

Three new Western Australian species related to *Calytrix violacea* (Myrtaceae: Chamelaucieae)

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SHORT COMMUNICATION

Calytrix Labill. (Myrtaceae: Chamelaucieae DC.) comprises at least 90 species and is widely distributed in Australia, with most species in south-west Western Australia and with secondary centres of species diversity in the monsoon tropics and eastern Australia. Most members of the genus are distinctive in having a long, slender awn terminating each sepal. Some species that lack, or have very reduced, awns were initially placed in *Lhotskya* Schauer, while one species with no sepals at all was placed in *Calythropsis* C.A.Gardner. Craven (1987) reduced *Lhotskya* to synonymy under *Calytrix* on the basis that there was an intergradation in sepal characters between the two genera, and subsequently (Craven 1990) also included *Calythropsis* in *Calytrix*. All species previously included in *Lhotskya* or *Calythropsis* (i.e. species without sepal awns) were placed by Craven (1987, 1990) into four informally recognised species-groups, three of which also contained distinctly awned species. The larger species groups were further subdivided into ‘alliances’.

Later publications (Keighery 2004; Barrett *et al.* 2009; Rye 2013, 2020; Nge *et al.* 2017) have resulted in the reinstatement of two old species, description of seven new species, and recognition of further informal species alliances. Several additional known or putative species have phrase names or are still awaiting the allocation of phrase names.

The current paper began with a recently discovered, awnless *Calytrix* population from the Cape Riche area on the south coast of Western Australia, which was regarded as likely to be a new species and phrase-named at the Western Australian Herbarium as *Calytrix* sp. Cape Riche (G.J. & B.J. Keighery 2934). Initial morphological examinations indicated that it was morphologically closest to members of the more or less awnless *C. violacea* (Lindl.) Craven species group, which, in Craven (1987), also included *C. acutifolia* (Lindl.) Craven, *C. merrelliana* (F.Muell. & Tate) Craven, *C. nematoclada* Craven and *C. parvivalis* Craven. The white-flowered *C. acutifolia* was regarded by Craven (1987) as an anomalous species in this group. Nge *et al.* (2021) provided the first comprehensive molecular phylogeny of the genus and confirmed that *C. acutifolia* is phylogenetically distant from other members of the *C. violacea* species-group. Most of the species-groups of Craven (1987) were not retrieved in the

phylogeny, including the *C. violacea* species-group. A future revised classification (which is currently pending further targeted research) could reduce the *C. violacea* species-group to fewer species or expand it to include 14 drawn from several of Craven's informal species-groups.

Given that a comprehensive molecular phylogeny exists, we sequenced the new *Calytrix* to assess its phylogenetic placement within the genus. Sampling, laboratory preparation, sequencing, and downstream phylogenetic analyses follow those adopted by Nge *et al.* (2021; including Supplementary Material). Due to a low DNA yield which may have resulted in sub-optimal sequencing, only 18 of the original 28 nuclear loci were successfully recovered from the Cape Riche specimen. The final alignment for this study included all other sequenced *Calytrix* species from Nge *et al.* (2012), but only 18 nuclear loci instead of the full 28, as it has been shown that missing sequence data can bias phylogenetic reconstructions (e.g. Smith *et al.* 2020). A maximum likelihood phylogeny (Figure 1) was generated using RAxML v. 8.2.10 (Stamatakis 2014), with the GTR+I+G nucleotide substitution model (see Abadi *et al.* 2019) and 100 regular bootstrap support replicates.

Our RAxML phylogeny presented here confirmed that the *Calytrix* sp. Cape Riche (G.J. & B.J. Keighery 2934) sample is closely related to *C. violacea*, placing it as sister to a sample of *C. violacea* (FN 612, AD284792) from near Wongan Hills, albeit with marginal bootstrap support (BS = 64). There is some indication from Figure 1 and Nge *et al.* (2021) that *C. violacea* may be polyphyletic, but support values are too low to make firm conclusions. The other *C. violacea* sample in the phylogeny (FN 424, AD205163) was collected from Kellerberrin and is likely to be another one of the new species that we are describing here (*C. mucronata*), instead of *C. violacea* s. str. However, an examination of the specimen is required to confirm this.

Detailed morphological examination indicated that the Cape Riche population is distinct from all other collections of *C. violacea*, from which it is also widely disjunct both geographically and ecologically. Further, close examination of all available herbarium material of *C. violacea* at PERTH, while dealing with the Cape Riche taxon, showed that it is polytypic and readily separable into three taxa differing in leaf length, indumentum and apex shape, flower size, and the size, shape and distribution of floral bracts.

Accordingly, we here describe the three new species *Calytrix djinda* Keighery & Rye, *C. mucronulata* K.R.Thiele and *C. ryeae* K.R.Thiele, and re-circumscribe *C. violacea*. Distributions of all four taxa are given in Figure 2, and a key to the species in *C. violacea* s. lat. provided.

Key to species segregated from *Calytrix violacea* s. lat.

1. Inflorescences elongate, without a distinct involucre of subtending empty floral bracts (Cape Riche area) **C. djinda**
- 1: Inflorescences usually contracted and head-like (sometimes somewhat elongate), with a distinct involucre of few to many subtending empty floral bracts (widespread in the Wheatbelt extending to the Goldfields; not on the South Coast)
 2. Leaves (4–)5–10 mm long, flattish (not deeply concavo-convex), obtuse; flowers 12–15 mm diam.; floral bracts broadly ovate to orbicular, obtuse, 3–7 mm long **C. violacea**
 - 2: Leaves (2–)3–5(–6) mm long, deeply concavo-convex, distinctly though minutely mucronulate; flowers 8–12 mm diam.; floral bracts ovate to triangular, acute to acuminate, 1.8–4 mm long

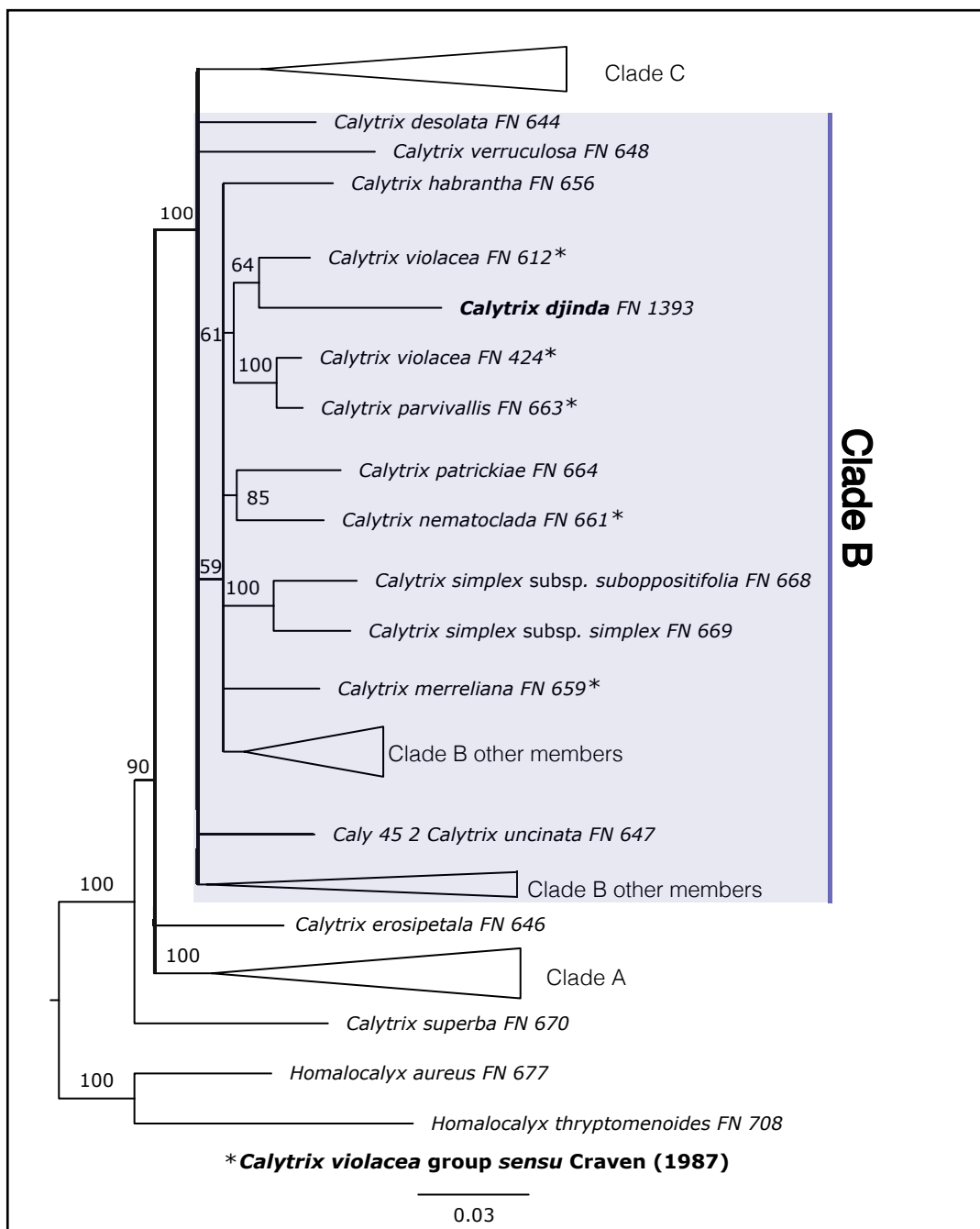


Figure 1. Phylogenetic relationships of *Calytrix* inferred from Maximum Likelihood (RAxML) analysis of 18 nuclear loci. Bootstrap support values ≥ 50 are displayed for each node; nodes with lower support values are collapsed. Asterisks indicate the *Calytrix violacea* group sensu Craven (1987). *Calytrix djinda* is highlighted in bold. Clade B is highlighted in blue. Other clades are collapsed and labelled following the clades (A, B, C) of Nge *et al.* (2021).

3. Leaves with an even indumentum of short, \pm straight, patent hairs; inflorescences axis usually determinate (Goldfields).....**C. ryeae**
- 3: Leaf indumentum variable, comprising short to long, usually curved hairs that are often restricted to the adaxial surface or the lateral angles of the lamina; inflorescence axis usually growing on after flowering (Wheatbelt)**C. mucronulatum**

Calytrix djinda Keighery & Rye, *sp. nov.*

Type: Cape Riche, Western Australia [precise locality withheld for conservation reasons], 29 October 2013, G.J. Keighery & B.J. Keighery 2934 (*holo:* PERTH 09196250; *iso:* CANB, K, MEL).

Calytrix sp. Cape Riche (G.J. & B.J. Keighery 2934), Western Australian Herbarium, in *Florabase*, <https://florabase.dpaw.wa.gov.au/> [accessed 8 March 2022].

Shrubs c. 0.5 m tall \times 0.3 m wide. *Young stems* sparsely pubescent with patent hairs 0.1–0.2(–0.4) mm long. *Leaves* alternate (sometimes partially sub-opposite), antrorse to spreading, scattered along the stems and often widely spaced; *petiole* 0.5–1 mm long, with indumentum as for the stems and leaves; *colleters* (‘stipules’) to 0.3 mm, filiform, pale to dark (deciduous or apparently absent on many leaves); *lamina* linear to very narrowly obovate, 4–7 mm long, 0.5–1 mm wide, straight, sparsely pilose with spreading, flexuose hairs to 0.5 mm long; abaxial surface deeply convex, carinate; adaxial surface flat to shallowly concave with a distinct, raised rib along the midline; apex acute to minutely apiculate, the apiculum glabrous to (rarely) sparsely hairy, \pm straight to slightly inflexed; *oil glands* inconspicuous, pale. *Inflorescences* raceme-like, subterminal, 15–35 mm long, with flowers borne at 8–15 consecutive axils, the axis continuing growth before flowering, with the uppermost fertile axil 5–20 mm below the shoot apex; *floral bracts* c. 4 mm long, ovate to elliptic, acute, concavo-convex, keeled, narrowly to broadly scarious-margined, moderately pilose with flexuose, white hairs to 0.7 mm long, a few basal ones sometimes empty (not subtending a flower) but not forming a distinct involucre. *Peduncles* 0.7–1.5 mm long. *Bracteoles* shortly connate at base to form a slightly compressed, funnel-shaped cheiridium 3–3.5 mm long, each with a narrowly triangular central green portion that is sometimes excurrent to 0.2 mm and has spreading hairs, and broad, translucent wings that are glabrous except for minute to long cilia towards the apex. *Flowers* 10–12 mm diam. *Hypanthium* not produced above the ovary, narrowly obconic, c. 3 mm long, c. 1 mm wide, not exceeding the cheiridium, 10-ribbed, moderately to densely white-pubescent, the hairs to c. 0.5 mm long, appressed at first becoming more spreading in fruit. *Sepals* very broadly or depressed-obovate, usually emarginate, 1–1.5 mm long, 1.3–1.8 mm wide, moderately hairy outside on the herbaceous part, glabrous on the broad, scarious margin; awn absent. *Petals* purple (darker at the base), ovate, c. 6 mm long, 2.3–3 mm wide. *Stamens plus staminodes* 53–75, 3- or 4-seriate, with the longest stamens in the outermost series and reduced stamens or staminodes in the innermost series; longest filaments 3.5–4.5 mm long, purple; largest anthers c. 0.3 mm long, yellow. *Ovary* yellowish on the summit; ovules 2. *Style* 4–5 mm long. *Fruits* not seen at maturity but the most mature one examined narrowly obovoid, the hypanthium c. 1.5 mm wide below the calyx and densely pubescent. (Figure 3)

Diagnostic features. Distinguished from *C. violacea* and its other segregates by having flowers borne in a loose raceme-like inflorescence below the vegetative apex of the stem, the base of the inflorescence subtended by a few widely spaced, sterile, leaf-like bracts not forming a distinct involucre.

Specimen examined. Only known from the type specimen.

Phenology. Buds, open flowers and young fruits were present when the type was collected in very late October, so flowering continues into November.

Distribution and habitat. Known from a single location in the Cape Riche area (Figure 2), occurring on seaside cliffs in red loam (possibly over spongolite) in low, wind-pruned heath.

Conservation status. Listed as Priority One under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *Calytrix* sp. Cape Riche (G.J. & B.J. Keighery 2934). The single specimen of this species was collected from a large population that is not in a nature reserve.

Etymology. From the Noongar (Minang) language of the Albany region: *djinda* (a star) refers to the star-shaped flowers, and is used as a noun in apposition.

Vernacular name. Cape Riche Starflower.

Notes. *Calytrix djinda* is geographically isolated from the other species of the *C. violacea* group. Most specimens of *C. violacea* and the other segregates dealt with here have dense terminal clusters of flowers subtended by a distinct involucre of leaf-like, empty bracts. A few specimens in the south of the range of *C. mucronulata* (described below) have a somewhat looser, more raceme-like inflorescence, but this is much more condensed than in *C. djinda* and an involucre is always present at the base of the inflorescence in the flowering stage. *Calytrix djinda*, by contrast, lacks an involucre, having instead a few widely spaced, empty floral bracts below the flower-bearing portion. Note that the involucre bracts are often shed in fruiting specimens. However, careful examination of old stems in fruiting specimens will reveal short sections of stem at the base of growth units (*C. violacea*, *C. mucronulata*) or peg-like, dead stubs (i.e., the stems not growing on; *C. ryeae*) with numerous scars left when the involucre leaves and flowers were shed; these are not present in *C. djinda*.

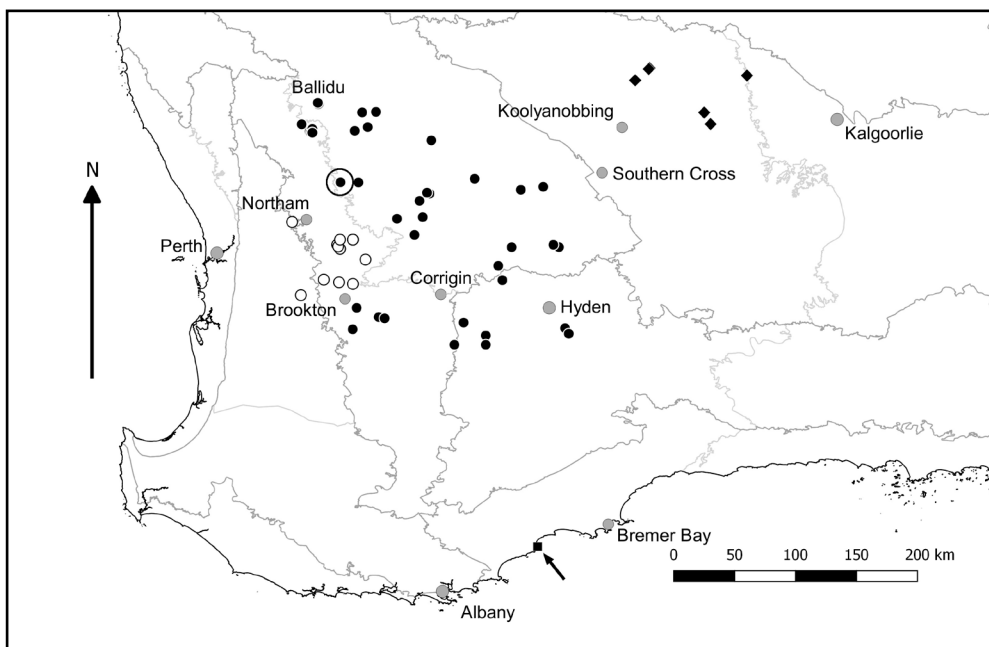


Figure 2. Distributions of *Calytrix djinda* (■; arrowed), *C. mucronulata* (●), *C. ryeae* (◆) and *C. violacea* (○) in Western Australia. The location of a mixed population of *C. mucronulata* and *C. violacea* is circled.

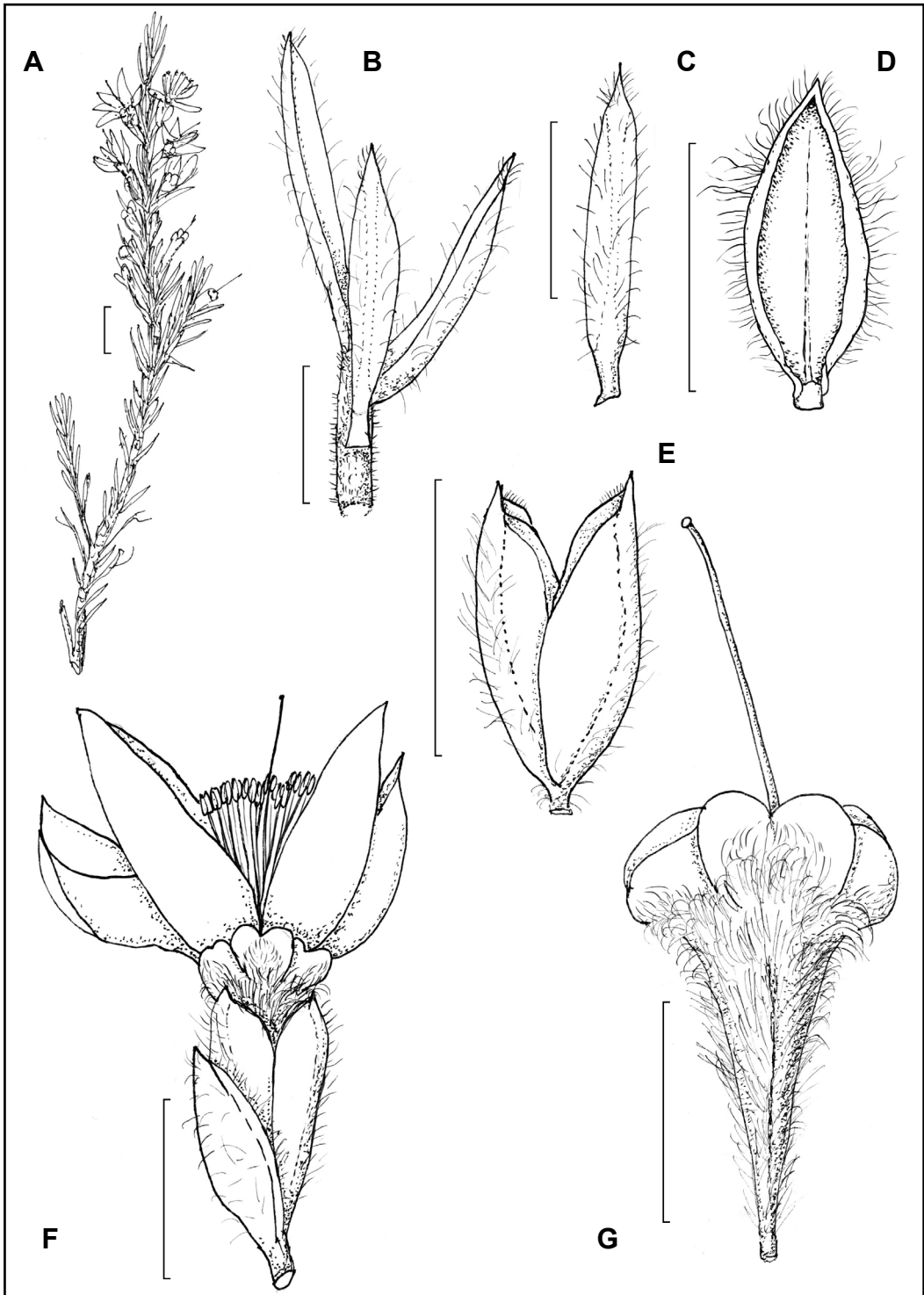


Figure 3. *Calytrix djinda*. A – flowering branch; B – leaves showing alternate arrangement; C – abaxial view of leaf; D – floral bract, showing the glabrous adaxial surface and densely ciliate margins; E – two bracteoles shortly united to form a cheiridium; F – flower subtended by a floral bract and cheiridium, showing the longest stamens (shorter stamens hidden from view); G – young fruit. Scale bars: 5 mm (A), 3 mm (B–H). Drawn by G.J. Keighery (A–C & E–G) and B.L. Rye (D) from G.J. Keighery & B.J. Keighery 2934 (A–G).

Calytrix mucronulata* K.R. Thiele, *sp. nov.

Type: Hindmarsh Rifle Range, Western Australia, 25 October 1987, *B.H. Smith* 1003 (*holo:* PERTH 03565823; *iso:* CANB, MEL).

Erect to spreading, often dwarf *shrubs* to 0.4(–1) m high. *Young stems* sparsely to moderately pubescent (rarely villous) with patent, straight to flexuose, greyish to pale fawn hairs 0.1–0.3(–0.5) mm long. *Leaves* alternate, spreading, rather crowded on younger branchlets; *petiole* 0.4–0.5 mm long, glabrous or sparsely to moderately minutely pubescent; *colleters* ('stipules') 0.3–1 mm long, filiform to acicular, pale to dark; *lamina* narrowly obovate, (2–)3–5(–6) mm long, 0.6–1.2 mm wide, straight to slightly incurved, sparsely to moderately and finely pubescent to (rarely) hispid or villous with patent to spreading, straight to curved (or rarely flexuose) hairs 0.2–1 mm long sometimes restricted to the adaxial surface or lateral angle; abaxial surface deeply convex, obscurely to prominently carinate; adaxial surface shallowly to distinctly concave, sometimes with a narrow, raised rib along the midline; apex acute to apiculate, the apiculum glabrous to (rarely) sparsely hairy, usually slightly inflexed; *oil glands* not prominent, pale to (rarely) dark. *Inflorescences* comprising 5–25 flowers on an axis 5–20 mm long, condensed to somewhat elongate (and then with the flowers crowded), terminating growth units and with the axis continuing growth after flowering (indicated by distinct, short segments of older stems bearing scars from the flowers and inflorescence-subtending floral bracts); *floral bracts* 1.8–4 mm long, narrowly ovate to ovate, acute to acuminate, flattened to concavo-convex, keeled, scarious- and ciliate-margined, glabrous to moderately pubescent, the 10–30 lowermost ones without flowers and forming a ± distinct involucre subtending the inflorescence. *Peduncles* to 1.2 mm long. *Bracteoles* shortly connate at base to form a slightly compressed, funnel-shaped cheiridium 3–3.6 mm long, each with a narrowly triangular central green portion excurrent to 0.2 mm and with short, patent hairs, and broad, translucent wings that are glabrous except for minute to long cilia towards the apex. *Flowers* 8–12 mm diam. *Hypanthium* not produced above the ovary, narrowly obconic, 2.4–3.5 mm long, *c.* 1 mm wide, not exceeding the cheiridium, 10-ribbed, densely white-pubescent, the hairs to *c.* 0.3 mm long, appressed at first becoming more spreading in fruit. *Sepals* orbicular to transversely elliptic, often emarginate, 1.2–1.8 mm long, 1.3–1.8 mm wide, densely hairy outside on the herbaceous part, glabrous on the broad, scarious margin; awn absent. *Petals* purple (darker at the base), ovate, 4.5–5.5 mm long, 2.2–3 mm wide. *Stamens plus staminodes* 32–45, 3- or 4-seriate, with the longest stamens in the outermost series and reduced stamens or staminodes in the innermost series; longest filaments 3.5–4 mm long, purple; largest anthers *c.* 0.3 mm long, yellow. *Ovary* yellowish on the summit; ovules 2. *Style* 3.5–4 mm long. *Fruits* 2.5–4 mm long, densely pubescent, the narrowly obconical hypanthium *c.* 1.5 mm wide below the calyx.

Diagnostic features. Distinguished from the other species segregated from *C. violacea* by the following combination of characters: leaves short (the lamina usually 3–5 mm long), deeply concavo-convex, apiculate, usually with an indumentum of short, patent hairs often restricted to, or more dense on, the adaxial surface and angles; inflorescences comprising 5–25 flowers, forming a contracted head with the axis growing on after flowering; floral bracts 1.8–4 mm long, ovate-acute, the 10–30 lowermost ones without flowers and forming a ± distinct involucre subtending the inflorescence; hypanthium not exceeding the cheiridium.

Chromosome number. $2n = c. 22$ (Rye 1979; as *Wehelia sp. aff. coarctata* F. Muell.), voucher: *B.L. Powell* 73086.

Selected specimens examined. WESTERN AUSTRALIA: near Narembeen which is S of Merredin, Sep. 1929, *W.E. Blackall s.n.* (PERTH); Mount Caroline Nature Reserve, S of Kellerberrin, SE area of Reserve, near base of granite outcrop, 1 Oct. 2015, *J. Borger* MC 0110-6 (PERTH); Water Reserve

No. 16418 adjacent to the Wongan Hills townsite, site W3, 22 Sep. 1991, *A.M. Coates* 2924 (PERTH); Dragon Rocks Nature Reserve No. 36128, NE section, eastern boundary N of Jilakin Rocks Rd, 25 Oct. 1991, *A.M. Coates* 3324 (PERTH); No. 2 Rabbit Proof Fence road junction with Cadoux-Koorda Rd, 18 Sep. 1985, *B.J. Conn* 2236 (PERTH); 9 km NW of Kulin on the Corrigin Rd, 23 Oct. 1981, *L.A. Craven* 7288 (PERTH); 6 km N of Popanyinning on the Pingelly Rd, 8 Nov. 1981, *L.A. Craven* 7439 (PERTH); 10 km E of South Kumminin on the Kumminin E Rd, 4 Nov. 1992, *L.A. Craven, F.A. Zich & A.M. Lyne* 9008 (PERTH); Manmanning, Avon District, 24 Sep. 1931, *C.A. Gardner* 2730 (PERTH); Quadrat 9 Hutchy's Block, Cardiff Pastoral Co., Hammond Rd, Wyalkatchem, c. 24 km ESE of the Wyalkatchem Townsite, 16 Sep. 2000, *C. Keating et al.* WYCH 9/33 (PERTH); Kellerberrin, Sep. 1897, *R.B. Leake s.n.* (PERTH); SWATT Sandplain Survey, UCL (Unallocated Crown Land), survey site SWA0403C, c. 63.13 km N (2.46 degrees) of Hyden and c. 51.51 km NW (66.56 degrees) of Narembeen, 13 Oct. 2013, *R. Meissner & B. Bayliss* 5691 (PERTH) 2 miles N of Wongan Hills, 7 Oct. 1966, *E.M. Scrymgeour* 1568 (PERTH); Kokardine, 28 Aug. 1984, *B.H. Smith* 417 (PERTH); Koorda North Rd, Water Reserve 9231, NW of Koorda, 10 Sep. 1995, *D.E. True* 8230 (PERTH); 20 km N of Trayning, 11 Aug. 1974, *P.S. Valentine* T 21 (PERTH).

Phenology. Flowers in September and October.

Distribution and habitat. Widespread in the Western Australian wheatbelt, from the vicinity of Ballidu south to Pingelly and east to Dragon Rocks and Walgoolan (Figure 2), occurring in shrub-heaths, mallee shrublands and low woodlands on sandy, gravelly and loamy soils on flats and gentle slopes over granite and laterite, with associated species including *Allocasuarina campestris*, *A. humilis*, *A. spinosissima*, *Banksia attenuata*, *B. prionotes*, *Callitris arenaria*, *Calytrix gracilis*, *Ecdeiocolea monostachya*, *Eucalyptus oldfieldii*, *Grevillea apiculoba*, *G. armigera*, *Hakea incrassata*, *H. trifurcata*, *Leptospermum erubescens*, *Melaleuca leptospermoides*, *M. uncinata s. lat.*, *Verticordia roei*, and *Xylomelum angustifolium*.

Conservation status. *Calytrix mucronulata* is widespread and common, and not considered to be under threat.

Etymology. From a diminutive of the Latin *mucronatus* (a sharp point) in reference to the minutely mucronulate leaves and floral bracts.

Notes. *Calytrix mucronulata* is the most common and widespread species among the segregates of *C. violacea* dealt with in this paper. It is best discriminated from the more restricted *C. violacea s. str.* by having shorter leaves that are abaxially deeply convex and mucronulate, and relatively small floral bracts that are narrowly ovate to ovate and acute to acuminate. In true *C. violacea* the leaves are larger, distinctly flatter, and obtuse, and the floral bracts are larger and broadly ovate to orbicular and obtuse. There is also a subtle though useful difference in leaf indumentum, with the hairs in *C. mucronulata* being shorter and straight to curved, while those of *C. violacea* are longer, softer and flexuose.

Calytrix ryeae K.R.Thiele, *sp. nov.*

Type: unallocated Crown Land, SWATT survey site SWA0704A, c. 72 km west-north-west of Koolyanobbing and c. 91 km west of Coolgardie, Western Australia, 3 October 2016, *E. Leitch & C. Macdonald* WAA 013475 (*holo:* PERTH 09195491).

Erect *shrubs* to 0.35 m high. *Young stems* moderately to densely pubescent with patent greyish hairs c. 0.1 mm long. *Leaves* alternate, spreading, rather crowded at the ends of branchlets; *petiole* 0.4–0.5 mm

long, with indumentum as for the leaves and stems; *colleters* ('stipules') to 0.3 mm, filiform, pale to dark (deciduous or apparently absent on many specimens); *lamina* narrowly obovate, 2.5–5 mm long, 0.6–0.8 mm wide, straight to slightly incurved, moderately and finely pubescent with evenly spaced, patent, straight hairs to 0.1 mm long; abaxial surface deeply convex, not carinate; adaxial surface \pm flat except for a distinct, raised rib along the midline; apex shortly apiculate with a minutely hairy apiculum (rarely broadly acute), \pm straight; *oil glands* prominent, scattered, dark. *Inflorescences* condensed and head-like, comprising (1–)3–6(–10) flowers on an axis 5–10 mm long, terminating growth units and with the axis usually not continuing growth after flowering (older stems with peg-like stubs bearing the scars of floral bracts and flowers); *floral bracts* 2–3 mm long, ovate to triangular, acute, flattened to concavo-convex, keeled and scarious-margined, moderately to densely pubescent, the 3–8 lowermost ones without flowers and forming a \pm distinct involucre subtending the inflorescence. *Peduncles* 0–0.1 mm long. *Bracteoles* shortly connate at base to form a slightly compressed, funnel-shaped cheiridium 3–3.5 mm long, each with a narrowly triangular central green portion with spreading hairs and sometimes excurrent to 0.2 mm, and broad, translucent wings that are glabrous except for minute to long cilia towards the apex. *Flowers* 10–12 mm diam. *Hypanthium* not produced above the ovary, narrowly obconic, 3–3.5 mm long, *c.* 1 mm wide, usually slightly exceeding the cheiridium, 10-ribbed, densely white-pubescent, the hairs to *c.* 0.7 mm long, appressed at first becoming more spreading in fruit. *Sepals* very broadly ovate to depressed-orbicular, not emarginate, 1.2–1.5 mm long, 1.2–1.4 mm wide, densely hairy outside on the herbaceous part, glabrous on the broad, scarious margin; awn absent. *Petals* purple (darker at the base), ovate, 5–5.5 mm long, 2.5–3 mm wide. *Stamens plus staminodes* 25–36, 2- or 3-seriate, with the longest stamens in the outermost series and reduced stamens or staminodes in the innermost series; longest filaments 4–4.5 mm long, purple; largest anthers *c.* 0.25 mm long, yellow. *Ovary* yellowish on the summit; ovules 2. *Style* 4.5–5 mm long. *Fruits* not seen at maturity.

Diagnostic features. Distinguished from other species segregated from *C. violacea* by the following combination of characters: leaves short (the lamina 2.5–5 mm long), deeply concavo-convex, usually minutely apiculate, \pm uniformly covered with very short, patent hairs; inflorescences comprising (1–)3–6(–10) flowers, forming a contracted head with the axis usually not growing on after flowering; floral bracts 2–3 mm long, ovate to triangular, acute, the 3–8 lowermost ones without flowers and forming a \pm distinct involucre subtending the inflorescence; hypanthium usually slightly exceeding the cheiridium.

Specimens examined. WESTERN AUSTRALIA: Credo Conservation Reserve, 17 km WNW of Credo Station homestead, 9 Oct. 2012, *N. Casson* WAA 003074 (PERTH); 16.5 km NE of Bungalbin Hill, 2 Oct. 1991, *R.J. Cranfield* 8143 (PERTH); 10 km NNE of access track to hill E of Bungalbin Hill, 8 Sep. 1989, *R.J. Cranfield & P.J. Spencer* 7785 (PERTH); Helena & Aurora Range to Hunt Range track, 13.25 km NE of Y junction, 6.5 km NE of Bungalbin Hill trig, 47.5 km NNE of Koolyanobbing, 20 Oct. 1990, *F.H. & M.P. Mollemans* 3751 (PERTH); 16 km NE of Bungalbin Hill, 25 Sep. 1982, *K. Newbey* 9609 (PERTH).

Phenology. Flowering specimens have been collected in September and October.

Distribution and habitat. Scattered between the vicinity of the Helena and Aurora Range, East Jaurdi, and Credo, in the Coolgardie IBRA bioregion (Figure 2), occurring on yellow sandplains with associated species including *Acacia yorkkrakinensis*, *Allocasuarina campestris*, *A. spinosissima*, *Calytrix creswellii*, *Eucalyptus oldfieldii*, *Grevillea hookeriana*, *Melaleuca cordata*, and *Triodia rigidissima*.

Conservation status. Relatively widespread including in a number of nature reserves, and not considered to be under threat.

Etymology. Named in honour of Dr Barbara L. Rye (1952–), botanist at the Western Australian Herbarium, in recognition of her very significant achievements over a long career dedicated to documenting and conserving Western Australian plants. Barbara has studied and published many new Western Australian taxa in a wide range of families, including in Myrtaceae: Chamelaucieae and *Calytrix*. She is one of the all-time top ten female authors of plant names, having described, alone or in collaboration with others, 10 genera, 250 species, and 60 infraspecies taxa at the time of writing. Barbara retired in 2022 and is continuing her taxonomic research as a Research Associate at PERTH. She is much admired and appreciated by her colleagues.

Notes. *Calytrix ryeae* is a distinctive species that is widely disjunct from the other taxa in the group, all of which occur in the Western Australian wheatbelt and far south coast. It is morphologically distinctive, with short leaves with an indumentum of evenly spaced, short patent hairs of even length on all surfaces. On most specimens, the axis of the relatively few-flowered inflorescence appears determinate, with new growth occurring from the axils of the involucre bracts. This results in distinctive, short, woody stubs on lower branches, each with numerous scars where the flowers and their subtending bracts have fallen. One specimen, however, has one inflorescence where the axis has continued its apical growth, indicating that there may be some flexibility, perhaps depending on seasonal conditions.

Calytrix violacea (Lindl.) Craven, *Brunonia* 10: 119 (1987); *Lhotskya violacea* Lindl., *Sketch Veg. Swan R.* 7 (1839). *Type:* Western Australia, *s. dat.*, *J. Drummond s.n.* (*lecto, fide* L.A. Craven, *Brunonia* 10: 119 (1987): CGE *n.v.*).

Erect to sprawling *shrubs* to 0.5 m high. *Young stems* sparsely pubescent to pilose with soft, spreading, pale grey hairs 0.2–0.5 mm long (the hairs flexuose when long). *Leaves* alternate, spreading, widely scattered on long stems; *petiole* 0.4–1 mm long, glabrous or sparsely to moderately pubescent with indumentum similar to the leaves and stems; *colleters* ('stipules') 0.3–0.6 mm long, filiform to acicular, pale to dark; *lamina* linear to narrowly obovate, (4–)5–10 mm long, 0.8–1.2 mm wide, straight to slightly incurved, glabrous to sparsely villous or woolly with soft, spreading, flexuose hairs to 1 mm long; abaxial surface shallowly convex, prominently carinate; adaxial surface flat to shallowly concave with a prominent, raised rib along the midline; apex obtuse (rarely obscurely and minutely apiculate); *oil glands* not prominent, pale. *Inflorescences* condensed, comprising 5–25 flowers on an axis 10–20 mm long, terminating growth units and with the axis continuing growth after flowering (indicated by distinct, short segments of older stems bearing scars from the flowers and inflorescence-subtending floral bracts); *floral bracts* 3–7 mm long, broadly ovate to orbicular, obtuse, flattened to concavo-convex, not strongly keeled and with broad scarious ciliate margins, hirsute (rarely glabrous), the 15–45 lowermost ones without flowers and forming a ± distinct involucre subtending the inflorescence. *Peduncles* 0–0.5 mm long. *Bracteoles* shortly connate at base to form a slightly compressed, funnel-shaped cheiridium 3–3.8 mm long, each with a narrowly ovate, villous, central green portion that is not excurrent, and very broad, translucent wings (the whole bracteole almost orbicular) that are glabrous except for minute to long cilia towards the apex. *Flowers* 12–15 mm diam. *Hypanthium* not produced above the ovary, narrowly obconic, 3–4 mm long, *c.* 1 mm wide, distinctly shorter than the cheiridium, 10-ribbed, densely white-pubescent with hairs to *c.* 0.5 mm long, appressed at first becoming more spreading in fruit. *Sepals* very broadly ovate to orbicular, not emarginate, 1.8–2.5 mm long, 1.8–2.2 mm wide, moderately to densely hairy outside on the herbaceous part, glabrous on the broad, scarious margin; awn absent. *Petals* purple (darker at the base), ovate, 5.5–7 mm long, 2.8–3.5 mm wide. *Stamens plus staminodes* 55–75, 3- or 4-seriate, with the longest stamens in the outermost series and reduced stamens or staminodes in the innermost series; longest filaments 4.5–5.5 mm long, purple; largest anthers *c.* 0.25 mm long, yellow; staminodes *c.* 1 mm long. *Ovary* yellowish on the summit; ovules 2. *Style* 5–6 mm long. *Fruits* 3–3.5 mm long, densely pubescent, the narrowly obconical hypanthium *c.* 1.5 mm wide below the calyx.

Diagnostic features. Distinguished from its segregates by the following combination of characters: leaves relatively long (the lamina usually 5–10 mm long), shallowly concavo-convex (flattish), obtuse, usually with an indumentum of long, fine, flexuose hairs; inflorescences comprising 5–25 flowers, forming a contracted head with the axis growing on after flowering; floral bracts 3–7 mm long, broadly ovate to orbicular, obtuse, the 15–45 lowermost ones without flowers and forming a \pm distinct involucre subtending the inflorescence; hypanthium not exceeding the cheiridium.

Selected specimens examined. WESTERN AUSTRALIA: sandheaths N of Greenhills, Sep. 1934, *C.A. Gardner s.n.* (PERTH); Dale district, 6 Oct. 1942, *C.A. Gardner* 6468 (PERTH); K. Binnings Property, central Needling Hills, E of York, 10 Sep. 2005, *H. Green & A. Sole* KB 109 (PERTH); Site 227, Property of R. Boase, W side of Nambling South Rd, N of Cunjardine River, SE of Goomalling, 19 Sep. 2008, *M. Hislop, P. Lewis & C. Curnow* WW 227-22 (PERTH); Bobakine Nature Reserve, Jilyading Drive, Northam, at the radio tower, 22 Oct. 2000, *F. Hort* 1198 (PERTH); uncleared privately owned land on CG 10492, 1 km NW Mawson Siding, 19 km W Quairading, 8 Sep. 1977, *B.G. Muir* 510 (4) (PERTH); 8 miles SW of Beverley, 30 Aug. 1963, *K.R. Newbey* 884 (PERTH); Avon location 6539, SW side of Goldfields Rd no. 349 at junction with Rd no. 260, 24 km by road NE of York, 6 Oct. 1983, *S. Patrick* 55 (PERTH); Banksia Block, Kokeby Water Reserve, Mount Kokeby, 14 Sep. 2003, *T. Watson* 480 (PERTH).

Phenology. Flowers mainly in September and October.

Distribution and habitat. *Calytrix violacea* occurs in the western part of the Western Australian wheatbelt between approximately Goomalling, Northam, Brookton and Quairading, where it occurs in shrublands and low woodlands on white and yellow sandy soils on plains and hilltops among granite and laterite, with associated species including *Adenanthos cygnorum*, *Allocasuarina humilis*, *Banksia* spp., *Calothamnus sanguineus*, *Eucalyptus wandoo*, *Leptospermum erubescens*, *Melaleuca leptospermoides*, and *Xylomelum angustifolium*.

Conservation status. *Calytrix violacea* is widespread, occurs in a number of nature reserves, and is not considered to be under threat.

Typification. Craven (1987: 120) discussed his selection of an unnumbered Drummond specimen from Lindley's herbarium in CGE as the lectotype for *Lhotskya violacea* and indicated that sheets from MEL, NSW and W were possible isolectotypes because they agreed well with the lectotype. However, he noted that they could not be confirmed as isolectotypes because the CGE specimen gave no information other than the collector's name.

Images on *Global Plants* of possible type sheets that have been annotated by Craven as *Calytrix violacea* include MEL 86910 and NSW 199380, which are of the Drummond 162 collection, with the latter specimen giving a date of 1843. Two other MEL sheets (86904 and 86911) have the number 162 given in square brackets and no date recorded. We have not listed any of these specimens as possible isolectotypes as it seems unlikely that they are from the same collection as the lectotype.

We are unable to assess the W sheet, which is not available on *Global Plants*, but there are two further images on *Global Plants* for material that was not cited by Craven (1987). Those sheets, G 00227413 and G 00227414, give the collection as *J. Drummond s.n.* and the date as 1839. The W and G sheets could possibly be isolectotypes.

Notes. *Calytrix violacea* as circumscribed here is best distinguished from the more widespread *C. mucronulata* in having longer, flatter leaves that are obtuse and often bear a soft indumentum of long, flexuose hairs, and floral bracts that are relatively large, broadly ovate to orbicular, and obtuse. The flowers in *C. violacea* are slightly larger in all respects than those of *C. mucronulata*. In both species the inflorescences are usually compact, with the inflorescence axis continuing growth during or shortly after anthesis.

While mostly parapatric, *C. violacea* s. str. and *C. mucronulata* have been collected growing together in intermixed stands at a location near Goomalling (M. Hislop pers. comm.; see M. Hislop, P. Lewis & C. Curnow WW 227-22 and 227-26). They were noted at the time as being clearly different, and with no intermediates. This and the clear morphological separation evident from herbarium specimens indicate that they are clearly separable at species rank.

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