

## ***Goodenia jabailiae* and *Scaevola goodsiorum* (Goodeniaceae), two new species from the Mallee bioregion of Western Australia**

**Kelly A. Shepherd<sup>1,4</sup> , Robert W. Davis<sup>2</sup>  and Leigh W. Sage<sup>3</sup> **

<sup>1</sup>Western Australian Herbarium, Biodiversity and Conservation Science,  
Department of Biodiversity, Conservation and Attractions,  
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983

<sup>2</sup>U/2 66 Earl Street, Albany, Western Australia 6330

<sup>3</sup>Swan Coastal District, Parks & Wildlife Service,  
Department of Biodiversity, Conservation and Attractions,  
5 Dundobar Rd, Wanneroo, Western Australia 6065

<sup>4</sup>Corresponding author, email: [Kelly.Shepherd@dbca.wa.gov.au](mailto:Kelly.Shepherd@dbca.wa.gov.au)

### **SHORT COMMUNICATION**

The discovery of undescribed, narrow range, endemic species still occurs with surprising frequency in Western Australia. The two species of Goodeniaceae named and described herein as *Goodenia jabailiae* K.A.Sheph. & L.W.Sage and *Scaevola goodsiorum* R.W.Davis, K.A.Sheph. & L.W.Sage were collected for the first time in 2006 and 2017 respectively. Both species are currently only known from a single population situated *c.* 45 km apart in the Mallee bioregion of southwest Western Australia and hence are species of conservation concern.

***Goodenia jabailiae*** K.A.Sheph. & L.W.Sage, *sp. nov.*

*Type:* southeast of Clyde Hill Nature Reserve, Western Australia, [precise locality withheld for conservation reasons], 2 October 2020, K.A. Shepherd & C.F. Wilkins KS 1777 (*holo:* PERTH 09815368; *iso:* CANB, K, MEL, NY).

Small prostrate annual *herb*, 5.5–17 cm wide, with strigose and simple hairs. *Leaves* in a basal rosette, narrowly obovate to oblanceolate, gradually narrowing basally, pinnatifid with linear to narrowly ovate lobes in the upper two thirds; lamina (including petiole) 8–31 mm long, 0.9–6 mm wide, lobes 1.4–3 mm long, 0.3–2.1 mm wide, with scattered strigose hairs 0.2–0.5 mm long, apex rounded to acute. *Inflorescence* with solitary flowers or a 2–3-flowered raceme, 30–80 mm long; peduncles 40–78 mm long, with scattered, simple hairs and strigose hairs, 0.3–0.4 mm long; pedicels 9–35 mm long, articulation line absent, hairs similar to peduncles, becoming denser towards the apex; bracts leaf-like, positioned at pedicel base, narrowly elliptic to narrowly ovate or pinnatisect, 4.3–10.1 mm long, 1.8–3.6 mm wide, with strigose hairs 0.4–0.8 mm long, apex subacute to acute; bracteoles absent. *Sepals* very narrowly lanceolate to narrowly elliptic, 1.4–2.9 mm long, 0.3–0.7 mm wide, adnate to *c.*  $\frac{3}{4}$  of the ovary, with scattered simple hairs and white or yellow strigose hairs 0.1–0.5 mm long, apex acute. *Corolla* yellow with reddish-brown markings at base of adaxial lobes, 9.7–10.3 mm long, not articulate; tube 0.8–1.1 mm long, pouch obscure, not exceeding ovary, 0.8–1.2 mm long, *c.* 0.6 mm wide; outer surface with moderately dense, simple and strigose hairs, 0.1–0.3 mm long, inside surface with retrorse, simple hairs inside throat, base glabrous. *Abaxial corolla lobes* 2.5–3.9 mm long, 1.3–1.9 mm wide, fused for 2.6–4.2 mm beyond the junction with the adaxial lobes, distinct from the wings, apex acute; wings 3–4.2 mm long, 1–1.9 mm wide, extending 1.1–1.3 mm beyond the apex of the lobe, with entire margins. *Adaxial corolla lobes* 3.8–6.3 mm long, 0.9–1.6 mm wide, fused for a further 0.9 mm; auricle cup-like and prominent, 1.5–2.2 mm long, 0.9–1.4 mm wide; wings almost equal, wing opposite auricle 3 mm long, 1.6–1.8 mm wide, wing above auricle 2.6 mm long, 1.3–2.0 mm wide, extending 1.2 mm

beyond the apex of the lobe, with entire margins and a line of simple hairs along the point of attachment to lobe. *Stamen* filaments linear, 1.4–2.0 mm long; anthers narrowly oblong to linear, 0.4–1.1 mm long, 0.3–0.4 mm wide. *Ovary* 1.2–1.3 mm long, obovoid, outer surface with moderately dense simple hairs 0.1–0.5 mm long, inner surface with a tuft of hairs at the base, septum obsolete, ovules 9 or 10 attached at base. *Style* 1.8–2.3 mm long, with scattered simple hairs 0.1–0.3 mm long towards the apex only; indusium broadly ovate, 1–1.7 mm long, 1.4–2 mm wide, outer surface with moderately dense simple hairs to 0.3 mm long mixed with short thicker hairs to 0.1 mm long, inner surface with a few simple hairs 0.3–0.5 mm long towards the base only, lips with more or less equal white and purple bristles 0.1–0.2 mm long. *Fruit* an ellipsoid capsule, glabrous, 3.2–3.4 mm long, 3.1–3.2 mm wide. *Seeds* flat, pale green to dark brown, smooth or with faint striations, 1.5 mm long, 1.3 mm wide, wing cream, 0.2–0.3 mm wide overlapping seed margin. (Figure 1)

*Diagnostic features.* Distinguished from related species allied to *Goodenia pinnatifida* Schltdl. by the following combination of characters: prostrate herb with simple and strigose hairs on the leaves, inflorescence and sepals; corolla 9.7–10.3 mm long, yellow with reddish-brown markings around the throat, with moderately dense simple and strigose hairs 0.1–0.5 mm long on the outer surface; adaxial



**Figure 1.** *Goodenia jabaillyae*. A – habitat; B – habit, low-lying plant *in situ*; C – close up of whole plant highlighting narrow sepals on a flower bud (red arrow); D – pinnatifid leaves; E – yellow flower with a reddish-brown base to the adaxial lobes, which have almost equal wings. Images by K.A. Shepherd (K.A. Shepherd & C.F. Wilkins KS 1777).



corolla lobe wings almost equal; ovary with an obsolete septum, ovules 9 or 10, basally attached; and seeds with the wing overlapping the seed margin.

*Other specimen examined.* WESTERN AUSTRALIA: [locality withheld for conservation reasons] 5 July 2006, R. Davis 11113 (PERTH 07362366).

*Phenology.* Flowering specimens were collected in July.

*Distribution and habitat.* Found growing in shallow brown clayey sand near exposed granite associated with species of moss and *Drosera*.

*Conservation status.* As this species is currently only known from a single population, it is to be listed as Priority One under Conservation Codes for Western Australian Flora (Tanya Llorens pers. comm.).

*Etymology.* This delicate new species is named in honour of our dear friend and colleague Dr Rachel S. Jabaily (1982–), Associate Professor at Colorado College (Colorado Springs, USA) (<https://orcid.org/0000-0002-4218-3533>), in recognition of her significant contribution to plant conservation through her research on Goodeniaceae and Bromeliaceae. Rachel is a passionate educator, teaching a wide range of courses in biogeography, phylogenetics, evolution and field biology and has provided support and guidance to many students throughout her career. A productive collaboration, spearheaded by Rachel and KAS through a National Science Foundation grant (2014–16), has resulted in a wide range of publications that have helped improve our understanding of the evolutionary history and generic boundaries in Goodeniaceae (Berger *et al.* 2017, Gardner *et al.* 2016a, Gardner *et al.* 2016b, Jabaily *et al.* 2012, Jabaily *et al.* 2014, Jabaily *et al.* 2018, Shepherd *et al.* 2017, Shepherd *et al.* 2020).

*Affinities.* Analyses of *trnL-F* and ITS molecular data (R. Jabaily, unpublished) confirmed that *G. jabaillyae* is genetically distinct, and most closely related to *G. pinnatifida*. It can be distinguished from this species by its smaller flowers (10–10.3 mm long vs 13–21 mm long), almost equal wings on the adaxial corolla lobes (vs uneven and narrow wing above the auricle), outer corolla with moderately dense simple and strigose hairs (vs glabrous), and orbicular ovary with an obsolete septum, 9 or 10 basally-attached of ovules (vs septum 2/3 length of the ovary, and 20 ovules in two rows).

Despite being most closely related to *G. pinnatifida*, *G. jabaillyae* keys out to *G. maideniana* in the *Flora of Australia* key to *Goodenia* (Carolin 1992). It can be differentiated from this species based on the characters stated in the key below.

### Updated *Flora of Australia* key for *Goodenia*

*Goodenia jabaillyae* can be included in the *Flora of Australia* key to *Goodenia* (Carolin 1992: 161) by altering couplet 26 of Group 6, as follows:

**26** Main stems straight or sinuate; cauline leaves broader than linear

**26a** Corolla 12–15 mm long; ovules to 30; seeds 31.5–2.8 mm long, reticulate, black..... **104. *G. maideniana***

**26a:** Corolla 9.7–10.3 mm long; ovules to 10; seeds c. 1.5 mm long; smooth or with faint striations, pale green to dark brown ..... ***G. jabaillyae***

**26:** Main stems zig-zag; cauline leaves linear..... **103. *G. anfracta***

***Scaevola goodsiorum*** R.W.Davis, K.A.Sheph. & L.W.Sage, *sp. nov.*

*Type:* south of Mount Ragged, Western Australia [precise locality withheld for conservation reasons], 7 August 2017, *M. Goods* GG 004 (*holo:* PERTH 08881162; *iso:* CANB).

*Scaevola* sp. Mt Ragged (M.G. Goods GG 004), Western Australian Herbarium, in *Florabase*, <https://florabase.dbca.wa.gov.au/> [accessed 25 June 2025].

*Erect*, open, sub-shrub, *c.* 30 cm high, 25 cm wide; stems terete, with a dense indumentum of appressed to ascending, fine, white hairs, 0.2–0.6 mm long, becoming glabrescent with age; axils with dense, white, long, silky hairs to 3 mm long. *Leaves* alternate, narrowly oblanceolate to elliptic, 25–65 mm long, 1.5–13 mm wide, margins entire or with scattered, shallow teeth, margin flat to shallowly recurved, both surfaces evenly covered with sparse to scattered, fine, white, hairs 0.2–0.6 mm long. *Inflorescence* condensed, axillary spikes, 7–10 mm long, 5–12 mm wide, with 3 or 4 (rarely 5) flowers. *Bracts* lanceolate, 3.3–4 mm long, 1.1–1.6 mm wide, outer surface with scattered hairs 0.4–0.5 mm long, inner surface with dense, white, silky hairs to 2 mm long, becoming glabrous towards base. *Bracteoles* narrowly lanceolate, 2.5–3 mm long, 0.5–0.7 mm wide, with white hairs to 0.5 mm long sometimes over a layer of obscure, scattered, glandular hairs < 0.1 mm long. *Sepals* free equal, rounded *c.* 0.1 mm long, glabrous, margins opaque. *Corolla* 4–5.5 mm long, white, becoming pale green towards the throat, without markings; outer surface with moderately dense hairs, 0.4–0.6 mm long, becoming glabrous towards base; inner surface with scattered, fine hairs, *c.* 0.25 mm long, becoming glabrous towards lobes, throat with three rows of stiff, course, retrorse hairs 0.2–0.3 mm long; tube almost split to the base, fused for 0.2–0.4 mm; lobes  $\pm$  equal, 1.8–2.1 mm long, 0.7–1.1 mm wide, wings  $\pm$  equal, 1.7–1.9 mm long, 0.1–0.3 wide. *Stamens* 5, filaments filiform, 1.3–1.7 mm long; anthers linear, 0.4–0.6 mm long. *Style* 3.4–3.6 mm long, with scattered, spreading, white hairs; indusium ovoid, 0.3–0.5 mm long, 0.6–0.9 mm wide, glabrous, lips with narrow fringe of stiff, white hairs 0.05–0.1 mm long. *Ovary* 0.7–1 mm long, with very sparse, short, simple, hairs with sessile glands. *Fruit* (immature), ellipsoid, 2.8–3 mm long, 1.1–1.3 mm wide, with very sparse short, appressed hairs; seed not seen. (Figure 2)

*Diagnostic features.* Distinct within the genus by virtue of the following features: narrowly oblanceolate to elliptic leaves with sparse to scattered, fine, white, hairs 0.2–0.6 mm long; inflorescence a condensed, axillary spike of 3–4(5) white flowers with a green base; sepals *c.* 0.1 mm long with an opaque margin; corolla 4–5.5 mm long, with lobes 1.8–2.1 mm long, outer surface with moderately dense hairs, 0.4–0.6 mm long, becoming glabrous towards base, inner surface with scattered, fine hairs, and three rows of stiff, course, retrorse hairs in the throat; style with scattered hairs; and indusium glabrous. *Phenology.* The specimen was in flower when collected in early August with some immature fruits also present.

*Distribution and habitat.* Currently known from one population of around 50 plants near Mount Ragged in the eastern Mallee bioregion of Western Australia. It is found growing in grey-brown loam over clay amongst rocks in scrubland associated with *Banksia*, *Eucalyptus* and *Stackhousia*.

*Conservation status.* *Scaevola goodsiorum* is currently listed as Priority Two under the Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), under the name *S. sp.* Mt Ragged (M.G. Goods 004). This species may be a disturbance opportunist, as it was apparent the plants at the type location had germinated following a recent fire (M. Goods pers. comm.).

*Etymology.* This species is named in honour of Maree and Graham Goods, in recognition of their substantial contribution to plant conservation through collecting specimens and photographing plants in the field. To date they have together and independently collected more than 660 voucher specimens while participating in Desert Discovery field trips in Western Australia.





**Figure 2.** *Scaevola goodsiorum*. A – flowering plant *in situ* growing amongst exposed rocks; B – white fan-like flowers with a green throat, no markings, and retrorse hairs in the throat. Images by M. Goods (M.G. Goods 004).

*Notes.* In the spring of 2017 Australian Plants Society (Victoria) members Maree and Graham Goods travelled across the Nullarbor with the intent to collect and photograph species of the family Goodeniaceae in southern Western Australia. The fan-flower family was to be the focus for the Society's FJC Rogers



2018 Seminar and these passionate citizen scientists planned to present delegates with a virtual plant guide highlighting the extraordinary floral diversity in this captivating family. On a random stop to explore a recently burnt area south of Mount Ragged in the Cape Arid National Park, Maree found a small white flowered species of *Scaevola* growing amongst some rocks. She took the opportunity to photograph (Figure 1) and voucher the plants. When this material was subsequently lodged with the Western Australian Herbarium (PERTH) it became evident that she had in fact discovered a new species.

*Affinities.* *Scaevola goodsiorum* is morphologically most similar to *S. paludosa* R.Br., *S. spicigera* Carolin, *S. canescens* Benth., and the South Australian *S. linearis* R.Br. but is readily differentiated from all of these species by its sepals being *c.* 0.1 mm long (*c.f.* sepals to *c.* 0.3 mm long).

*Scaevola goodsiorum* is most similar to *S. canescens* Benth., but can be readily distinguished from it by the presence of dense, white, long, silky hairs in the leaf axils (vs softly felted axillary hairs that aren't dense), smaller corollas 4–5.5 mm long (vs 9–11 mm long) that lack brownish veins or markings (vs corollas with brownish veins), and being located approximately 700 km east of the known distribution of *S. canescens*.

In the *Flora of Australia* key to *Scaevola* (Carolin 1992), *S. goodsiorum* keys out to *S. paludosa*. Besides having shorter sepals, *S. goodsiorum* differs from *S. paludosa* in having narrowly oblanceolate to elliptic leaves with sparse to scattered, fine, white, hairs 0.2–0.6 mm long (vs elliptic leaves with scattered, coarse, antrorse hairs sometimes with a slightly swollen base); corolla white with a green throat and no markings and 4–5.5 mm long (vs corolla white with dark reddish brown markings and 7–10 mm long).

### Updated *Flora of Australia* Key

The following is a modification to the *Scaevola* key in *Flora of Australia* (Carolin 1992) Group 4 amendment to couplet 23 (p. 91):

6: Ovary and fruit hairy

22. Flowers in lateral spikes mostly shorter than leaves

23. Sepals free; leaves ± hispid, hairs both simple and minute glandular

23a. Sepals free to *c.* 0.3 mm long; corolla 7–10 mm long; bracts shorter than bracteoles ..... ***S. paludosa***

23a: Sepals free to *c.* 0.1 mm long; corolla 4–5.5 mm long; bracts longer than bracteoles ..... ***S. goodsiorum***

23: Sepals reduced to a rim; leaves tomentose with dense, simple or felted hairs

### Acknowledgements

Rachel Jabaily (Colorado College) is sincerely thanked for undertaking molecular sequencing of *Goodenia pinnatifida* and allied species including *Goodenia jabailiae*, while the Goodeniaceae Study Group of Australian Plants Society are also acknowledged for providing funding towards this project. Maree and Graham Goods are also acknowledged for their significant contribution to plant conservation in Western Australia, and specifically for their large collection of Goodeniaceae species (including the holotype of *Scaevola goodsiorum*), which has assisted with ongoing taxonomic work in the family, while Neville Walsh is also thanked for providing a helpful review.

### References

- Berger, B.A., Han, J., Sessa, E.B., Gardner, A.G., Shepherd, K.A., Ricigliano, V.A., Jabaily, R.S. & Howarth, D.G. (2017). The unexpected depths of genome-skimming data: A case study examining Goodeniaceae floral symmetry genes. *Applications in Plant Sciences* 5(10): 1700042. <https://doi.org/10.3732/apps.1700042>
- Carolin, R.C. (1992). *Scaevola*. In: George, A.S. (ed.) *Flora of Australia*. Vol. 35. pp. 84–146. (Australian Government Publishing Service: Canberra.)

- Gardner, A.G., Fitzgerald, J.N., Menz, J., Shepherd, K.A., Howarth, D.G. & Jabaily, R.S. (2016a). Characterizing Floral Symmetry in the Core Goodeniaceae with Geometric Morphometrics. *PLoS ONE* 11(5): e0154736. <https://doi.org/10.1371/journal.pone.0154736>.
- Gardner, A.G., Sessa, E.B., Michener, P., Johnson, E., Shepherd, K.A., Howarth, D.G. & Jabaily, R.S. (2016b). Utilizing next-generation sequencing to resolve the backbone of the Core Goodeniaceae and inform future taxonomic and floral form studies. *Molecular Phylogenetics and Evolution* 94: 605–617. <https://doi.org/10.1016/j.ympev.2015.10.003>
- Jabaily, R.S., Shepherd, K.A., Gardner, A.G., Gustafsson, M.H.G., Howarth, D.G. & Motley, T.J. (2014). Historical biogeography of the predominantly Australian plant family Goodeniaceae. *Journal of Biogeography* 41(11): 2057–2067. <https://doi.org/10.1111/jbi.12363>
- Jabaily, R.S., Shepherd, K.A., Gustafsson, M.H.G., Sage, L.W., Krauss, S.L., Howarth, D.G. & Motley, T.J. (2012). Systematics of the Austral-Pacific family Goodeniaceae: Establishing a taxonomic and evolutionary framework. *Taxon* 61(2): 419–436. <https://onlinelibrary.wiley.com/doi/pdf/10.1002/tax.612012>
- Jabaily, R.S., Shepherd, K.A., Michener, P.S., Bush, C.J., Rivero, R., Gardner, A.G. & Sessa, E.B. (2018). Employing hypothesis testing and data from multiple genomic compartments to resolve recalcitrant backbone nodes in *Goodenia* s.l. (Goodeniaceae). *Molecular Phylogenetics & Evolution*. 127: 502–512. <https://doi.org/10.1016/j.ympev.2018.05.005>
- Shepherd, K.A., Lepschi, B.J., Johnson, E.A., Gardner, A.G., Sessa, E.B. & Jabaily R.S. (2020). The concluding chapter: recircumscription of *Goodenia* (Goodeniaceae) to include four allied genera with an updated infrageneric classification. *PhytoKeys* 152: 27–104. <https://doi.org/10.3897/phytokeys.152.49604>
- Shepherd, K.A., Wege, J.A. & Jabaily, R.S. (2017). (2526) Proposal to conserve the name *Goodenia* (Goodeniaceae) with a conserved type. *Taxon* 66(3): 757–758. <https://doi.org/10.12705/663.25>
- Western Australian Herbarium (1998–). *Florabase—the Western Australian Flora*. Department of Biodiversity, Conservation and Attractions. <http://florabase.dbca.wa.gov.au/> [accessed 28 March 2019].

