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Calandrinia sp. Edel Land (F. Obbens FO 01/17) is a synonym of *C. sphaerophylla* (Montiaceae)

Frank Obbens

Western Australian Herbarium, Biodiversity and Conservation Science,
Department of Biodiversity, Conservation and Attractions,
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983
Email: frank.obbens@aussiebb.com.au

SHORT COMMUNICATION

Calandrinia sphaerophylla J.M.Black was first collected in 1925 from a locality near Port Lincoln on the Eyre Peninsula (the exact location is unknown) and was described by Black (1927). This species is a small, semi-erect to erect succulent annual with very small, creamy white flowers (3–5 mm diam.) with 5 petals, 6 stamens and 3 stigmas (i.e. 3-valved in fruit). Many of the basal and other leaves are spheroidal, but it can also have obovoid leaves. It has seeds roughly 0.5 mm long that are dark red-brown, shiny and sub-reniform to ovoid in shape. The seed surface has numerous minute papillae or tubercules, and in this respect, looks very similar to *C. papillata* Syeda, a species that is very different in habit, size, and habitat to *C. sphaerophylla* and is also 8-petalled with 4-valved fruits. One might suspect that *C. sphaerophylla* could be related to *C. eremaea* Ewart because both species are small plants with somewhat similar papillate seeds, however, there are several subtle differences. For example, *C. eremaea* seeds are reniform and black or metallic in colour, whereas *C. sphaerophylla* seeds are sub-reniform to ovoid and dark red-brown. Also, seed of *C. eremaea* has strong rows of papillae predominantly on the dorsal surface and less distinct elsewhere and is also distinctly colliculate, whereas the papillae or tubercules on seeds of *C. sphaerophylla* generally occur over most of the surface and the colliculi are less distinct. In his protologue, Black (1927) states, in reference to *C. sphaerophylla*, '[r]esembles *C. pygmaea* F.Muell. [i.e. *C. granulifera* Benth.] in size, but differs in the reflexed pedicels, thinner not deciduous sepals, obtuse petals, filaments united about the middle, broad not slender styles and pale capsule splitting almost to base.' In fact, Black was correct in comparing *C. sphaerophylla* and *C. granulifera* as allied species because molecular analyses showed both species to belong in the same clade (Clade 5), but neither is placed with *C. eremaea* nor *C. papillata* (Hancock *et al*. 2018).

The original Eyre Peninsula specimen of *C. sphaerophylla* was almost certainly collected from shallow soils in rocky limestone habitat, like the few collections made since. Those later collections were made in 2019 from the north-west Eyre Peninsula, *D.E. Murfet* 9451 (MEL 2477195A) and Nullarbor National Park, *D.E. Murfet* 9429 (MEL 2477175A), the latter very near the border with Western Australia. The type (AD 97826032) and yet another Murfet collection in 2015, *D.E. Murfet* 8095 (AD 281087) from the Nullarbor (possibly the same location as above) are the only other South Australian collections.

In the late 2000s I examined the specimen *M.E. Trudgen* 7453 (PERTH 01228544) that had been incorrectly determined as *C. calyptrata* Hook.f. and which I recognised was probably a new species for Western Australia. It had the same morphological characteristics as *C. sphaerophylla* although I was unaware of this at that time. Over the years more specimens matching *Trudgen* 7453 were discovered within the PERTH collection or collected from the Shark Bay area, including several from targeted field surveys in 2017 and 2018. All these collections came from limestone habitats, mostly rocky, from the outer-most peninsula of Shark Bay (locally known as Edel Land) and on several islands north of this peninsula. The name *C.* sp. Edel Land (F. Obbens FO 01/17) was subsequently established in early 2018 (Western Australian Herbarium 1998–). Sometime later a further collection, *J.J. Alford & G.J. Keighery*

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s.n. (PERTH 06507239) from Eucla National Park near the border with South Australia, was recognised as morphologically identical to the Shark Bay collections. This collection, however, was question-marked as *C.* sp. Edel Land (F. Obbens FO 01/17) because there was no spirit material available at that time to provide a proper comparison of floral features with the Shark Bay specimens and also partly due to the substantial geographical separation.

Eventually, I realised that the description of *C. sphaerophylla* seemed very similar to *C.* sp. Edel Land (F. Obbens FO 01/17) and I also became aware of Murfet's collection of *C. sphaerophylla* near the border. This sparked a wider investigation which included viewing all the known interstate collections of *C. sphaerophylla* and their seeds. For the MEL collections of *C. sphaerophylla* I have seen high resolution scans of the sheets and SEMs of the seed. I have personally examined the AD collections including the type and their seeds. There appears to be very little difference between the collections of *C. sphaerophylla* from South Australia and those collections of *C.* sp. Edel Land (F. Obbens FO 01/17) from Western Australia. All the Western Australian specimens follow Black's original description for the species and the seed SEMs and macro images are all very similar (see Figure 1). At this stage, I consider *C.* sp. Edel Land (F. Obbens FO 01/17) to be a synonym of *C. sphaerophylla*. If a genetic study of the disjunct populations were undertaken then it might provide some evidence in the future for a subspecies ranking, but currently the morphological evidence does not support this (see Figure 2).

Calandrinia sphaerophylla J.M.Black, *Trans. & Proc. Roy. Soc. South Australia* 51: 378 (1927); *Parakeelya sphaerophylla* (J.M.Black) Hershk., *Phytologia* 84: 103 (1999); *Rumicastrum sphaerophyllum* (J.M.Black) Carolin ex Hershk., *Phytologia* 102: 121 (2020). *Type citation*: 'Near Port Lincoln' and 'collected in 1925 without indication of exact locality'. *Type specimen*: Port Lincoln district, Eyre Peninsula, South Australia [precise locality and collector unknown], October 1925, specimen forwarded to Black per Edquist (*holo*: AD 97826032!; *iso*: K).

Calandrinia sp. Edel Land (F. Obbens FO 01/17), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 22 January2024].

Diagnostic features. *Calandrinia sphaerophylla* can be distinguished from other members of the genus by its diminutive erect habit with spheroid to obovoid succulent leaves, very small creamy white, 5-petalled flowers with 6 stamens and 3 stigmas and occurring in calcareous, coastal habitats.

Other specimens examined [localities withheld for conservation reasons]. WESTERN AUSTRALIA: without date, *J.J. Alford & G.J. Keighery* s.n. (PERTH 06507239); 29 Aug. 1998, *S.J. Claymore & A.S. Weston* 200 (PERTH 05269695); 27 Aug. 1998, *S.J. Claymore & A.S. Weston* 207 (PERTH 05266858); 12 Nov. 2017, *S. Fox & S. Thomson* SBULU01-11 (PERTH 09441638); 4 Sep. 1972, *A.S. George* 11520 (PERTH 09312218); 25 Sep. 1997, *A. Markey* 1457 (PERTH 05241278); 18 Sep. 2017, *F. Obbens* FO 01/17 (PERTH 08934142); 3 Sep. 2018, *F. Obbens* FO 15/18 (PERTH 09044280); 3 Sep. 2018, *F. Obbens* FO 16/18 (PERTH 09044272); 23 Sep. 1989, *M.E. Trudgen* 7453 (PERTH 01228544).

SOUTH AUSTRALIA: 29 Sep. 2015, *D.E. Murfet* 8095 (AD 281087); 6 Sep. 2019, *D.E. Murfet* 9429 (MEL 2477175A image!); 8 Sep. 2019, *D.E. Murfet* 9451 (MEL 2477195A image!).

Phenology. This species appears to flower and fruit from early to late spring and possibly longer.

Distribution and habitat. The distribution for *C. sphaerophylla* now occurs from the Eyre Peninsula in South Australia to just across the Western Australian border at Eucla and then a wide disjunction to the Shark Bay region. This represents a substantial range extension for *C. sphaerophylla*, but there are a number of examples in Western Australia where species known from the Kalbarri-Shark Bay coastal region also occur along the far south-east coast of Western Australia. All *C. sphaerophylla* collections to date are from coastal limestone habitats including from cliff tops, smaller rocky rises or flatter areas behind the shoreline. It is generally collected on rocky limestone in soil pockets or cracks or on more substantial limestone sediments behind bays. Usually found in shrubland, shrub-heath or areas of

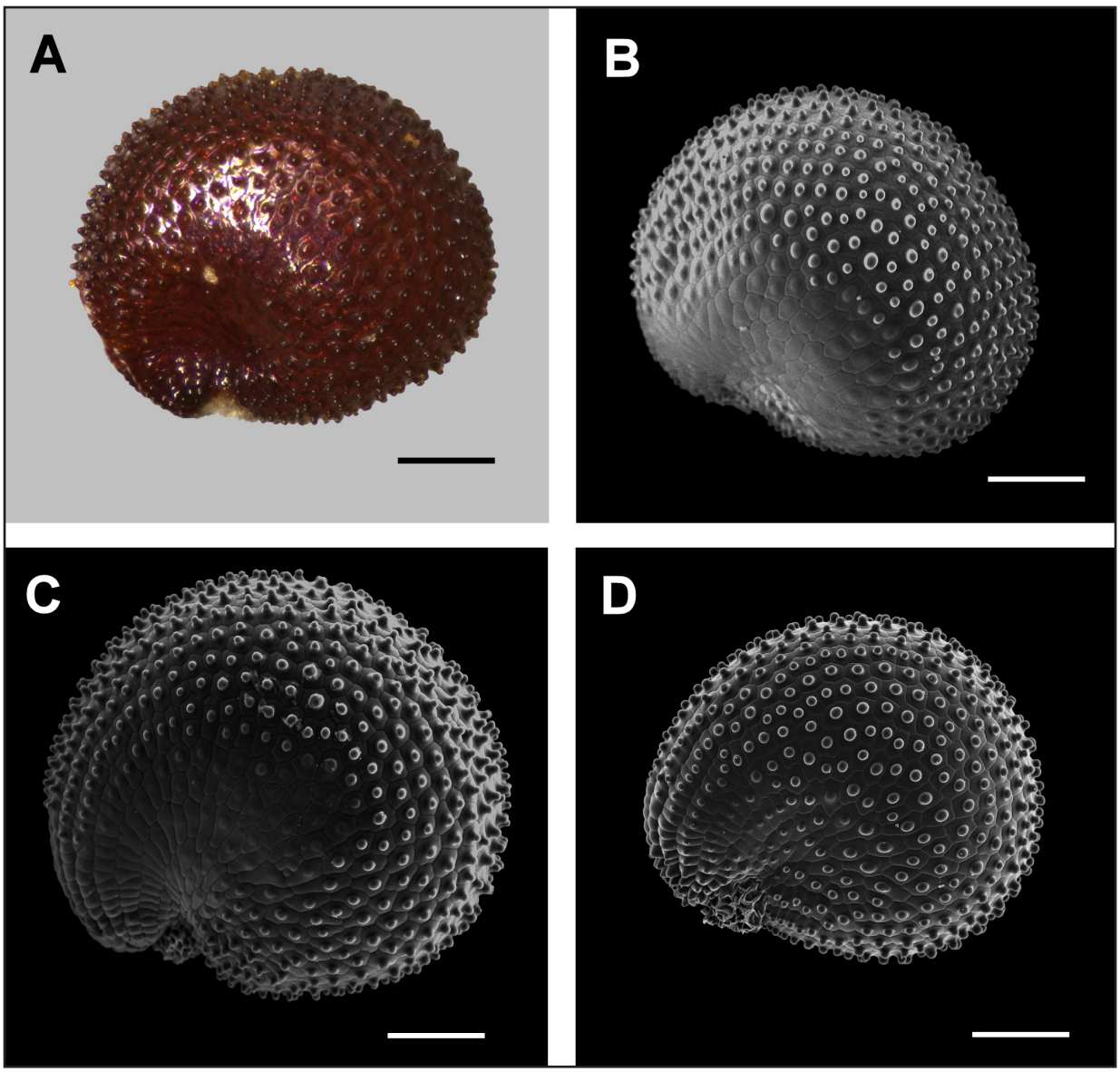

Figure 1. *Calandrinia sphaerophylla* seeds. A – Type from Port Lincoln district, Eyre Peninsula, South Australia (AD 97826032). B – NW Eyre Peninsula, South Australia, *Murfet* 9451 (MEL 2477195A). C – Nullarbor National Park, South Australia, *Murfet* 9429 (MEL 2477175A). D – Edel Land Peninsula, Shark Bay, Western Australia, *Obbens* FO 01/17 (PERTH 08934142). Scale bars = 0.1 mm (A–D).

herbfields within these vegetation associations including being in or adjacent to samphire communities. In Western Australia common associated species include *Acacia andrewsii*, *Atriplex paludosa* subsp. *moquiniana*, *A. bunburyana*, *Alyogyne* sp., *Capparis spinosa*, *Exocarpos aphyllus*, *Frankenia pauciflora, Rhagodia latifolia* and *Senecio pinnatifidus*, while in South Australia *Correa backhousiana*, *Goodenia varia*, *Gnaphalium indutum*, *Melaleuca acuminata*, *Pittosporum angustifolium* and *Senecio euclaensis* are listed.

Conservation status. *Calandrinia sphaerophylla* is listed as rare under the South Australian *Environment Protection and Biodiversity Conservation Act 1999*. Note *C.* sp. Edel Land (F. Obbens FO 01/17) is currently listed as Priority Two under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). Targeted surveys for *C. sphaerophylla* might find more populations on the limestone habitats of the Baxter Cliffs and Wylie Scarp that extends for many kilometres westward from south of Cocklebiddy almost to Cape Arid, Western Australia. There is also potential for it to be discovered further south of Shark Bay along the Zuytdorp Cliffs towards Kalbarri where there is also significant limestone habitat. It is certainly under-collected in current areas of its distribution including within South Australia.

Figure 2. *Calandrinia sphaerophylla* plant habit and some images with opened flowers. A, B – NW Eyre Peninsula, South Australia, *Murfet* 9451 (MEL 2477195A). C – Nullarbor National Park, South Australia, *Murfet* 9429 (MEL 2477175A). D – Edel Land Peninsula, Shark Bay, Western Australia, *Obbens* FO 01/17 (PERTH 08934142). Photographs D. Murfet (A–C) and F. Obbens(D).

Affinities. *Calandrinia sphaerophylla* appears to belong within clade 5 (Hancock *et al*. 2018). Members of this group are all small, annual plants with some of the smallest sized flowers in the genus (3–5 mm diam.). Most species within this clade are 5-petalled with 3 stigmas and generally have 10 stamens or fewer. Many species in this group also have spheroid to obovoid leaves.

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