leaves with a blade 7–15(–20) mm long (Serpentine–Busselton)..... var. **ananeotes**

1: Shrub without a lignotuber, often bushy, up to 1.5 m high. Longest leaves with a blade 2–10(–14) mm long

2. Sepals 4–5.5 mm long. Petals 3.5–4.5 mm long, usually white, rarely pale pink (S of Stirling Ra.–Cape Arid NP) .....var. **grandiflora**

2: Sepals 1.8–4 mm long. Petals 2–3.8 mm long, pale to deep pink, rarely white

3. Leaf blades 2–5 mm long, 0.6–1 mm thick. Sepals 3–4 mm long (Marvel Loch– Fitzgerald River NP–Scadden).....var. **incrassata**

3: Leaf blades 2–10(–14) mm long, 0.35–0.6 mm thick. Sepals 1.8–3.5(–4) mm long

4. Peduncles 1.5–4 mm long. Sepals 1.8–2.8 mm long. Flowering branchlets corymbose. Occurring in winter-wet sites including depressions (Busselton area).....var. **vassensis**

4: Peduncles (2–)4–12 mm long. Sepals 2.3–4 mm long. Flowering branchlets with numerous groups of flowers on short lateral branchlets, or if corymbose then occurring on granite

5. Leaf blades 7–10(–14) mm long. Sepals 2.5–4 mm long. Occurring on granite (Wooroloo–far south-west–Cape Riche)..... var. **plumosa**

5: Leaf blades 2–8 mm long. Sepals 2.2–3.5 mm long. Occurring mainly in low-lying sites, often in winter-wet depressions (Arrowsmith River–Scott River–Fitzgerald River NP)..... var. **brachyphylla**

Status of the four common varieties of *Verticordia plumosa*

Verticordia plumosa has four common varieties—var. *brachyphylla*, var. *grandiflora*, var. *incrassata* and var. *plumosa*—with fairly large distributions in the south-west (Figures 1, 2). Although all four show considerable morphological variation across their ranges, they can usually be distinguished fairly readily from one another on morphological grounds as well as differing in their areas of occurrence and habitat preferences. The enlarged circumscription of var. *brachyphylla*, as made formal below, has resulted in a greater range of flower size and peduncle length being accepted in this variety. The effect of adding the relatively small-flowered coastal specimens to var. *brachyphylla* has increased the average difference in flower size between var. *brachyphylla* and the other three varieties, as var. *brachyphylla* already tended to have smaller flowers.

Verticordia plumosa var. **brachyphylla** (Diels) A.S.George, *Nuytsia* 7: 356 (1991). *Verticordia fontanesii* var. *brachyphylla* Diels, *Bot. Jahrb.* 35: 403 (1904). *Verticordia plumosa* var. *brevifolia* (F.Muell.) Domin, *Mêm. Soc. Sci. Bohême* 1921–1922, 2: 79 (1923), *nom. illeg. Type*: near Waeel, Western Australia, October 1901, *E. Pritzel s.n.* (*lecto*: K *n.v.*, *fide* A.S. George, *Nuytsia* 7: 356 (1991); *isolecto*: BM *n.v.*, E *n.v.*, NSW 542650, PERTH 01623044).

Verticordia plumosa var. *pleiobotrya* A.S.George, *Nuytsia* 7: 354–355 (1991). *Type*: Kargotich Road, 0.8 km south of Mundijong Road, west of Mundijong, Western Australia, 7 November 1986, *A.S. George* 16902 *& E.A. George* (*holo*: PERTH 01886851; *iso*: AD *n.v.*, CANB *n.v.*, MEL *n.v.*, NSW 542676, PERTH 01883577).

Selected specimens examined. WESTERN AUSTRALIA: Abernethy Rd, 1.4 km E of Kargotich Rd, W of Byford (Population 6), 20 Dec. 2007, *A. Crawford* ADC 1732 (PERTH); Bullsbrook Nature Reserve, 5 Nov. 2003, *R.M. Evans* 45 (PERTH); Mundijong Rd, 200 m W of Pure Steel Lane, 14 Dec. 2011, *A.M. Harris* AH 203 (PERTH); Boundary Rd, Kenwick, W side of road, 1998, *F. Obbens* FO 524/98 (PERTH); Canning River East Branch, *c.* 14 km direct line ESE of the Canning Dam, 7 Nov. 2009, *K.R. Thiele* 3911 (PERTH).

Distribution and habitat. Extends from Arrowsmith River south to Scott River and south-east to Fitzgerald River National Park (Figure 1A). Occurs mainly in low-lying sites, often in winter-wet depressions.

Flowering period. October to December.

Conservation status. This variety has numerous populations in a range that extends for more than 600 km.

Notes. A small selection of the recently collected specimens from the Swan Coastal Plain and Darling Range is cited above. George (1991) noted that plants on the coastal plain, which now include those previously placed in var. *pleiobotrya*, tend to have longer, more slender leaves and peduncles than those from northern and inland localities. This still holds true for the leaves but not for the peduncles. Variety *brachyphylla* is the most widely distributed of the varieties and overlaps or abuts the ranges of the others.

Although *V. plumosa* var. *pleiobotrya* is no longer formally recognised, it would be worth preserving the full range of morphological variation found in the *V. plumosa* complex on the Swan Coastal Plain, both in natural populations and in cultivation.

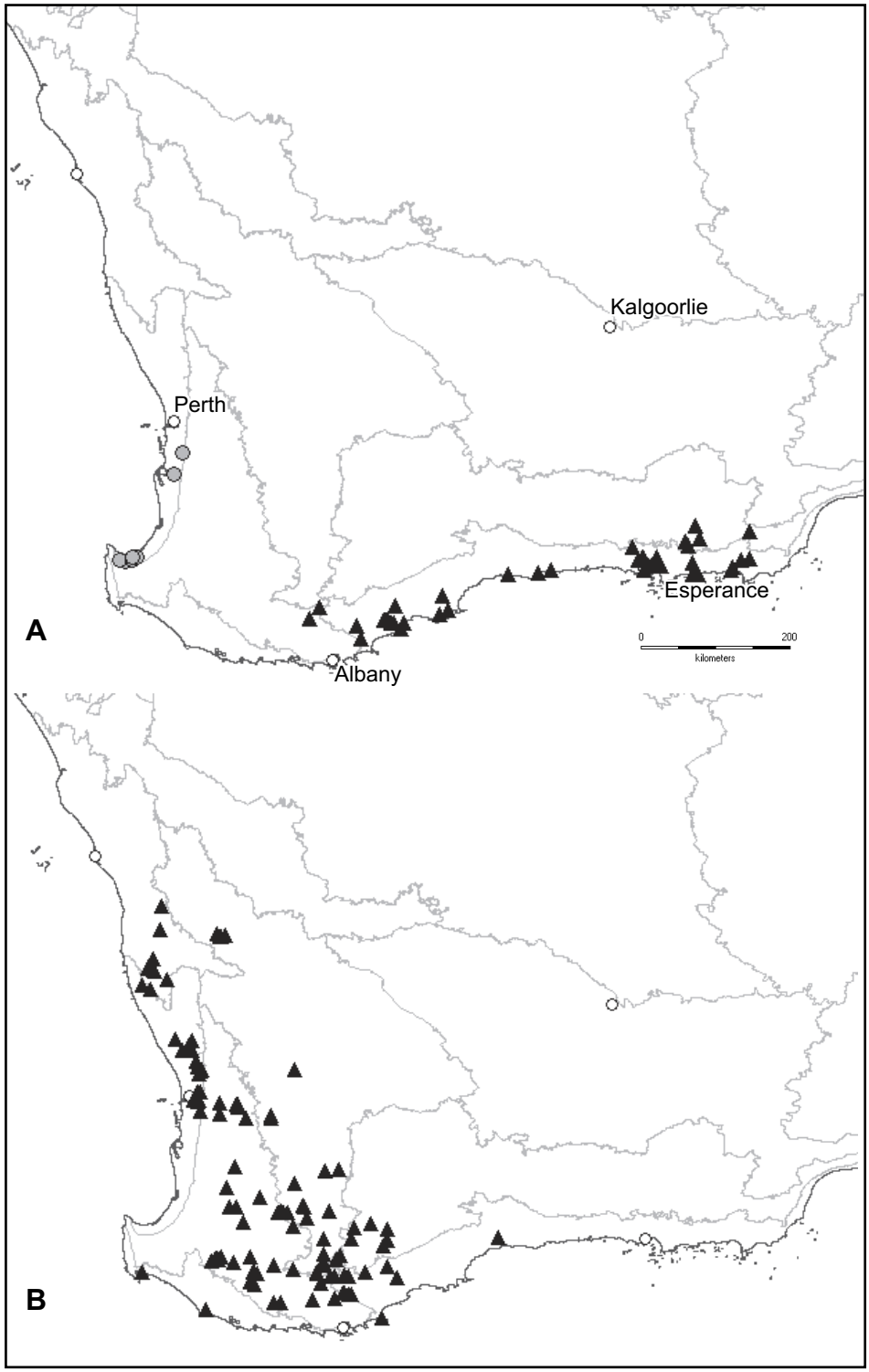

Figure 1. Distribution maps for varieties of *Verticordia plumosa*. A – var. *ananeotes* (●) and var. *grandiflora* (▲); B – var. *brachyphylla* (▲).

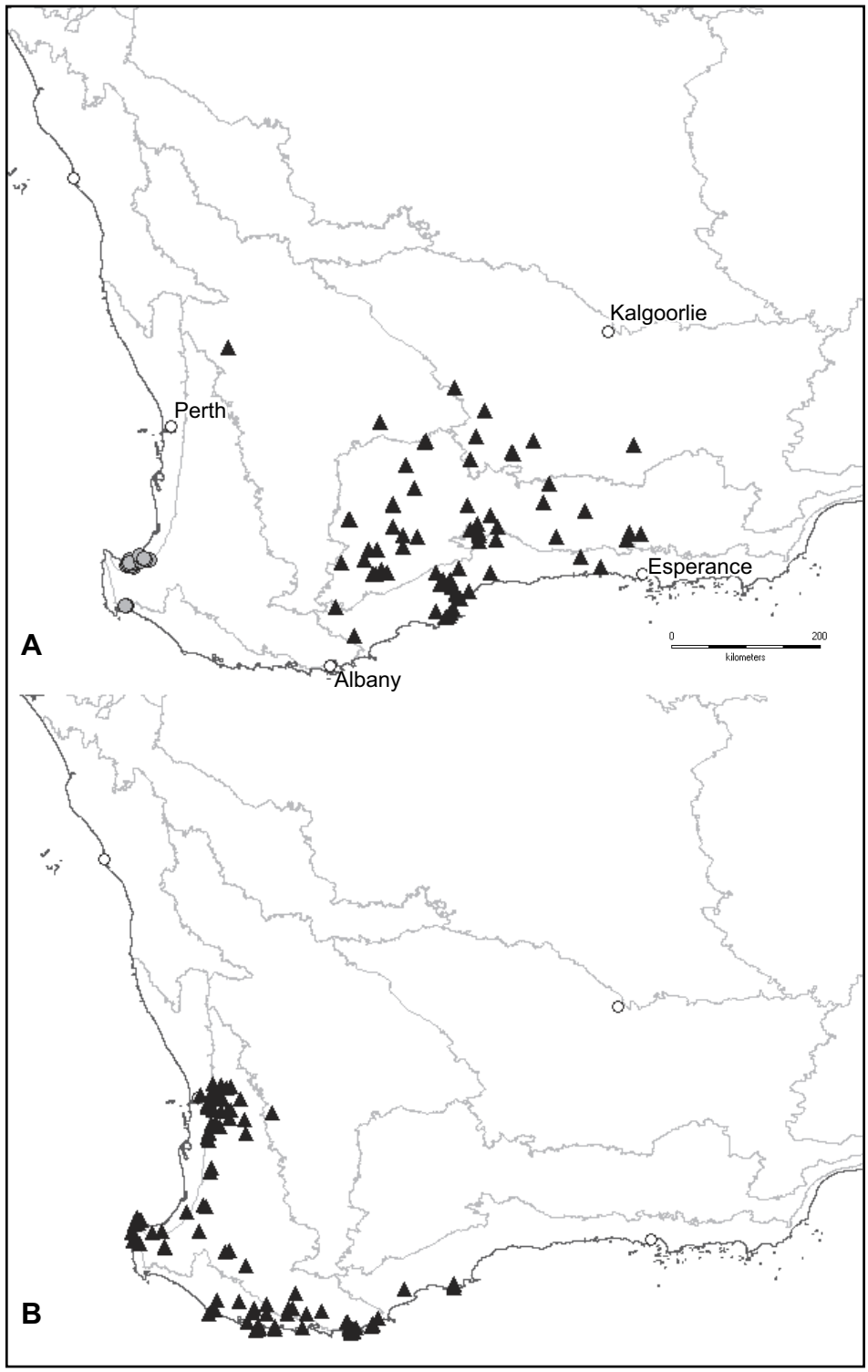

Figure 2. Distribution maps for varieties of *Verticordia plumosa*. A – var. *incrassata* (▲) and var. *vassensis* (◉); B – var. *plumosa* (▲).

Status of *Verticordia plumosa* varieties *ananeotes* and *vassensis*

Both of the uncommon varieties of *V. plumosa*—var. *ananeotes* and var. *vassensis*—are apparently being maintained in cultivation to some degree, as they were included in the plant list for the Friends of Kings Park plant sale held on 3 November 2012.

Verticordia plumosa var. *ananeotes* is listed as Threatened under DEC Conservation Codes for Western Australian Flora (Smith 2012); it has a restricted range (Figure 1A) and there are fewer collections of it than of any of the other varieties. It is apparently unique in having a lignotuber, and its leaves tend to be longer than in all the other varieties. Although var. *ananeotes* appears to be distinctive, it needs further study in the Ruabon area, where it apparently comes into contact with at least one of the non-lignotuberous varieties, to determine whether it interbreeds and intergrades with non-lignotuberous variants or maintains its distinctiveness.

Verticordia plumosa var. *vassensis* is also listed as Threatened under DEC Conservation Codes for Western Australian Flora (Smith 2012) and appears to have the smallest range of any of the varieties (Figure 2B). It was considered to have the smallest flowers, with sepals only 1.5–2.3 mm long; however, all specimens currently housed under this variety have sepals 1.8–2.8 mm long. Separation of var. *vassensis* from var. *brachyphylla* is in question now that var. *brachyphylla* includes specimens with sepals down to 2.2 mm long. However, there does appear to be a more significant difference between the two varieties in their inflorescence type, and on that basis var. *vassensis* is considered worth maintaining as a distinct variety, for now.

The whole *V. plumosa* complex certainly needs further investigation, especially in the far south-west where var. *vassensis* and three other varieties apparently overlap in range.

Acknowledgements

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