Four new species of *Goodenia* Smith (Goodeniaceae) from Queensland

A.E.Holland & T.P.Boyle

Summary

Holland, A.E. & Boyle T.P. (2002). Four new species of *Goodenia* Smith (Goodeniaceae) from Queensland. *Austrobaileya* 6 (2): 253–265. Four new species are described for Queensland: two new species from northern Queensland, *G. splendida* and *G. debilis*, and two from the south-west of the state, *G. atriplexifolia* and *G. expansa*. A central Queensland species, *G. rosulata* Domin, is also reinstated. Notes on affinities and conservation status are included. A key to the species occurring in Queensland is provided.

Keywords: *Goodenia* - Queensland, *Goodenia splendida*, *Goodenia debilis*, *Goodenia atriplexifolia*, *Goodenia expansa*, *Goodenia rosulata*

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Introduction

Goodenia Smith is a genus of approx. 200 species, mostly endemic to Australia. Carolin described a number of new species and varieties for Queensland in 1990 and provided a key to all of the Australian species (Carolin 1992). Since then, several new taxa have been identified as part of an overall review of the approximately 57 species occurring in Queensland. All of these taxa were first collected prior to 1990 but further collections have enabled elucidation of characters and determination of status and relationships. The key was written in response to a need for a State based identification tool.

Species of *Goodenia* are distinguished from the other genera of Goodeniaceae by the usually bilabiate flowers (2 long adaxial and 3 shorter abaxial corolla lobes), free stamens, ovary incompletely 2-locular with more than 2 ovules, the (usually) 2-valved dry, dehiscent capsule, and the seeds which are flattened and often winged. The subgenus *Monochila* (G.Don) Carolin does not occur in Queensland but all of the 4 sections of the subgen. *Goodenia* are represented (Carolin 1992).

Materials and methods

This review was based on the examination of herbarium specimens and reconstituted floral material from BRI. Floral measurements were mainly based on material reconstituted in boiling water. The remainder was measured from dried material. Distributions of the new taxa are given in the maps. Distributions by pastoral district of the other Queensland taxa are given in Henderson (2002). The maps were generated from the herbarium label database HERBRECS.

The key was written using field characters where possible, but a hand lens is needed for some characters. It is preferable to have flowering and fruiting material present when using the key.

Terminology

The terms used follow Carolin (1992). The term "bract" is used for cauline "leaves" which subtend flowers. The bracts are often different in size and/or shape from the basal leaves. Bracteoles occur on the flower stalk and mark the top of the peduncle and bottom of the pedicel. If no bracteoles are present, the whole stalk is taken to be the pedicel. For cymes and thyrses the bracts are only the basal pair of appendages. The sepals of most Queensland species are adnate to the ovary nearly to the ovary apex. Only the free part is measured. Terms for corolla parts include "abaxial lobes" which are the three shorter or fan lobes and "adaxial lobes" which are the two longer lobes. These are sometimes auriculate and surround the indusium. The auricle is usually clearly marked and of different tissue from the wings, but in some cases (see below) it is indistinct and merged with the wing which, itself, is enlarged in the middle. Corolla lobe

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measurements do not include the wings (these are given separately).

1. Goodenia splendida A.E.Holland & T.P.Boyle, **sp. nov.** *G. ramelii* affinis sed foliis angustioibus, sepalis et pedicellis longioribus, ovalis paucioribus et seminibus longioribus differens. **Typus:** Queensland. South Kennedy District: About 22.5 km NNW of Yarrowmere Station, on Great Dividing Range, 15 October 1983, *R.J.Henderson* H2844, *G.P.Guymer & H. Dillewaard* (holo: BRI (2 sheets); iso: SYD, US, MEL, AD).

Goodenia sp. (Yarrowmere, R.J.Henderson+ H2844)

Erect, densely tufted perennial herb to 50 cm high, with a short woody stem and thickened taproot. All parts viscid, with multicellular glandular hairs 0.1–0.6 mm long. Leaves mostly basal, narrowed into a petiole to 3 cm long, or sessile; lamina oblanceolate to lanceolate, 4–15 cm long, 5–20 mm wide, L:W ratio 5–12 (–17):1, apex acute, base tapered, margins entire or denticulate, both surfaces glandular hairy, or nearly glabrous; lowest leaves often 3-veined. Inflorescence a raceme or thyrse to 25 cm long (at least ½ of the plant); bracts oblanceolate, lanceolate or linear, 10–30 mm long, 0.5–3 mm wide, acute, entire; peduncles 5–25 mm long; bracteoles similar to bracts, 3–17 mm long; pedicel 3–8 mm long; articulated just below ovary. Sepals subequal, adnate to ovary almost to apex, free part subequal, linear to lanceolate, 3–6 mm long, 0.5–1.2 mm wide, bluntly acute. Corolla 12–20 mm long, blue or purple; outer surface with a mixture of glandular and strigose hairs; inner surface with a few long hairs on margins and in throat, enations prominent; anterior pouch prominent, 3–6 mm long, *c.* 1 mm wide, slightly shorter than ovary. Abaxial corolla lobes 3.5–7 mm long, 1.2–2.0 mm wide, wings (2.5–) 5–7 mm long, 1.5–2 mm wide, entire. Adaxial corolla lobes free almost to base, 7–12 mm long; 1.2–2.0 mm wide; auricle indistinct, merged with wing 6–9 mm long, 1.5–2 mm wide; opposite wing 3–6 mm long, 1.5–2 mm wide. Stamen filaments 4–5 mm long; anthers 1.5–2.5 mm long. Ovary 4–9 mm long, with longitudinal ribs, rounded or cuneate at base, densely glandular hairy; septum ¾ of ovary length; ovules 20–34. Style 9–11 mm long, villous; indusium square to oblong, 1.9–2.4 mm long, 1.6–2.2 mm wide, with scattered long hairs, pale brown; upper lip slightly convex with bristles to 0.3 mm long; lower lip shorter, with bristles *c.* 1 mm long; bristles tinged purple. Fruit ellipsoid, 8–11 mm long, 3–4 mm wide, dehiscing longitudinally almost to base. Seed elliptic, 1.9–2.4 mm long, 1.3–2.2 mm wide, colliculate at maturity, brown; wings absent or very narrow. Fig. 1. A–D.

***Additional specimens examined*: Queensland.** Mitchell District: Poison Valley, Torrens Creek, White Mountains National Park, Apr 2000, *McDonald* KRM452 (BRI); White Mountains National Park, (Site 74), Apr 2000, *Thompson* HUGT38 & *Thomas* (BRI). North Kennedy District: North Branch Creek, White Mountains National Park, Apr 1992, *Bean* 4314 (BRI, NSW, MEL); Burra Range, N of Burra Microwave Tower, May 1991, *Cumming* 11020 (BRI, DNA, PERTH); 19 km N of Burra Microwave Tower towards Poison Valley, W of Pentland, without date, *Cumming* 9583 (BRI); 16 km N of Burra Range Microwave, Jul 1984, *Jackes* s.n. (BRI). South Kennedy District: 27.5 km W of St Anns homestead (Site10/6–7), Jun 1992, *Thompson* BUC816 & *Sharpe* (AD, BRI, DNA, NSW, MEL, PERTH, K); Darkies Range, *c.* 17 km SW of Lake Buchanan, Mar 1998, *Thompson* BUC2114 & *Turpin* (AD, BRI, MO).

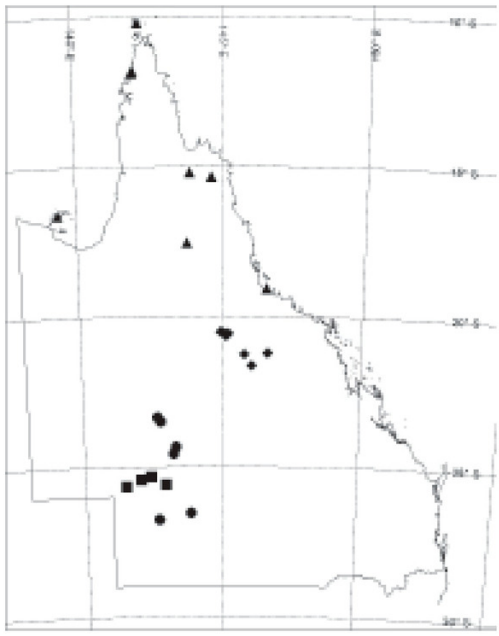
***Distribution and habitat*:** North Queensland, from the White Mountains National Park and as far south as Lake Buchanan. Occurs in *Eucalyptus* and *Corymbia* woodland and open *Melaleuca* shrublands, in sandy or gravelly soil over sandstone. Common after fire. Map 1.

***Phenology*:** Flowers March to October, possibly at other times.

***Affinities*:** This new species belongs in *Goodenia* sect. *Caeruleae* (Benth.) Carolin, subsect. *Scaevolina* Carolin (Carolin 1992). *Goodenia splendida* is most closely related to *Goodenia ramelii* F.Muell. which occurs in the north west of the state. *Goodenia splendida* is a smaller plant and has narrower leaves, longer sepals and pedicels, fewer ovules and longer seeds. *Goodenia ramelii* grows to 1 m high, with leaves 2–4.5 cm wide, pedicel to 4 mm long, sepals to 2 mm long and 40–50 ovules.

Carolin saw only one collection of this species (the type material of *G. splendida*) and included it in his description of *G. scaevolina* F.Muell. He comments "the single collection

Fig. 1. ***Goodenia splendida.*** A, raceme; B, flower; C, indusium; D, seed. ***Goodenia debilis*** E. raceme; F, flower; G, seed. A from *Bean* 4314; B–D from *Cumming* 11020 (BRI); E & G from *Forster* PIF22614 (BRI); F from *Clarkson* 7783 (BRI).



Map 1. Distribution of *Goodenia splendida* ◆, *Goodenia debilis* ▲, *Goodenia atriplexifolia* ● and *Goodenia expansa* ■.

from the highlands of northern Qld resembles the specimens from Victoria R. area but has a very prominent pouch." *Goodenia splendida* differs from *G. scaevolina* in the narrow, mostly basal leaves, shorter sepals and smaller corolla. *G. scaevolina* is a subshrub to 80 cm and has cauline leaves 20–30 mm wide, sepals 5–10 mm long and corolla 20–25 mm long. It is not known to occur in Queensland.

***Etymology*:** This name refers to the showy foliage and flowers.

***Conservation*:** Conserved in the White Mountains National Park and known to be common in the areas from which it has been collected. Not considered to be rare or threatened at present.

2. Goodenia debilis A.E.Holland & T.P.Boyle, **sp. nov.** *G. armstrongianae* affinis sed foliis integris longioribus angustioribusque, corollas brevioribus, ovalis paucioribus et testa alveolatus differens. **Typus**: Queensland. Cook District: Bulleringa National Park, 80 km NE of Mt Surprise, Red River track past Donkey Spring, *P.I.Forster* PIF22614 & *R.Booth* (holo: BRI; iso: DNA, NSW)

Goodenia sp. (Welcome Creek, A.R.Bean 1936)

Ascending or weakly erect annual herb up to 40 cm high, with one to several thin stems branched from base. All parts strigose with appressed white hairs 0.2–0.6 mm long or nearly glabrous. Leaves cauline and sessile; lamina erect or ascending and slightly decurrent; lamina linear-lanceolate, 1–5 cm long, 0.5–3 mm wide, L:W ratio (leaves and bracts) 12–32:1, apex acute, margins entire, recurved or flat, both surfaces strigose at least on margins and midrib. Inflorescence a leafy raceme to 20 cm long (more than ½ of the plant); bracts leaf-like; pedicel divaricate, thread-like, 11–22 mm long; articulated just below ovary; bracteoles absent. Sepals adnate to ovary almost to apex, free part subequal, linear, 1.1–1.8 mm long, *c.* 1 mm wide. Corolla 4–6 mm long, cream or yellow, with brownish markings; outer surface strigose; inner surface ±glabrous, enations absent; anterior pouch absent. Abaxial lobes 0.5–2 mm long, 0.4–0.6 mm wide; wings 0.5–1 mm long, 0.8–1.2 mm wide; margin irregular. Adaxial corolla lobes 2/3 free, 1.6–2.5 mm long, 0.4–0.6 mm wide; auricle 0.6–0.8 mm long and wide; wing above auricle 0.2–0.5 mm long and wide; opposite wing 0.2–0.8 mm long and wide. Stamen filaments 1.5–2 mm long; anthers 0.2–0.4 mm long. Ovary 1.5–2 mm long, rounded at base, smooth or strigose; septum scarcely ½ ovary length; ovules 8. Style 2–3 mm long, glabrous; indusium broadly oblong to semi-circular, 0.3–0.5 mm long, 0.5–0.8 mm wide, straight or slightly concave at apex, glabrous or with a few hairs, brown; bristles 0.1–0.2 mm long, slightly longer on upper lip. Fruit ellipsoid 4–7 mm long, 2–3 mm wide, dehiscent almost to base. Seed elliptic, 1.6–2.1 mm long, 1.0–1.1 mm wide; alveolate at maturity, pale yellow to light brown; wing absent. Fig. 1. E–G.

Additional specimens examined: **Queensland.** Burke District: Girriri, Mornington Island, Sep 1981, *Fosberg* 61885 (BRI). Cook District: Welcome Creek Plateau, 13 km SSW of 'Battle Camp' via Cooktown, Jul 1990, *Bean* 1936 (BRI, NSW); 5.3 km SE of Hann River on Laura-Coen Road, Jul 1998, *Bean* 13528 (BRI); Moa Island, *c.* 1 km NE of Kubin along road to St Pauls, Feb 1989, *Clarkson* 7783 (BRI); Namaleta Creek, May 1994, *Goble-Garratt* 186

(BRI); Upper reaches of Namelita Creek, Cape York on Venture Mine Lease, Apr 1994, *Gunness* 2333 (BRI). NORTH KENNEDY DISTRICT: Halfway between Townsville and Rollingstone, Apr 1945, *Blake* 15776 & *Webb* (BRI).

Distribution and habitat: North Queensland, from the Torres Strait islands to just north of Townsville, with one specimen from Mornington Island. Occurs in *Eucalyptus* and *Melaleuca* woodlands, with a grass, herb or sedge understorey, on sandy and podsolic soils, usually in damp areas, in and around seasonal watercourses. Map 1.

Phenology: Flowers February to September.

Affinities: This new species belongs in *Goodenia* section *Goodenia*, subsection *Borealis* Carolin (Carolin 1992). It is most closely related to *G. armstrongiana* de Vriese, differing mainly in the more narrow, linear-lanceolate leaves with entire margins, shorter corolla, fewer ovules, and an alveolate seed surface. *Goodenia armstrongiana* has a leaf L:W ratio of 2–5:1, usually dentate leaves, corolla 8–12 mm long, ovules 10–20 and seed surface verrucose.

***Conservation*:** This species, though apparently widespread, has rarely been collected. This may be due to the habitat, or its short lifespan. It is currently conserved in the Bulleringa National Park and does not appear to be rare or threatened at present.

3. Goodenia atriplexifolia A.E. Holland and T.P. Boyle, **sp. nov.** *G. viridulae* affinis sed foliis planus dentatus latioribusque et ovalis numerosioribus differens. **Typus**: Queensland. MITCHELL DISTRICT: 150 km S of Longreach on Jundah road, 2 km N of turnoff to Stonehenge, Mar 2001, *M.B.Thomas* 2255 & *N.Fechner* (holo: BRI; iso: DNA, PERTH).

Goodenia sp. (Stonehenge, J.Milson JM1426)

Woody subshrub to 30 cm tall. All parts grey or white tomentose with a dense felted mat of very fine white hairs. Leaves cauline, sessile; lamina elliptic to ovate, 0.8–2.8 cm long, 4–14 mm wide, L:W ratio (leaves and bracts) 2–3 (–5):1, apex acute, base cuneate or tapered, margins dentate or serrate, sometimes lobed, rarely entire, both surfaces grey tomentose; lowest leaves 3-veined. Inflorescence a leafy spike to 20 cm (more than ½ of the plant) with 1–3 flowers in the axils of leaf-like bracts; bracteoles absent or minute at base of calyx. Sepals adnate to ovary to summit, free part subequal, triangular, 1.0–1.4 mm long, 0.5–0.8 mm wide at base. Corolla 7–10 mm long, cream; outer surface tomentose; inner surface villous in throat, enations hidden or absent; anterior pouch absent. Abaxial corolla lobes 2–5 mm long, 1.0–1.6 mm wide, wings 2–4 mm long, 0.6–1.2 mm wide, margin irregular. Adaxial corolla lobes free almost to base, 4–5 mm long, 0.6–0.8 mm wide; auricle 1.8–2.0 mm long, 0.8–1.0 mm wide; wing above auricle absent; opposite wing 1.6–2.4 mm long, 0.2–0.8 mm wide. Stamen filaments 1.5–2 mm long; anthers *c.*1 mm long. Ovary 3–3.5 mm long, slightly narrowed at base, white tomentose; septum scarcely ½ ovary length; ovules 8–20. Style 2–3 mm long, with short spreading hairs; indusium oblong, 1.1–1.5 mm long, 0.7–1.0 mm wide, with short hairs at base, brown; upper lip convex, with bristles *c.* 3 mm long; lower lip shorter, concave, with very short bristles *c.* 0.05 mm long. Fruit ellipsoid to subglobular, 4–6 mm long, 2–4 mm wide, dehiscing almost to base. Seed elliptic to oblong, 2–3 mm long, 0.8–1.1 mm wide, with a thick rim, colliculate to minutely aculeate at maturity, yellow-brown; wing to 1 mm wide. Fig. 2. A–C.

***Additional specimens examined*: Queensland**. GREGORY NORTH DISTRICT: 18 km SW of Opalton, Nov 1986, *Neldner* 2616 (BRI). MITCHELL DISTRICT: Longreach to Jundah near Stonehenge, Jun 1977, *Cockburn* s.n. (BRI); 3 km NE of Stonehenge Main Turnoff, Aug 1988, *Milson* JM1426 (BRI); 22 km W of Vergemont HS SW of Longreach, Apr 1986, *Neldner* 2348 (BRI). GREGORY SOUTH DISRICT: Grey Range, 50 km W of Quilpie, Aug 1978, *Purdie* 1596 (BRI); 27.5 km from Cooma turnoff on road to Plevna Downs, Sep 1989, *Wilson* 443 (BRI, NSW).

***Distribution and habitat*:** Occurs in south-western Queensland, from Opalton south to the Grey Range, in tall *Acacia* shrubland and open *Eucalyptus* woodland, with *Triodia* understorey, on residual tablelands and rocky plateaus. Map 1.

***Phenology*:** Flowers June to September, possibly at other times.

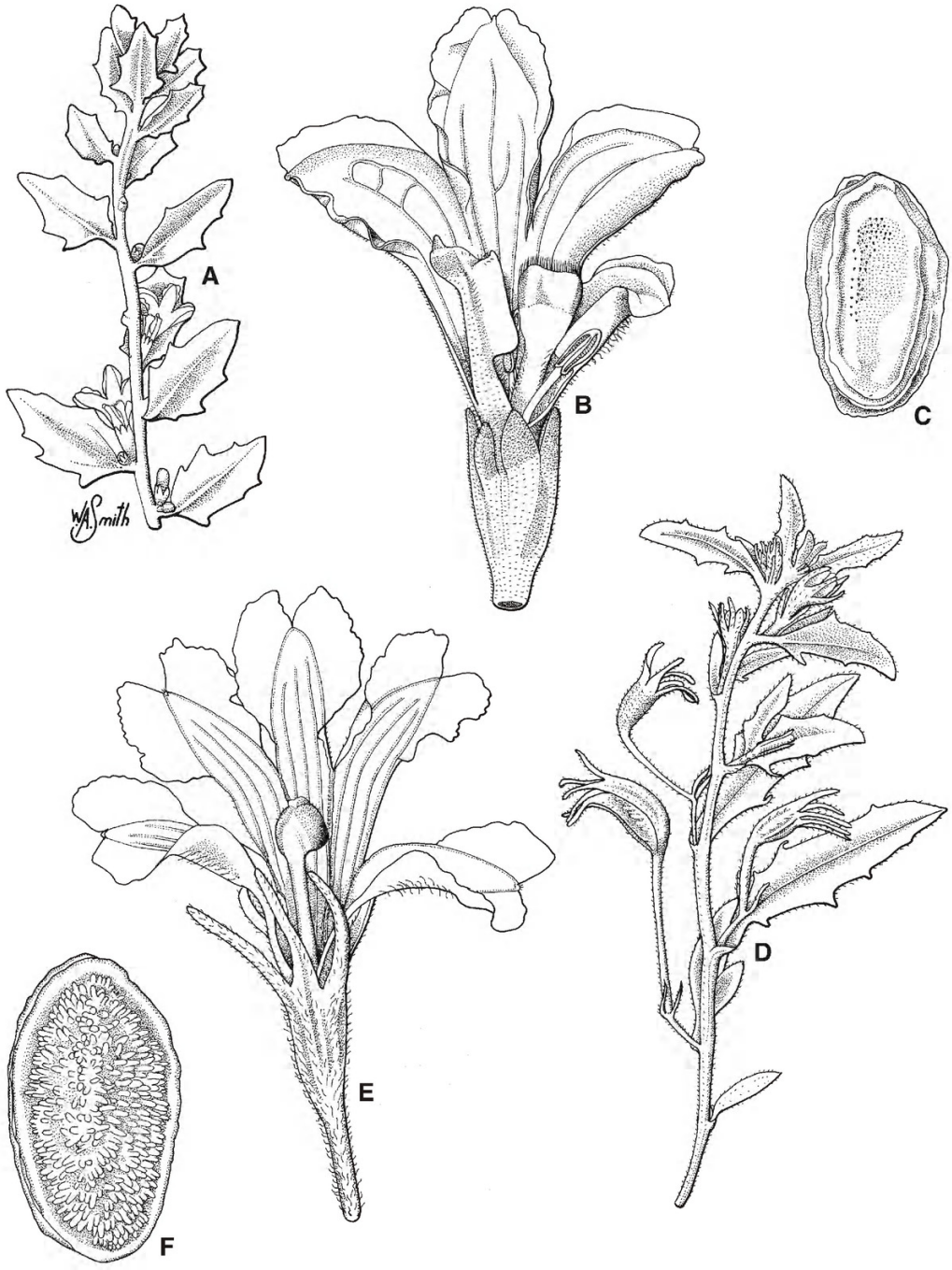


Fig. 2. ***Goodenia atriplexifolia.*** A, raceme; B, flower; C, seed. ***Goodenia expansa.*** D, raceme; E. flower; F. seed. A–C from *Milson* JM1426 (BRI); D–F from *Williams* 88038 (BRI).

***Affinities*:** This new species belongs in *Goodenia* section *Goodenia*, subsection *Goodenia* (Carolin 1992). It is most closely related to *G. viridula* Carolin, differing mainly in the much wider leaves which are flat and dentate, and by the more numerous ovules, and cream corolla. *Goodenia viridula* has terete leaves to 2 mm wide, 4–6 ovules and greenish corolla. It is also related to *G. disperma* F.Muell. but differs from this species in the wider leaves, sessile flowers with smaller sepals, and smaller fruits. *Goodenia disperma* has leaves to 5 mm wide, pedicellate flowers with sepals 4–9 mm long, and fruit 4–9 mm long.

***Etymology*:** The name refers to the leaves, which resemble those of *Atriplex* species.

Conservation: *G. atriplexifolia* does not occur in any conservation areas and is currently known only from five locations. Little is known of population sizes and distribution, although it has so far only been collected from jump-ups. Numbers of individuals have not been recorded. There are no known threats at the present time. It is recommended that this species be listed as DD (data deficient) under the IUCN (2001) red list categories and criteria.

4. Goodenia expansa A.E.Holland and T.P. Boyle, **sp. nov.** affinis *G. arenicola* et *G. geniculatae*, sed ab illa pedicellis et pedunculis brevioribus, racemis et sepalis longioribus et pilis multicellularibus grossis, ab hac corolla enationibus intus praedita, sepalis longioribus, absentia pilorum gossypinorum et ovulis numerosioribus differens. **Typus**: Queensland. GREGORY SOUTH DISTRICT: Cuddapan Station, Birdsville Development Road, about 4 km E of old homestead, 26 Sept 1988, *K.A.Williams* 88038 (holo: BRI).

Goodenia sp. (Cuddapan Station, K.A.Williams 88038)

Annual or short-lived perennial with a thickened root, initially tufted, then developing several to many prostrate leafy racemes to 60 cm, the whole plant spreading to 1 m diam. All parts of the plant hirsute with a mixture of spreading, ascending, curved or flexed white hairs, 0.1–0.8 mm long, the longer hairs multicellular. Leaves mostly basal, narrowing into a petiole 2–4 cm long; lamina narrowly elliptic to oblanceolate, 5–8 cm long, 5–20 mm wide, L:W ratio 4–14:1, apex acute, base tapered, margin dentate, or lobed with spreading acute lobes to 6 mm long, both surfaces hirsute, glabrescent. Inflorescence a leafy raceme to 60 cm long (more than ¾ of mature plant); flowers arising singly in axils of bracts, a few flowers arising basally; bracts smaller than leaves, sessile or nearly so, elliptic to obovate, 2–4 cm long, 5–10 mm wide, acute at both ends, dentate; flower stalk (pedicels and peduncles) geniculate at bracteoles at maturity; peduncles 6–30 mm long; pedicel 6–35 mm long; bracteoles linear, 6–9 mm long. Sepals adnate to ovary nearly to apex, free part subequal, linear, slightly folded, acute, 6–12 mm long, 0.6–1.0 mm wide. Corolla 15–20 mm long, pale yellow or cream; outer surface with a mixture of long and short hairs; inner surface hairy in throat, enations conspicuous; anterior pouch absent or obscure. Abaxial corolla lobes 6–8 mm long, 1.5–2.2 mm wide; wings 4–6 mm long, 1.7–2.6 mm wide; margin entire or irregular. Adaxial corolla lobes free almost to base, 10–14 mm long, 1.5–2.2 mm wide; auricle 3.5–6 mm long, 2.0–2.2 mm wide; wing above auricle 2–3 mm long, 0.7–1.5 mm wide; opposite wing 4–7 mm long, 1–2 mm wide. Stamen filaments 2–3 mm long; anthers 2.0–2.6 mm long. Ovary 5–8 mm long, 5-ribbed (ribs extending into sepals), tapered at base, with coarse spreading hairs on ribs, and soft tangled white hairs between ribs; septum *c.* 2/3 ovary length; ovules 28. Style 6–10 mm long, with scattered short and long hairs; indusium tightly folded, obtriangular, 2–2.5 mm long, *c.* 2 mm wide (folded), with a few scattered short hairs, brown; lips subequal with white bristles 0.1–0.2 mm long; Fruit ellipsoid, slightly curved, 8–13 mm long, 4–6 mm wide, the surface ribbed horizontally (over seeds) and vertically (along sepals) at maturity, dehiscing nearly to base. Seed flat, elliptic, 3–4 mm long, 1.8–2.4 mm wide, with a thick rim, tuberculate, yellow-brown; tubercles 1–3 mm long; wing absent. Fig. 2. D–F.

***Additional specimens examined*: Queensland**. GREGORY SOUTH DISTRICT: 180 km E of Monkira, near Windorah, Sep

1989, *Cowan* 131 & *Bushell* (BRI); 30 km E of Windorah, Oct 1984, *Neldner* 1619 (BRI); Windorah on roadside, Oct 1968, *Williams* 148 (BRI).

***Distribution and habitat*:** Occurs in south-western Queensland in the vicinity of Windorah, on sandplains dominated by *Triodia* species and *Corymbia terminalis*. Map 1.

***Phenology*:** Flowers and fruits in spring, probably after rain.

***Affinities*:** *Goodenia expansa* is very closely related to *G. arenicola* Carolin, sharing with this species, the folded indusium and tapered ovary. *G. expansa* differs from this species in the shorter pedicels and peduncles, longer sepals, long raceme development, hair type and ovule number. *Goodenia arenicola* has a minute, soft indumentum, pedicels and peduncles 30–40 mm long, sepals only 5–6 mm long, and 30–50 ovules. Unfortunately, only one specimen of *G. arenicola* exists (SYD) and the fruit are unknown. Both *G. arenicola* and *G. expansa* are closely related to the southern *G. geniculata* which also has a folded indusium, but G. *geniculata* lacks enations, and has oblong sepals only 4–5 mm long, cottony hairs, and only 14–16 ovules.

***Etymology*:** This species is named for the spreading habit, expanding from the basal tuft to up to 1m in diameter.

***Conservation status*:** *Goodenia expansa* does not occur in any conservation areas and is currently known only from four locations. Little is known of population sizes or area of distribution, although it has only been recorded from sandplains. Numbers of individuals has not been recorded. There are no known threats at the present time. It is recommended that this species be listed as DD (data deficient) under the IUCN (2001) red list categories and criteria.

5. Goodenia rosulata Domin, Biblioth. Bot. 89: 644 (1929). **Type:** Queensland. MITCHELL DISTRICT. Near Jericho, Mar 1910, *K.Domin* 8783; lecto: PR, fide R.C.Carolin, *Telopea* 3: 533 (1990)

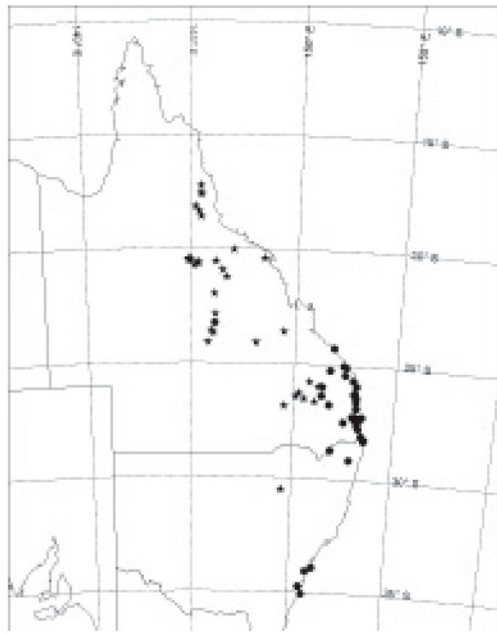
***Illustration*:** Domin loc. cit. p. 665 (Fig. 198).

Erect or ascending annual herb to 40 cm, rosulate. All parts sparsely to densely hirsute to pilose with a mixture of spreading, curved or flexed hairs to 1 mm long, rarely nearly glabrous. Leaves basal, gradually narrowed into a petiole to 5 cm long; lamina obovate to spathulate, 2–9 cm long, 1–3.5 cm wide, L:W ratio 1.5–3.5:1, apex rounded, base tapered, margin dentate or lobed with widely separated teeth/lobes, rarely entire, both surfaces hirsute or pilose, or nearly glabrous. Inflorescence a much branched panicle or thyrse to 25 cm long (approx. 2/3 of the plant), the branches spreading or ascending, often with a zigzag appearance; bracts linear to lanceolate, 4–10 mm long, 1–4 mm wide, acute, glabrous or sparsely hairy; pedicel 4–12 mm long, articulate *c.* 1 mm below ovary; bracteoles similar to bracts, 0.7–2.0 mm long. Sepals adnate to ovary nearly to apex, free part subequal, triangular to ovate, acute, 0.8–2.0 mm long, 0.4–0.8 mm wide, hairy or glabrous. Corolla 7–13 mm long, yellow; outer surface with a mixture of spreading simple hairs and short glandular hairs; inner surface glabrous or with a few hairs, enations absent; anterior pouch indistinct, shorter than the ovary. Abaxial corolla lobes 3–4 mm long, 0.8–1.2 mm wide; wings 2–2.5 mm long, 0.7–1.2 mm wide, entire. Adaxial corolla lobes 5.5–7 mm long, 0.8–1.2 mm wide; auricle indistinct, merged with wing 2.5–6 mm long, 1.0–1.7 mm wide; opposite wing 2–4 mm long, *c.* 1 mm wide, entire. Stamen filaments 2–3 mm long; anthers *c.* 1 mm long. Ovary 1–1.5 mm long, with a mixture of stiff spreading hairs and short glandular hairs, slightly ribbed; septum *c.* 2/3 ovary; ovules many. Style 3–7 mm long, with spreading hairs; indusium square to oblong or somewhat hemispherical, 0.8–1.2 mm long, 1.0–1.5 mm wide, with a few long hairs at base, white or purplish brown; bristles on lips subequal, to 0.1 mm long, tinged purple. Fruit obovoid, 2.8–4.0 mm long, 1.2–2.0 mm wide, dehiscing to base. Seed circular to elliptic, 0.3–0.5 mm long, smooth, pale brown or tan; wing *c.* 1 mm wide.

***Selected specimens*: Queensland.** COOK DISTRICT: Base of Mt Misch near Tolga, Mar 2000, *Ford* 2366 (BRI, QRS). NORTH KENNEDY DISTRICT: 2.7 km along Hollands road, W of Toumoulin, May 2000, *Bean* 16594 (BRI); 8 miles [12.8 km] W of Pentland on Hughenden road, Apr 1974, *Carolin* 8327 (BRI); 15 km W of Princess Hills towards Wairuna,

Apr 1997, *Cumming* 15931 (BRI, NSW); Warrigal on Great Dividing Range, Feb 1931, *Hubbard* 7125 & *Winders* (BRI); *c.* 12 miles [19.2 km] E of Lucy Hut on road leading to Oak Hills, Aug 1967, *Morain* 158 (BRI); 10 km E of Ravenswood, Leichhardt Range, Sep 1991, *Thompson* 466 & *Dillewaard* (BRI); White Mountain National Park near Warang, Mar 2000, *Wannan* 1615 (BRI, NSW). SOUTH KENNEDY DISTRICT: N of junction of Campaspe & Cape Rivers, Apr 1945, *Blake* 15734 & *Webb* (BRI); 8.9 km E of Gum Creek Dam on road to Carmichael-Ulcanbah turnoff, May 1991, *Neldner* 3419 & *Thompson* (AD, BRI). LEICHHARDT DISTRICT: *c.* 6 miles [9.6 km] N of Goowarra, Sep 1959, *Johnson* 937 (BRI); Zamia Range *c.* 3 miles [4.8 km] NNW of Springsure, Mar 1960, *Johnson* 1417 (BRI); 23.5 km E of St Anns homestead (Site 10/6-8), Jun 1992, *Thompson* BUC840 & *Sharpe* (BRI). MITCHELL DISTRICT: 'Yalleroi', 1946, *Clemens* s.n. (BRI); Wololla, SW of Jericho, Feb 1998, *Fensham* 3406 (BRI); 64 km E of Barcaldine, along Capricorn Hwy, Jun 1991, *Halford* Q414 (BRI, MEL, NSW); 9 km NW of Lennox homestead on road to Dunrobin, Mar 1992, *Thompson* GAL24 (BRI); Torrens Creek, Mar 1933, *White* 8709A (BRI). BURNETT DISTRICT: 7 km along Shelleytop Road, NE of Durong, Mar 1999, *Bean* 14712 (BRI, MEL); Brovinia State Forest, S of Mundubbera, Mar 1999, *Bean* 14723 (BRI, MEL); Toondahra, Langtree Creek, Langtree Paddock, Mundubbera Shire, Jan 1984, *Forster* 1712 (BRI). MARANOA DISTRICT: Clayhole Creek, 20 miles [32 km] S of Yuleba, Nov 1958, *Johnson* 653 (BRI). DARLING DOWNS DISTRICT: Nudley State Forest (SF 93), about 20 km NNW of Jandowae, Dec 1997, *Bean* 12666 (BRI, MEL); Moorra, *c.* 20 miles [32 km] ESE of Wandoan, Apr 1959, *Johnson* 767 (BRI); top of Main Range, near Gurulmundi, Nov 1930, *Hubbard* 5078 (BRI); Windarra near Chinchilla, Jul 1979, *Rennick* s.n. (BRI). **New South Wales.** Pilliga Forest between Narrabri and Coonabarabran, Nov 1963, *Pedley* 1608 (BRI).

***Distribution and habitat*:** This species occurs in inland districts, from Tolga in northern Queensland to the Pilliga State Forest in northern NSW, in *Eucalyptus*, *Melaleuca*, *Acacia*, or *Callitris* open woodland, often with *Triodia* species, in sandy soil. It has also been found in artesian springs and seasonally swampy areas. Map 2.



Map 2. Distribution of *Goodenia paniculata*● *and Goodenia rosulata*★.

***Phenology*:** Flowers all year, but most frequently from February to June.

***Discussion*:** *Goodenia rosulata* is distinguished from the related *G. paniculata* Sm., *G. macbarronii* Carolin and *G. lamprosperma* F.Muell., by the obovate to spathulate leaves, less than 4 times as long as wide, usually quite hairy, and often lobed. The mature inflorescence of *G. rosulata* has many short spreading branches, giving it a distinctive zigzag appearance.

Key to the Species of *Goodenia* in Queensland

Key to the Groups

1. Style branched, (2 or 3 indusia) ..... **Group 1**
   Style not branched (one indusium) 2

2. Corolla blue, purple, mauve or red (may be yellowish in throat) ..... **Group 2**
   Corolla yellow, white or green 3

3. Leaves up to 2 mm wide, terete or linear ..... **Group 3**
   Leaves more than 2 mm wide, flat 4

4. Bracteoles absent ..... **Group 4**
   Bracteoles present ..... **Group 5**

Group 1

1. Plant lacking glandular hairs; sepals 3–5 mm long ..... **G. pilosa** (R.Br.) Carolin
   Plant with glandular hairs; sepals 1.5–3 mm long 2

2. Pedicel articulate; fruit 7–13 mm long ..... **G. berardiana** (Gaudich.) Carolin
   Pedicel not articulate; fruit *c.* 3 mm diameter (one record)
   ..... **G. heteroptera** (F.Muell.) B.D.Jackson

Group 2

1. Corolla 1–3 mm long 2
   Corolla more than 3 mm long 3

2. Corolla 1–2 mm long, reddish; fruit 2–3 mm long ..... **G. pumilio** R.Br.
   Corolla 2–3 mm long, bluish-purple; fruit 3–4 mm long ..... **G. minutiflora** F.Muell.

3. Corolla 4–5 mm long (2 records) ..... **G. paludicola** Carolin
   Corolla more than 5 mm long 4

4. Fruit 1–4 mm long; seed 0.4–0.7 mm long; corolla 5–12 mm long 5
   Fruit 7–20 mm long; seed 1.5–4.5 mm long; corolla 11–30 mm long 6

5. Corolla 5–7 mm long; fruit *c.* 1.5 mm long (2 records) ..... **G. viscidula** Carolin
   Corolla 8–12 mm long; fruit 2–4 mm long ..... **G. purpurascens** R.Br.

6. Leaves distinctly petiolate, lamina obtuse to cordate at base ..... **G. grandiflora**
   Leaves sessile or lamina tapered at base into an indistinct petiole 7

7. Bracteoles absent; corolla without enations; indusium notched ..... **G. vilmoriniae** F.Muell.
   Bracteoles present; corolla with enations; indusium not notched 8

8. Leaves glabrous; bracteoles obovate, rounded (one record) ..... **G. azurea** F.Muell.
   Leaves usually hairy; bracteoles linear to lanceolate, acute 9

9. Leaves more than 2 cm wide; pedicel 1–4 mm long ..... **G. ramelii** F.Muell.
   Leaves less than 2 cm wide; pedicel 3–8 mm long .. **G. splendida** A.E.Holland & T.P.Boyle

Group 3

1. Corolla greenish or white; stems cottony hairy 2
   Corolla yellow; stems glabrous or pubescent but without cottony hairs 3

2. Sepals 1–2 mm long; flowers sessile or nearly so; fruit 4–8 mm long ... **G. viridula** Carolin
   Sepals 4–5 mm long; flowers pedicellate; fruit 8–9 mm long ..... **G. disperma** F.Muell.

3. Small shrub with woody stems ..... **G. racemosa** F.Muell.
   Annual or perennial herb, not woody 4

4. Bracteoles absent 5
   Bracteoles present 6

5. Plant viscid or varnished; leaves absent or to 3 (–6) mm long;
   seed 3.5–4 mm diam. ..... **G. armitiana** F.Muell.
   Plant not viscid; leaves mostly 4–10 cm long; seed 4–6 mm diam. . **G. triodiophila** Carolin

6. Sepals 1–1.4 mm long; indusium tightly folded (the sides touching) ..... **G. gracilis** R.Br.
   Sepals 2.5–7 mm long; indusium flat 7

7. Outer surface of corolla stellate hairy ..... **G. stelligera** R.Br.
   Outer surface of corolla glabrous ..... **G. angustifolia** Carolin

Group 4

1. Sepals unequal, one more than twice the length of the others ..... **G. redacta** Carolin
   Sepals all subequal 2

2. Flowers sessile or nearly so; pedicel less than 2 mm long 3
   Flowers distinctly pedicellate; pedicel more than 2 mm long 4

3. Corolla white, 7–10 mm long ..... **G. atriplexifolia** A.E.Holland & T.P.Boyle
   Corolla yellow, 3–4 mm long ..... **G. subauriculata** C.T.White

4. Corolla white; ovary distinctly spurred;
   fruit 12–15 mm long ..... **G. calcarata** (F.Muell.) F.Muell.
   Corolla yellow; ovary spurred or not; fruit 3–10 mm long 5

5. Indusium tightly folded (the sides touching) ..... **G. odonnellii** F.Muell.
   Indusium flat 6

6. Corolla glabrous outside ..... **G. pinnatifida** Schltdl.
   Corolla variously hairy outside 7

7. Pedicel 2–5 mm long; plants glaucous ..... **G. glauca** F.Muell.
   Pedicel more than 5 mm long; plants not glaucous 8

8. Indusium with one lip glabrous ..... **G. lunata** F.M.Black
   Indusium with white bristles on both lips 9

9. Outer surface of corolla and ovary with glandular hairs 10
   Outer surface of corolla and ovary with simple hairs only 11

10. Stems prostrate or ascending, pubescent;
    seed 2–2.5 mm long ..... **G. havilandii** Maiden & Betche
    Stems erect, glabrous; seed 3–4 mm long ..... **G. janamba** Carolin

11. Corolla 4–8 mm long 12
    Corolla 8–25 mm long 14

12. Leaves mostly basal; flowers in subumbels ..... **G. heteromera** F.Muell.
    Leaves mostly cauline; flowers in racemes 13

13. Corolla 4–6 mm long; leaves 0.5–3 mm wide, entire ... **G. debilis** A.E.Holland & T.P.Boyle
    Corolla 6–8 mm long; leaves 1.5–8 mm wide, denticulate ..... **G. armstrongiana** de Vriese

14. Leaves stem clasping (auriculate); seed not winged ..... **G. byrnesii** Carolin
    Leaves tapered at base; seed wing 0.2–1 mm wide 15

15. Indusium hemispherical; fruit 8–13 mm long ..... **G. strangfordii** F.Muell.
    Indusium square or oblong or elliptic; fruit 5–8 mm long 16

16. Sepals 6–8 mm long; fruit with 1–4 seeds ..... **G. megasepala** Carolin
    Sepals 1–5 mm long; fruit with 6 or more seeds 17

17. Ovary spurred ..... **G. cycloptera** R.Br.
    Ovary not spurred 18

18.Stems stoloniferous; flowers in subumbels; seed 1.5–2.5 mm long . **G. heteromera** F.Muell.
Stems erect or prostrate, not stoloniferous; flowers mostly in racemes; seed 3–6 mm long 19

19.Leaves mostly entire; 3 abaxial lobes of corolla 5–10 mm long ..... **G. fascicularis** F.Muell. & Tate
Leaves dentate or lobed; 3 abaxial lobes of corolla 4–5 mm long 20

20.Leaves to 3.5 cm long; sepals 1.5–2.5 mm long; seed 4.5–6 mm long ..... **G. heterochila** F.Muell.
Leaves 3–10 cm long; sepals 3.5–5 mm long; seed 3–4 m long ..... **G. hirsuta** F.Muell.

Group 5

1. Corolla white, cream or greenish 2
Corolla yellow 3

2. Leaves 10–35 mm wide; ovary with a distinct spur ..... **G. calcarata** (F.Muell.) F. Muell.
Leaves 1–5 mm wide; ovary without a spur ..... **G. disperma** F.Muell.

3. Shrubs to 2 m tall 4
Annual or perennial herbs to 80 cm 7

4. Leaves entire; pedicel to 3 mm long; corolla 12–15 mm long ..... **G. racemosa** F.Muell.
Leaves dentate; pedicel more than 3 mm long; corolla 10–30 mm long 5

5. Leaves hairy; outer surface of corolla with glandular hairs ..... **G. grandiflora** Sims
Leaves glabrous; outer surface of corolla glabrous or with simple hairs only 6

6. Plants viscid; leaves distinctly petiolate ..... **G. ovata** Sm.
Plants not viscid; leaves tapered at base ..... **G. stirlingii** F.M.Bailey

7. Outer surface of corolla with stellate hairs ..... **G. stelligera** R.Br.
Outer surface of corolla with simple and/or glandular hairs or glabrous 8

8. Outer surface of corolla glabrous or glandular hairy, simple hairs sometimes also present.. 9
Corolla outer surface with simple hairs only 15

9. Indusium tightly folded (the sides touching) ..... **G. gracilis** R.Br.
Indusium flat or nearly so 10

10.Corolla 14–18 mm long; fruit 10–15 mm long; seed 3.5–4 mm long ..... **G. nigrescens** Carolin
Corolla 7–15 mm long; fruit 2–6 mm long; seed 0.5–1.5 mm long 11

11.Leaves cauline; pedicel not articulate; seed c. 1.5 mm long ..... **G. heterophylla** Sm.
Leaves mostly basal; pedicel articulate; seed 0.3–0.8 mm long 12

12.Abaxial corolla-lobes (3 fan lobes) 1–3 mm long; indusium longer than wide ..... **G. lamprosperma** F.Muell.
Abaxial corolla-lobes (3 fan lobes) 4–7 mm long; indusium square or wider than long 13

13.Leaves obovate to nearly orbicular, often lobed, L:W ratio 1.5–3.5:1 ..... **G. rosulata** Domin
Leaves oblanceolate to linear, never lobed, L:W ratio 5–40:1 14

14. Corolla 7–9 mm long; pedicel 0–3 mm long ..... **G. macbarronii** Carolin
    Corolla 9–15 mm long; pedicel 6–16 mm long ..... **G. paniculata** Sm.

15. Indusium tightly folded (the sides touching) 16
    Indusium flat or nearly so 19

16. Cauline leaves distinctly lobed on one side at base (asymmetric), glabrous ..... **G. glabra** R.Br.
    Cauline leaves ± symmetric at base; glabrous or hairy 17

17. Bracteoles 1–2 mm long; sepals 1–1.5 mm long ..... **G. gracilis** R.Br.
    Bracteoles 5–12 mm long; sepals 5–12 mm long 18

18. Sepals 5–6 mm long (one record) ..... **G. arenicola** Carolin
    Sepals 6–12 mm long ..... **G. expansa** A.E.Holland & T.P.Boyle

19. Pedicel 40–70 mm long; corolla 15–25 mm long ..... **G. strangfordii** F.Muell.
    Pedicel 0–20 mm long; corolla 7–17 mm long 20

20. Pedicel 0–1 mm long; fruit 2–4 mm long ..... **G. bellidifolia** Sm.
    Pedicel usually more than 1 mm long; fruit 3–13 mm long 21

21. Corolla almost glabrous outside; ovary with glandular hairs ..... **G. heterophylla** Sm.
    Corolla hairy outside; ovary lacking glandular hairs 22

22. Leaves 30–40 mm wide; seed circular, c. 3 mm long ..... **G. goodeniacea** (F.Muell.) Carolin
    Leaves 2–30 mm wide; seed elliptic 2–2.5 mm long 23

23. Leaves linear to narrowly elliptic; sepals 2–2.5 mm long ..... **G. delicata** Carolin
    Leaves orbicular to ovate to narrowly oblong; sepals 3–7.5 mm long 24

24. Bracteoles inserted 0–2 mm below ovary ..... **G. rotundifolia** R.Br.
    Bracteoles inserted at least 5 mm below ovary ..... **G. hederacea** Sm.

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