

## ***Sida picklesiana* (Malvaceae), a new species from the Murchison-Gascoyne region of Western Australia**

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### **Abstract**

Markey, A.S., Dillon, S.J., Cockerton, G.T.B. & Barker, R.M. *Sida picklesiana* (Malvaceae), a new species from the Murchison-Gascoyne region of Western Australia. *Nuytsia* 21(3): 127–137 (2011). This article provides a description of the recently discovered species *Sida picklesiana* A.S.Markey, S.J.Dillon & R.M.Barker. This species is known from an area near Wiluna in Western Australia's Murchison-Gascoyne region, where it occurs in a variety of habitats. *Sida picklesiana* has conservation priority status as it has a relatively limited distribution. Major differences between *S. picklesiana* and the species with which it is most likely to be confused are discussed, and the most recently published draft key to *Sida* is amended to include this new species.

### **Introduction**

The genus *Sida* L. (Malvaceae) is a common and diverse component of the flora of central Australia. It is also a taxonomically problematic group, and nearly half of the 62 taxa recognized in Western Australia are currently undescribed (Western Australian Herbarium 1998–). Barker (2007) produced a draft key to Western Australian species of *Sida s. lat.* as part of an ongoing revision of the genus. *Sida picklesiana* was unknown at that time, and is described here as a new species from the Murchison and Gascoyne regions of Western Australia.

Recent vegetation surveys of Banded Iron Formation (BIF) ranges in the Midwest region of Western Australia by the Department of Environment and Conservation (DEC) have found a number of previously unknown species (Gibson *et al.* 2007, Wege *et al.* 2007). One such survey near the township of Wiluna located a population of an unusual *Sida*, and specimens were found to have a combination of characters that did not match any taxon represented in the collections of the Western Australian Herbarium (Markey & Dillon 2009). The floral and vegetative characters were distinctive enough to immediately recognise this as a new entity, and later to assign it the interim phrase name of *Sida* sp. Wiluna (A. Markey & S. Dillon 4126). Unknown to these authors at that time, several populations of a distinctive *Sida* had also been located by G. Cockerton near Mt Keith (c. 40 to 65 km south of the Wiluna populations). Examination of fertile material determined that these populations were southern variants of *Sida* sp. Wiluna (A. Markey & S. Dillon 4126).

Formal recognition of *Sida picklesiana* A.S.Markey, S.J.Dillon & R.M.Barker was delayed by a lack of fruiting collections in these initial surveys, as both the schizocarp and fruiting calyx provide diagnostic features in *Sida* (Barker 2007). Recent surveys located both mature fruits and several new populations, allowing for both this entity to be formally described and an amendment to the key for Western Australian *Sida* s. lat. (Barker 2007) to be given in this paper.

### Methods

This study was based on an examination of specimens of *Sida* species lodged at the Western Australian Herbarium (PERTH) and the State Herbarium of South Australia (AD). Close comparisons were made of material from species that were similar in appearance, notably from *Sida* sp. dark green fruits (S. van Leeuwen 2260), *S. ectogama* W.R.Barker & R.M.Barker, *S. petrophila* F.Muell., *S. calyxhymenia* DC. and *S. sp.* Petermann Ranges (B.G. Thomson 2340). Informal phrase names cited in this paper are listed on the census of Western Australian plants database of the Western Australian Herbarium (1998–).

Observations and measurements of fruit and vegetative characters were made from dried and wet (70% ethanol) herbarium specimens. Dried flowers were rehydrated for observations, measurements and sectioning. Descriptive terminology follows Barker (2007). Herbarium notes on habit and habitat were supplemented by field observations. A distribution map was generated from herbarium records (PERTH) using DIVA–GIS freeware version 5.0 ([http://www.diva\\_gis.org/](http://www.diva_gis.org/)).

### Taxonomy

***Sida picklesiana*** A.S.Markey, S.J.Dillon & R.M.Barker, *sp. nov.*

Foliis discoloris et plantis dioeciis *S. ectogamae* W.R.Barker & R.M.Barker similis, praecipue differt floribus parvioribus subsessilibus, calycis lobis non-acrescentibus, marginibus foliorum integris (non-crenulatis), et columna stamineali glabra.

*Typus*: south-west of Wiluna, Western Australia [precise locality withheld for conservation reasons], 12 April 2010, R. Davis & M. Henson RD 11470, with female flowers and fruit (*holo*: PERTH 08215626; *iso*: AD); 12 April 2010, R. Davis & M. Henson RD 11471b, with male flowers and fruit (*topo*: AD, PERTH 07984022).

*Sida* sp. Wiluna (A. Markey & S. Dillon 4126), Western Australian Herbarium, in *FloraBase*, <http://florabase.dec.wa.gov.au/> [accessed January 2011].

Woody perennial shrub, 0.4–1.0(–1.5) m high and 0.8–1.0(–1.2) m wide, compact, rounded, densely branched, twiggy; root morphology and regenerative capacity from rootstock unknown. *Branches* divaricate, more densely so when browsed, densely pubescent when young, glabrescent and becoming weathered, scurfy and grey with age; branchlets sometimes clustered in dense fascicles, rounded; leaf abscission scars present; bark smooth, minutely fissured with age. *Indumentum* in all parts of sessile to shortly stipitate, eglandular, stellate, colourless or white to golden-yellow hairs. *Leaves* alternate, distinctly discoloured, petiolate; petiole 1–3(–4) mm; lamina ovate or oblong to narrowly ovate-oblong or depressed obovate, (5–)10–20(–40) × (3–)4–8(–11) mm, usually 4–9 times petiole length,

sometimes folded such that upper two halves of the blade are appressed to each other; base rounded; margin entire or occasionally with 1–2 pairs of serrations; apex truncate or emarginate, often with midrib extended by *c.* 0.5 mm; adaxial surface dark olive green, often aging to brown-red, with dense indumentum of colourless, sessile stellate hairs 0.1–0.2(–0.3) mm in diameter, the rays appressed to slightly ascending; abaxial surface and leaf margins pale golden-yellow or pale green with indumentum of very dense, white to golden-yellow, sessile to shortly stipitate stellate hairs 0.3–0.5(–0.6) mm in diameter, the rays ascending to erect; venation reticulate, obscured above, raised below. *Stipules* in pairs at petiole base, usually only present on younger growth but scars visible on older growth, linear to subulate-linear, 0.5–3.6(–4.0) mm long, the indumentum as on petiole and lamina but apex glabrescent. *Flowers* subsessile, axillary, solitary or paired in leaf axils of newer growth, unisexual on generally dioecious plants (occasional fruits from female flowers observed on male plants). *Buds* ellipsoid to subglobose, faintly 5 grooved at apex, erect. *Pedicels* 0.4–3.0(–3.6) mm long in flower, 0.8–3.0 mm long in fruit, with dense, sessile, white to golden stellate hairs, basally articulate. *Calyx* (3–)4–5 mm long, synsepalous with five lobes, lobed to middle third, broadly cupular in open flower, persistent in fruit, non-acrescent, without longitudinal striations, abaxial surface stellate-hairy, adaxial surface of tube glabrous, of lobes with puberulous hairs, loosely enclosing base of schizocarp; lobes broadly triangular with acute to acuminate apex, 1.3–2.7 mm long, 1.2–2.3 mm wide at base. *Corolla* yellow, glabrous, just exceeding calyx; (4.0–)5.0–8.0 mm in diameter; claw 0.2–0.5 mm long, ciliate; lobes spatulate, obtuse–emarginate apically, 1.8–3.5(–4.5) mm long, 1.7–3.0 mm wide at widest part, non-ciliate. *Stamens* 20(–23) per flower; filaments connate into a tube around the styles for much of their length; free parts arranged regularly at apex, all equal, 0.8–1.1 mm long in male flowers, 0.1–0.2 mm long in female flowers; staminal column 1.5–2.3 mm long in male flowers, 1.1–1.2 mm long in female flowers, glabrous; anthers in male flowers all fertile, scarcely exerted from the corolla, 0.5–0.8 mm long, reniform, versatile, longitudinally dehiscent by single top suture; pollen yellow; sterile anthers in female flowers much smaller, 0.3–0.4 mm long. *Styles* 5(6), in female flowers 2.2–2.8 mm long, exerted 1.0–1.5 mm beyond staminal column and stamens and just exerted from flower; stigma discoid; styles in male flowers rudimentary and remaining enclosed within the base of the staminal column, 0.4–0.9 mm long and 1/3–1/2 length of staminal column. *Ovary* 0.5–1.0 mm high, 1.0–1.2 mm wide, ovules 5(6), appearing fully developed in male flowers. *Schizocarp* 3.2–4.7 mm diameter, 3.0–4.0 mm high, regular or rarely irregular due to unequal development of mericarps, depressed-ovoid–transversely ellipsoid, raised at centre, green when immature, light brown at maturity, shallowly grooved between mericarps; *mericarps* 5(6), 3.0–3.6 mm high, 1.5–2.2 mm wide, all regular, trigonous, indehiscent, grooved at apex, separating at maturity from each other and columella; dorsal (exposed) surface unornamented, smooth or slightly rugose, with a dense indumentum of minute, short, sessile, stellate hairs; lateral walls (internal faces) prominently reticulate; columella, pedicel and calyx persistent on plant after shedding of mericarps, eventually separating from the branch with age. *Seed* one per mericarp, 2.2 mm long, 1.5 × 1.5 mm wide, trigonous with obtuse outer surface, light brown; surface smooth, villous, with an indumentum of simple, eglandular hairs. (Figures 1–3)

*Selected specimens examined.* WESTERNAUSTRALIA: [localities withheld for conservation reasons] 14 Oct. 2010, *G. Cockerton & C. Jowett s.n.* (PERTH); 4 Nov. 2010, *G. Cockerton, D. Brassington & S. Colwill* LCH 29854 (PERTH); 12 Apr. 2010, *R. Davis & M. Henson* RD 11465 (PERTH); 12 Apr. 2010, *R. Davis & M. Henson* RD 11467 (PERTH); 12 Apr. 2010, *R. Davis & M. Henson* RD 11470 (PERTH); 13 Apr. 2010, *R. Davis & M. Henson* RD 11469 (PERTH); 14 Apr. 2010, *R. Davis & M. Henson* RD 11471a (PERTH); 14 Apr. 2010, *R. Davis & M. Henson* RD 11471b (PERTH); 4 Aug. 2010, *R. Davis & M. Henson* RD 11480 (PERTH); 4 Aug. 2010, *R. Davis & M. Henson* RD 11476 (PERTH); 27 Aug. 2006, *D.J. Edinger* 5375 (PERTH); 20 Aug. 2006, *A. Markey & S. Dillon* 4126 (AD, PERTH); 20 Aug. 2006, *A. Markey & S. Dillon* 4306 (PERTH); 21 Aug. 2006, *A. Markey & S. Dillon* 4305 (PERTH); 21 Aug. 2006, *A. Markey & S. Dillon* 4127 (AD, PERTH); 8 Dec. 1995, *A.A. Mitchell* 4149 (PERTH).

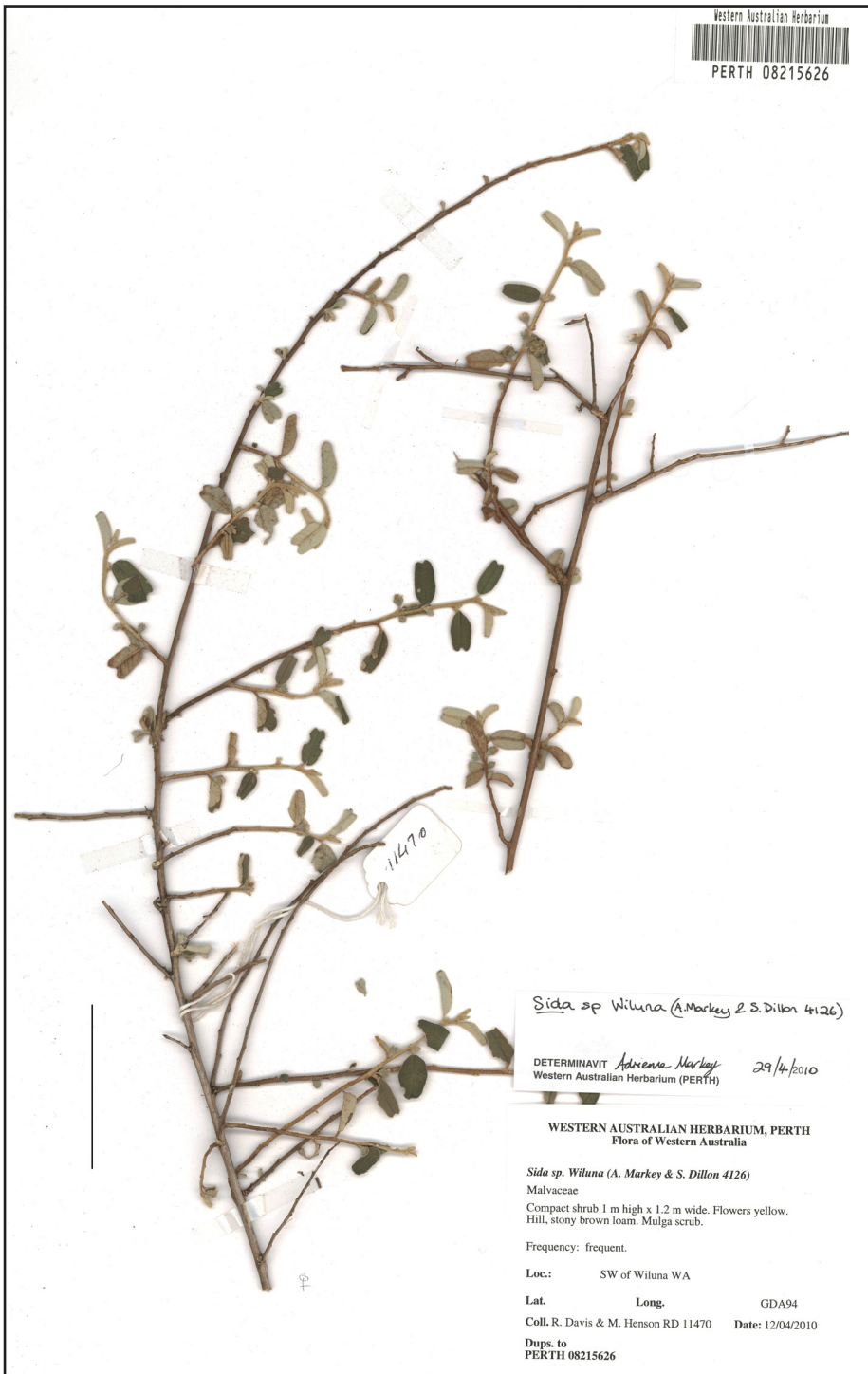


Figure 1. Holotype of *Sida picklesiana* (R. Davis & M. Hensen 11470), with precise locality obfuscated. Scale bar = 5 cm.

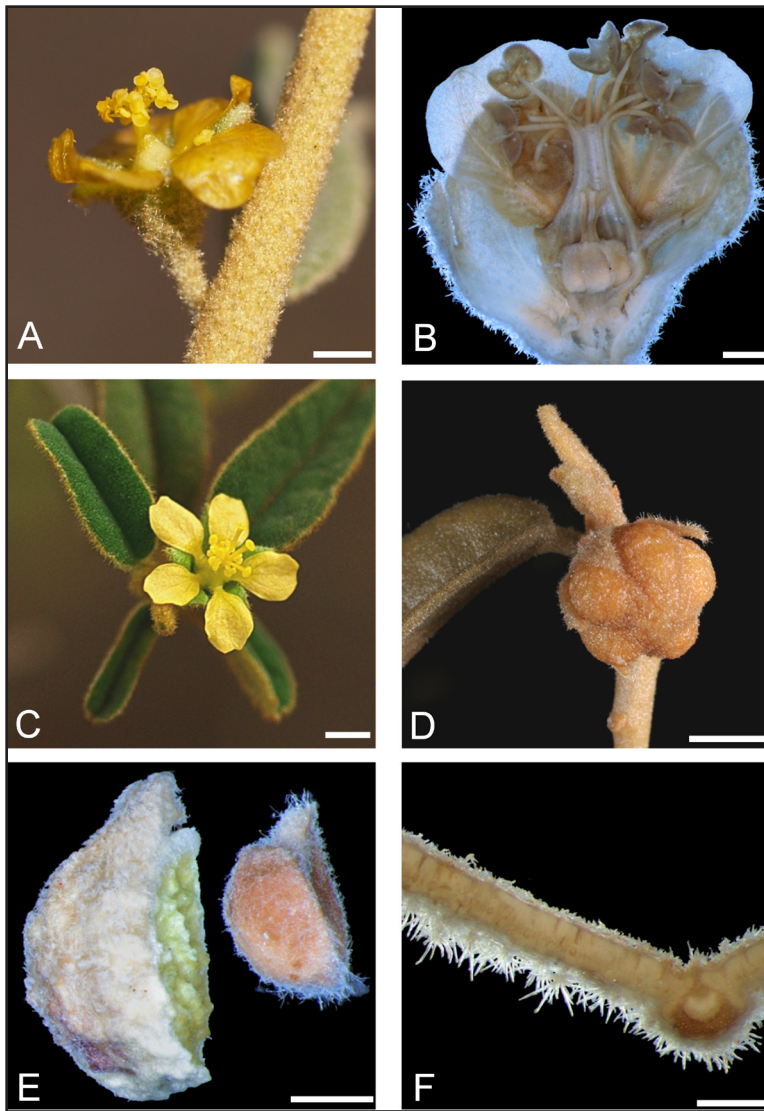


Figure 2. *Sida picklesiana*. A – male flower (scale = 2.0 mm); B – rehydrated male flower sectioned to show the ovary and degenerate style (scale = 0.5 mm) (*R. Davis & M. Henson* RD 11471b); C – female flower (scale = 2.0 mm); D – fruit preserved in ethanol (scale = 2.4 mm) (*R. Davis & M. Henson* RD 11469); E – mericarp and seed (scale = 1.0 mm) (*R. Davis & M. Henson* RD 11469); F – transverse section of rehydrated leaf (scale = 1.0 mm) (*R. Davis & M. Henson* RD 11471b). Images: A – S. Dillon at Herbert Lukin Ridge; B, E, F – A. Markey; C – R. Davis at Doolgunna Station; D – K. Thiele.

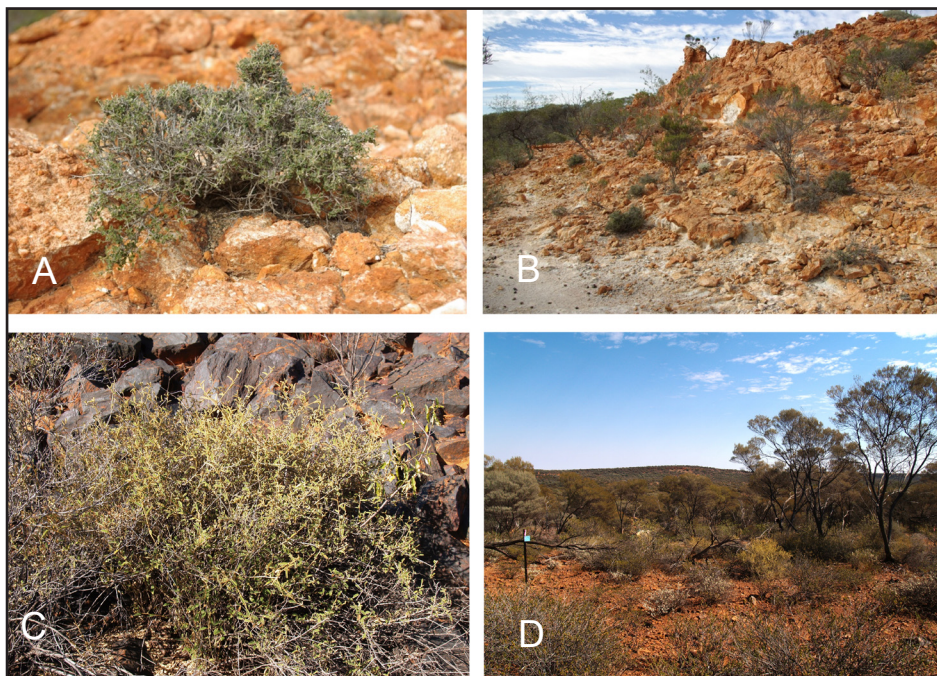


Figure 3. *Sida picklesiana*. A – example of growth habit of plants at a population near Mt Keith; B – typical habitat occupied by populations near Mt Keith; C – typical growth habit of plants at Herbert Lukin Ridge (A. Markey & S. Dillon 4126); D – an example of the habitat occupied at Herbert Lukin Ridge. Heavy browsing by macropods at sites near Mt Keith has produced shorter ( $\leq 0.5$  m, densely divaricate shrubs (A, B) relative to unbrowsed shrubs along the Herbert Lukin Ridge (C, D). Photographs by G. Cockerton (A, B) and S. Dillon (C, D).

**Distribution.** *Sida picklesiana* is found in the Murchison and Gascoyne IBRA regions (Department of the Environment and Water Resources 2008), in an area near the townships of Wiluna, Meekatharra and Leinster (Figure 4). Most records come from locations near Wiluna, Mt Keith and Doolgunna Station. It appears to have a limited distribution, as surveys of BIF ranges in the surrounding Murchison region (Gibson *et al.* 2007; Markey & Dillon 2010; Meissner *et al.* 2009a, 2009b) and nearby calcretes (R. Meissner<sup>1</sup>, pers. comm.) have failed to locate it in the wider region.

**Ecology.** *Sida picklesiana* has been recorded from open *Acacia* (*A. aneura*, *A. quadrimarginea*, *A. pruinocarpa*, *A. balsamea*) woodlands and shrublands on a variety of substrates, often on exposed, rocky habitats on hills of BIF and granite breakways, on footslopes of BIF hills, on stony plains (ironstone and quartz) and near creeklines. Soil types include deeper sandy clays on plains and hardpan and shallow or skeletal sandy clay loams overlying rock. Plants have been observed growing in rock crevices when on outcrops. This species appears to tolerate grazing, although plants become densely divaricate and stunted if this occurs.

**Phenology.** Fruiting material has been collected in April, flowering material has been collected in April, August and September, and flowering recorded in February (F. Sugg<sup>2</sup>, pers. comm.). Flowering and fruiting appears to be rainfall-dependent as surveys during prolonged dry periods have not located reproductive material.

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<sup>2</sup>Feigh Sugg, Project Environmental Scientist, Keith Lindbeck and Associates, Bullcreek, Western Australia.

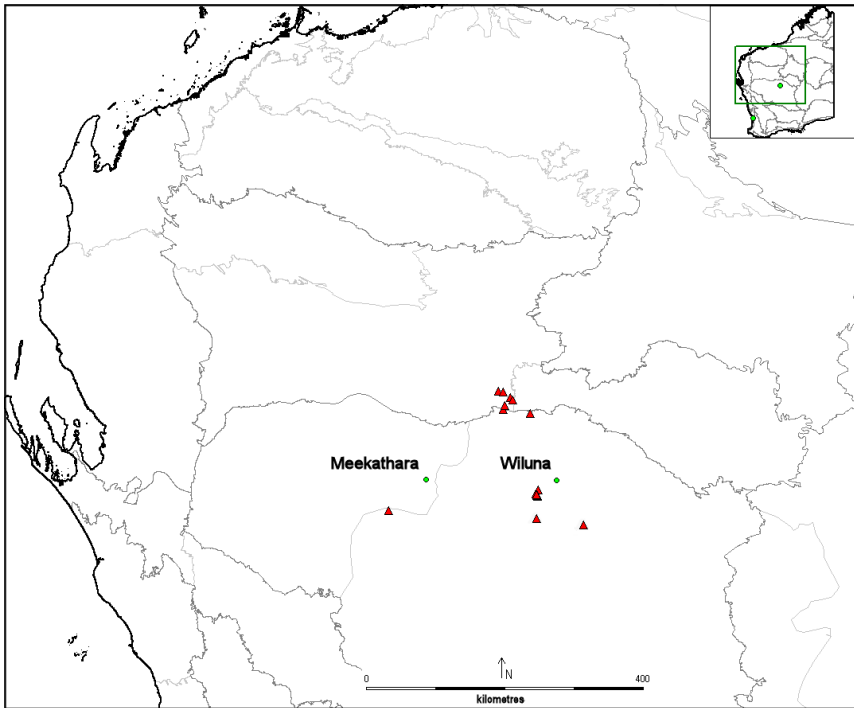


Figure 4: Distribution of *Sida picklesiana* in Western Australia (inset) and relative to nearest major townships, based on specimen data from the Western Australian Herbarium. *Version 6.1 IBRA regions* (Department of the Environment, Water, Heritage and the Arts 2008) indicated in grey.

*Gender expression.* From both field observations (this study, R. Davis<sup>3</sup>, pers. comm.) and an examination of all available herbarium specimens, all have been found to have unisexual flowers and populations have been found to be usually dioecious. On a single collection (R. Davis & M. Henson RD 11471b), fruits that had developed from female flowers were found on a plant with male flowers. This suggests that male flowers on this plant may have been preceded by female flowers. Further field investigations are required to document the expression of floral gender in this species and determine how frequently it is monoecious.

*Conservation status.* Recently listed as Priority Three under the DEC Conservation Codes for Western Australian Flora, under the phrase name *Sida* sp. Wiluna (A. Markey & S. Dillon 4126).

*Etymology.* Named in honour of David Pickles, a Department of Environment and Conservation Environmental Officer based in Kalgoorlie, who has been an advocate for this species and steadfastly pushed for further inquiry on its distribution, taxonomy and conservation status.

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## Generic placement

*Sida picklesiana* belongs within *Sida s. lat.*, along with other Australian species in an unresolved collection of species which lack the characters that define *Sida* section *Sida*, namely the calyx ten-ribbed at the base and a shoulder separating an upper dehiscent and lower indehiscent portion of the fruit (Barker 1998, 2007; Fryxell 1987). The generic limitations of *Sida* and the tribe Malveae are currently under investigation (Fryxell 1985, 1987; Holland & Reynolds 1988; Barker 1998, 2007; Fuertes *et al.* (2003). *Sida sens. lat.* may be split into separate genera in the future as a result of these investigations

## Distinguishing features

*Sida picklesiana* is characterised by the combination of a densely branched, rounded habit with small, sessile flowers and fruits and distinctly discoloured leaves. Unlike those of most other *Sida* species in the region, the pedicels do not appear to lengthen appreciably in fruit. Relative to the abaxial leaf surface and leaf margins, the adaxial leaf surface is less hairy, with stellate hairs with shorter, appressed rays (Figure 2F). Leaves are truncate or emarginate, ovate or oblong to narrowly ovate-oblong or depressed obovate and entire. Laminas tend to become folded on herbarium specimens, but leaves are held partially or fully open in the field unless plants are drought-stressed.

Most *Sida* species have bisexual flowers, but in a few species these have become functionally unisexual with either the styles or anthers failing to develop fully (Barker 2007). The small flowers of *S. picklesiana* are functionally unisexual, and plants are usually dioecious. Female flowers have fertile styles growing up through and protruding beyond the staminal column while the anthers are much reduced in size, borne on short filaments and do not produce pollen (Figure 2A–C). The calyx does not expand nor become chartaceous during development of the schizocarp (Figure 2D), and the mericarps are small and unornamented. Male flowers have fertile anthers on longer filaments on the apex of the staminal column and no style arms emerging from the top of the staminal column (styles are greatly reduced in size and undeveloped). In one case, fruits have been observed on a plant with otherwise male flowers (*R. Davis & M. Henson* RD 11471b), and the remnant floral parts attached to the fruit had staminodes present, verifying that it had been produced from a female rather than a bisexual flower. Male flowers have apparently well-developed ovules within an ovary of comparable size to that in female flowers. The fertility of these ovules is unknown, but the undeveloped styles would prevent self pollination in male flowers.

## Variation within the new species

Leaves in the Mt Keith population are in the lower range of lengths recorded for this species (6–12 mm) and can be very small ( $\leq 5$  mm long), and the shrubs are distinctly more divaricately branched than northern populations (Figure 3). Otherwise leaf morphological characters such as indumentum and shape match those of other populations of *S. picklesiana*. These Mt Keith populations occur on Archaean granite breakaways, and grazing pressure from local populations of euro (*Macropus robustus erubescens*) and/or black-footed rock-wallaby (*Petrogale lateralis*) is evident (Figure 3). Despite this, fruit and floral characters match those of other populations of *S. picklesiana*, and leaf size alone is insufficient evidence to segregate this as a distinct taxon. Populations from Mt Keith were found to be more likely to develop irregular fruits due to lack of fertilization of some of the ovules. Irregular



development of fruits is a feature commonly associated with unisexual flowers (e.g. in *S. ectogama*, Barker 2007), but was not observed in northern populations of *S. picklesiana*. The fertilization of all mericarps suggests relatively good pollen transfer occurred within northern populations during the 2010 fruiting season.

### Affinities

*Sida picklesiana* has clear affinities to *Sida* sp. Petermann Ranges (B.G. Thomson 2340), which is an informally named species from arid regions of Western Australia and the Northern Territory (Barker 2007) and which is currently being described by R.M. Barker and W. R. Barker (State Herbarium of South Australia, Department of Environment and Natural Resources). Both species possess small, mostly unisexual flowers and schizocarps of similar morphology. *Sida* sp. Petermann Ranges (B.G. Thomson 2340) is a variable species, and specimens from the Petermann Ranges have distinctly ovate, concolorous leaves, a glabrous staminal column, up to 5 flowers per axil, a calyx exceeding the fruit, distinct pedicels (2–8 mm in length) and are low, spreading woody shrubs (Barker 2007). Collections from the Pilbara (*K. Newbey* 10692, *S. van Leeuwen* 4377, *A.A. Mitchell* PRP1058) have markedly discoloured leaves reminiscent of *S. picklesiana*, but have longer pedicels (5–20 mm), a more lax, spindly habit and a sparse indumentum of stellate hairs on the staminal column.

### Distinction of *Sida picklesiana* from similar species

The distribution of *Sida picklesiana* falls within that of other superficially similar species that are widespread through the Midwest region of Western Australia. It could be most easily confused with *S. ectogama*, *S. calyxhymenia* and *S. petrophila*, as all taxa have obovate to elliptic leaves, 5–7(8) mericarps, and a shrubby habit. These three species differ from *S. picklesiana* by their obviously pedicellate rather than sessile flowers and calyx lobes which considerably exceed the fruit. The leaves of these three species have crenulate-serrulate margins, whereas leaf margins are entire in *S. picklesiana*. The leaf apices of *S. picklesiana* are more distinctly truncate and/or emarginate than in *S. ectogama*, *S. calyxhymenia* and *S. petrophila*. *Sida calyxhymenia* and *S. petrophila* can be distinguished from *S. picklesiana* by their bisexual flowers, concolorous leaves and an indumentum flecked with dark green stellate hairs (particularly on the calyx). *Sida ectogama* has unisexual flowers and discoloured leaves like *S. picklesiana*, but differs by its larger flowers (10–15 mm), notably ciliate and emarginate corolla lobes, a very short staminal column in male flowers, and distinctly elongate and exerted styles and stamens (Barker 2007). *Sida* sp. dark green fruit (*S. van Leeuwen* 2260) is a low, often sprawling and spreading shrub with narrowly oblong, discoloured leaves. It can easily be distinguished from *S. picklesiana* by its larger leaves, long-pedicellate (5–20 mm) rather than sessile flowers and fruits, bisexual rather than unisexual flowers and 7–8(–10) rather than 5(6) styles and mericarps.

The *Sida* species key by Barker (2007) should be altered to read (from couplets 39 and 60):

39. Calyx inflated in fruit; flowers unisexual and stamens and styles well exerted from corolla; fruits with mericarps often developing unequally and remaining attached to each other for dispersal [spindly shrubs always growing under other vegetation; predominantly found in Murchison] ..... ***S. ectogama***

- 39:** Calyx not inflated in fruit; flowers mostly bisexual but if unisexual stamens and styles just exerted from corolla; fruits with mericarps developing equally and detaching from each other for dispersal ..... **39A**
- 39A:** Flowers unisexual ..... **39B**
- 39A:** Flowers bisexual ..... **40**
- 39B:** Flowers pedicellate, in terminal leafless panicles. Tall spindly shrubs [watersheds of the Pilbara, Gascoyne and Great Sandy Desert; there are at least two taxa]..... **S. sp. spiciform panicles (E.Leyland s.n. 14/8/90) p.p.**
- 39B:** Flowers subsessile, solitary in axils. Compact, densely branched shrubs [on exposed, rocky habitats, stony plains and near creeklines in the Cue, Wiluna, Meekatharra area] ..... **S. picklesiana**
- 60.** Flowers cymose or racemose [fruits smooth or somewhat corrugated, 3.5–6.5 mm diameter, deeply grooved between mericarps; mericarps 7 or 8,  $\pm$  entire at apex; widespread and variable across Australia, undoubtedly containing a number of entities] ..... **S. fibulifera**
- 60:** Flowers solitary or paired..... **61**
- 61.** Herbs, often prostrate, sprawling, not markedly woody; flowers bisexual; calyx enclosing fruit base and sides, not exceeding it ..... **62**
- 61:** Spreading woody shrub; flowers unisexual; calyx exceeding the fruit; corolla similar length to calyx; flowers usually unisexual ..... **63**
- 62.** Stipules lanceolate, 0.3–1.4 mm wide, buds 5–angled; leaves deeply crenate [some specimens from Cape Range and Dirk Hartog Island have been referred here in the past, but is likely that true *S. corrugata* does not occur in Western Australia] ..... **S. corrugata**
- 62:** Stipules filiform, to 0.2 mm wide; buds not 5–angled; leaves crenulate [Kimberley] ..... **S. brachypoda p.p.**
- 63.** Flowers distinctly pedicellate, pedicels 2–20 mm long, staminal column either with or lacking stellate hairs, sprawling subshrub to 20 cm high and up to 100 cm wide [Petermann Ranges only but with some outliers in the Pilbara showing a tendency to this species] ..... **S. sp. Petermann Ranges (B.G. Thompson 2340) p.p.**
- 63:** Flowers subsessile, pedicels < 5 mm long, staminal column glabrous, densely branched rounded shrub to a metre or more high and wide [Gascoyne and Murchison regions]..... **S. picklesiana**

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