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Reinstatement of *Burchardia congesta* (Colchicaceae)

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Abstract

Keighery, G.J. and Muir, W. Reinstatement of *Burchardia congesta* (Colchicaceae). *Nuytsia* 15(3): 347–353 (2005). *Burchardia* R. Br. is an endemic Australian genus of five species in the Colchicaceae. *Burchardia umbellata* R. Br. is a widespread taxon occurring disjunctly in temperate Eastern Australia and in south-west Western Australia. Studies on the morphology, ecology and anatomy of the Western and Eastern populations have shown marked discontinuities in character sets, leading to the recognition that each area is a seperate taxon. The name *B. congesta* Lindl. is re-instated for the Western populations and the name *B. umbellata* restricted to the Eastern populations.

Introduction

Burchardia R. Br. is an endemic Australian genus of Colchicaceae. Five species were recognised in a "Flora of Australia" treatment of the genus (Macfarlane 1987). As defined in that treatment, *Burchardia umbellata* R. Br. is a widespread taxon occurring disjunctly in temperate Eastern Australia (from south-east Queensland to Tasmania and South Australia) and in south-west Western Australia**.** However, Macfarlane noted that the western plants of this taxon differed from the eastern ones in habitat preference, in having yellow rather than purple anthers, and in having conspicuous glossy thickenings on the angles of the capsule.

Both Green (1964) and Beard (1969) commented on species which are disjunct between south-western and south-eastern Australia. Beard listed 280 taxa, while Green concentrated on the 34 species that had disjunctions of over 2,500 kilometres. In the Liliaceae *s. lat.* there were 16 such species listed by these authors. One additional species in this category, *Stypandra glauca*, has been noted by Henderson (1987d).

This publication presents the results of anatomical, cytological and morphological studies on populations of *Burchardia umbellata s. lat.* from eastern and western Australia and reports on the current status of other liliaceous taxa that have previously been listed as having similar disjunctions.

Materials and methods

Anatomical and cytological studies were undertaken on populations from Kings Park, Albany and Cockleshell Gully (Western Australia), the Mount Lofty Ranges (South Australia), Colac and Ballarat

(Victoria), Shellharbour (New South Wales) and Canberra (Australian Capital Territory). Voucher collections were lodged in UWA and the appropriate herbaria. For anatomical studies, whole plants were fixed in FAA. The material was then divided embedded in paraffin wax, sectioned on a rotary microtome at 10–12 µm and stained with safarin and fast green. Flower buds for cytological studies were fixed in Bradley's solution, stained in Snow's acid aceto-carmine and squashed in 45% acetic acid. Suitable spreads were photographed and made permanent using liquid nitrogen and mounting in Euparol. *Burchardia umbellata* collections in all major Australian herbaria were examined to compare the morphological characters of eastern and western plants.

Results

Anatomy of peduncles and pedicels

The peduncles and pedicels are structurally similar in populations from both areas, the major differences being a reduction in the amount of fibres in the eastern populations (Figure 1A). The vascular bundles are arranged in a double ring, below a layer of chlorenchymatous tissue and, in the western populations, are embedded in secondarily thickened parenchyma in both the peduncle and pedicel (Figures 1B and 1C). A pith of parenchyma is present in both areas. Structurally the vascular bundles are identical in form, consisting of a U-shaped xylem element surrounded by phloem (Figure 1D).

The difference in the peduncles and pedicels of the eastern and western populations probably relates to their ecology and life history. In Eastern Australia *Burchardia umbellata* is frequently a wetland plant. In Western Australia most *Burchardia* species favour winter-wet sites (*B. monantha* Domin and *B. rosea* Keighery) or swamps (*B. bairdiae* Keighery and *B. multiflora* Lindl.). Only *B. umbellata* is consistently a dryland species.

The western populations of *B. umbellata* retain their seeds in the capsule, which is held erect on top of the dry persistent inflorescence stalk. They are released slowly as wind shakes the capsules or as the old stalks fall over in autumn with the first rains. Observations on natural populations of *Burchardia umbellata* at Woodvale Nature Reserve (25 km north of Perth) have shown that seeds are mature by late November, the capsules open in late November after the seeds mature and the seeds fall to the base of the capsule. On December 30 all capsules still contain all the mature seeds, by January 30 22% of capsules have fallen or lost most of their seed, by Feb 28 all capsules have lost their seed, although all were still erect. A storm occurred before April 30 and most capsules were lying on the ground and less than 5% had seeds still retained. This retention of seed protects them from the very high surface temperatures of the sandy soils where they grow.

Retention of seed by the old inflorescences in south Western and Eremaean herbs is a very common but largely ignored trait in our flora. The other species have capsules that rapidly break down on maturity and release the seeds into the drying wetlands before the onset of summer. In *Burchardia rosea* which lacks strengthening tissue, like the eastern populations of *B. umbellata*, the peduncles collapse from wilting soon after picking. This also appears to be the case in *Burchardia umbellata* in Eastern Australia.

Leaf anatomy

Typical sections of the leaves cut 4 cm from the leaf apex are shown in Figure 1E. The greater width and thickness of the leaves of the western populations is immediately apparent, however, again they

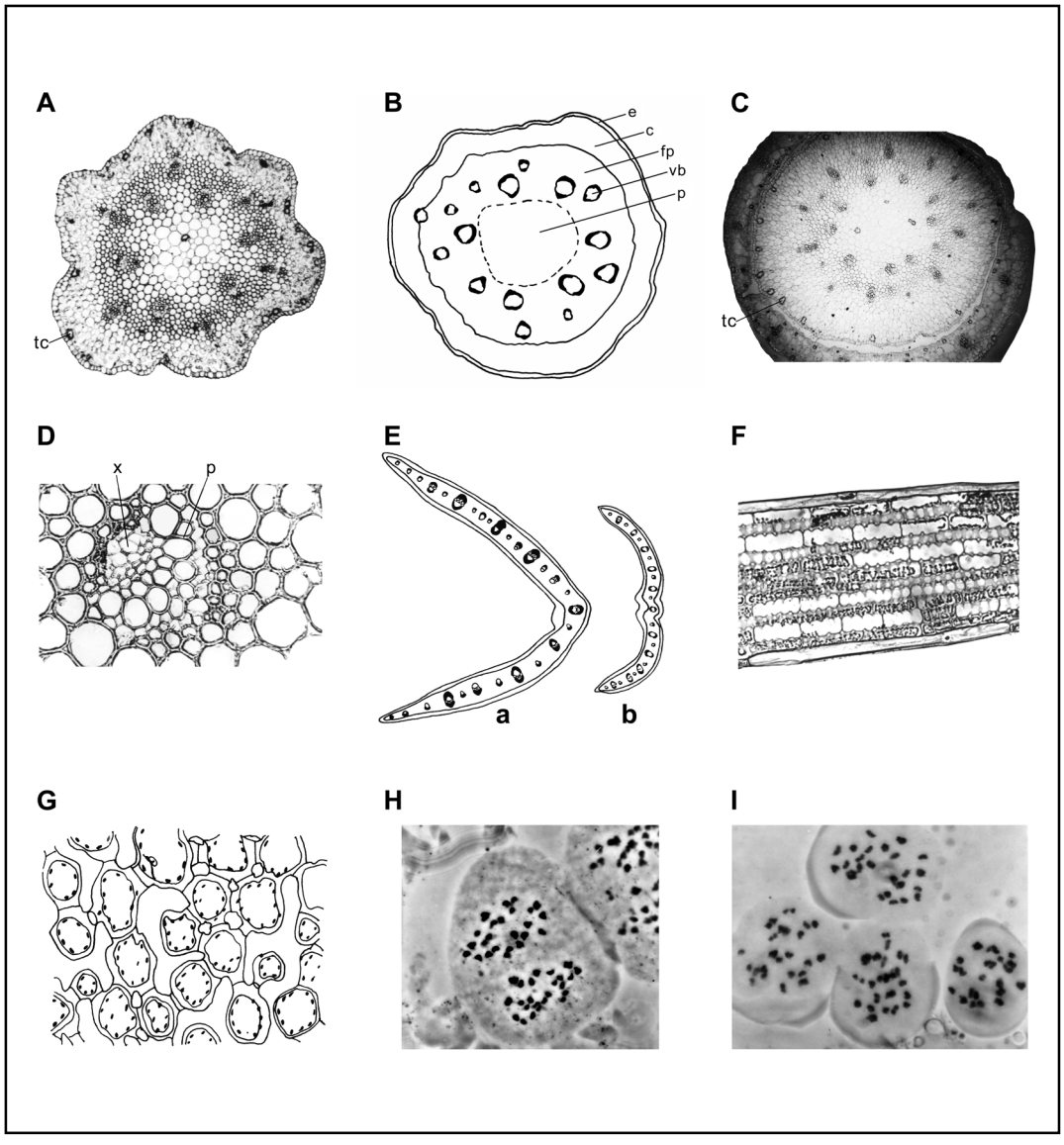

Figure 1. A – TS of pedicel of *Burchardia congesta,* from Cannington WA, ×30, tc=tannin cell; B – tissue diagram of TS of flowering stem of *Burchardia congesta*, from Kings Park WA, ×10, e=epidermal layer, c=chlorenchyma, fp=secondarily thickened parenchyma, vb=vascular bundle, p=parenchymatous pith; C – TS of base of flowering stem of *Burchardia umbellata*, from Colac Vic. – note lack of thickened parenchyma, ×30, tc=tannin cell; D – TS of vascular bundle of *Burchardia congesta*, from Kings Park WA, ×100, p=phloem, x=xylem; E – TS of leaves: a – *Burchardia congesta* from Kings Park WA, b – *Burchardia umbellata* from Ballarat Vic., ×2; F – LS of leaf of *Burchardia congesta*; G – TS of leaf of *Burchardia congesta*; H – meiotic chromosome spreads of *Burchardia umbellata*, ×1000; I – meiotic chromosome spreads of *Burchardia congesta*, ×1000.

are structurally similar. In both eastern and western samples, large and small veins alternate along the leaf and the structure of the vascular bundles is identical.

Burchardia leaves are very unusual in the Australian Lilies in that they lack any mesophyll or palisade parenchyma. Instead the chlorenchymatous tissue is composed of elongated parenchyma (Figure 1F) which are identical in cross-section (Figure 1G). These cells all possess chloroplasts and bear numerous cross connections to neighbouring cells (Figure 1G). This tissue would give the annually produced leaf its considerable rigidity despite its lack of fibres and great length.

Both forms have identical stomata, which are not shrunken, nor is the cuticle particularly thick since the plants only produce leaves during the growing season and are not subject to water stress.

Root morphology

Both forms have roots that are swollen storage organs from a short rhizome, that support the plant after the aerial parts die back at the onset of summer until re-growth occurs in the winter. Consequently the basal rhizome and large roots are packed with starch grains. There are none in the smaller annually-produced side roots. The development of the storage organs in the Western form is discussed in greater detail by Pate & Dixon (1982).

Cytology

All populations surveyed from eastern and western Australia were diploid with n = 24 (Figure 1H,I).

General morphology

This study confirmed Macfarlane's observations (1987) that the eastern material consistently differs from western collections in lacking thickened angles to the fruit and in possessing purple not yellow coloured anthers. Other differences noted were that the eastern Australian plants are smaller in stature, more slender than western plants and bear fewer flowers per umbel. Ovule number is consistently higher (7 per locule) in Western Australian plants versus 5 per locule in eastern plants.

Update on disjunct taxa reported for Liliaceae

As noted in the introduction, 17 species of Australian Liliaceae *s. lat.* have been recorded as having major disjunctions between south-western and south-eastern Australia. Table 1 lists these taxa and summarises the latest information on their status.

Of the 17 species listed, three have a distribution pattern that is not truly disjunct (*Bulbine semibarbata*, *Dianella revoluta* and *Tricoryne elatior*), one was a misidentification, five have been separated into western and eastern vicarious species, one as two subspecies (*Wurmbea dioica*) and two are cytologically separable as different biological species (*Chaemascilla corymbosa* and *Thysanotus patersonii*). This leaves only three species (*Burchardia umbellata*, *Dichopogon fimbriatus* and *Lomandra micrantha*) which are still considered to have disjunct occurrences in both sides of Australia with no significant differences. *Lomandra micrantha* itself is as currently understood a complex of three subspecies, two of which *Lomandra micrantha* subsp. *micrantha* and *L. micrantha* subsp. *teretifolia* are disjunct and the other *L. micrantha* subsp. *tuberculata* is confined to eastern Australia.

Table 1. Conspecific disjunct Liliaceae *s. lat.* listed by Green (1964), Beard (1969) and Henderson (1987d), and their current status.

Taxon	Current status
Borya nitida	Grampians plants segregated as a new species *B. mirabilis* (Churchill 1985).
Bulbine semibarbata	Not disjunct as grows in intermediate arid zone (Watson 1987).
Burchardia umbellata	Examined in this study.
Caesia parviflora	Material from Western Australia re-assigned to *C. micrantha* (Henderson 1987a).
Calectasia cyanea	Eastern Australian plants re-assigned to *C. intermedia* by George (1986) and Barrett & Dixon (2001).
Chaemascilla corymbosa	Eastern and western populations are cytologically very distinct, diploid vs. octoploid, probably not conspecific (Keighery 2001)
Corynotheca lateriflora	Misapplication of name. Eastern Australian plants now *C. licrota* and western *C. micrantha* (Henderson 1987b).
Dianella revoluta	Not disjunct as grows in intermediate arid zone. Taxonomy of this species complex not resolved (Henderson 1987c).
Dichopogon fimbriatus	Still regarded as disjunct (Brittan 1987b).
Dichopogon strictus	Misidentification, name applies to an eastern Australian species.
Laxmannia sessiliflora	Eastern Australian material segregated as a new species *L. orientalis* (Keighery 1987).
Lomandra glauca	*L. collina* is the current name. Not disjunct as grows in intermediate arid zone (Lee & Macfarlane 1986).
Lomandra micrantha	Three subspecies recognised, of which subsp. *micrantha* and subsp. *teretifolia*) are disjunct (Lee & Macfarlane 1986)
Stypandra glauca	This genus is currently under study and the eastern and western populations are proposed to be reinstated as separate species.
Thysanotus patersonii	Still disjunct (Brittan 1987a) but western plants are diploid and eastern ones octoploid (Brittan 1962) and they are anatomically distinct in stem structure (Brittan 1970).
Tricoryne elatior	Not disjunct as grows in intermediate arid zone. Taxonomy of this species complex not resolved.
Wurmbea dioica	Eastern (*W. dioica* subsp. *dioica*) and western (*W. dioica* subsp. *alba*) taxa separated as subspecies (Macfarlane 1980).

Taxonomy

The consistent morphological and ecological differences observed in the eastern and western populations of *Burchardia umbellata* indicate that two distinct taxa are involved. The differences are as great or greater than those separating the western and eastern taxa of other Australian Liliaceae at the species level shown in Table 1. As the type of *Burchardia umbellata* is from Port Jackson in eastern Australia, this name must be applied to the eastern species.

Two species names previously treated as synonyms of *B. umbellata* are based on Western Australian material. The earlier of these, *B. congesta*, is reinstated here and the later name *B. rigida* is listed below as a synonym. The other two synonyms listed for *B. umbellata* by Macfarlane (1987) are retained under that species.

Burchardia congesta Lindl., Sketch Veg. Swan R. lviii (1840). *Type:* Swan River, [Western Australia], 1839, *J. Drummond s.n.* (*holo:* CGE *n.v.*, photograph seen).

Burchardia [as *Burckhardia*] *rigida* Gand., *Bull. Soc. Bot. France* 66: 293 (1919). *Type:* Darlington, Darling Range, [Western Australia], *A. Morrison* (*n.v.*).

Updated key to *Burchardia* species

The only change required to the key to *Burchardia* given in "Flora of Australia" Volume 45 is the substitution of the name *B. congesta* for *B. umbellata* in the third couplet, as shown below. Distribution data have been added to the key as a further aid for identification of these taxa.

1. Flower solitary (Capel to Tunney) ..... **B. monantha**
1: Flowers 2 or more together, grouped in umbels
  2. Anthers purple
    3. Tepals white or with a faint pink abaxial mid-stripe; uppermost scape bract 7–40 mm long; longest umbel bract 4–12 mm long. (Eastern Australia) ..... **B. umbellata**
    3: Tepals pinkish white with a deep pink abaxial mid-stripe; uppermost scape bract 35–160 mm long; longest umbel bract 15–45 mm long. (Jurien Bay to Stirling Range) ..... **B. multiflora**
  2: Anthers yellow
    4. Flowers pink; tepal nectaries absent. (Kalbarri to Port Gregory) ..... **B. rosea**
    4: Flowers white or at most with a pink abaxial mid-stripe; tepal nectaries present
      5. Scape unbranched, rarely once branched; scape bracts 1 or 2; capsule thickened on angles. (Northampton to Stirling Range) ..... **B. congesta**
      5: Scape 1–4-branched; scape bracts 3 or 4; capsule not thickened on angles. (Cockleshell Gully to Jandakot) ..... **B. bairdiae**

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