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Redefinition of *Tephrosia supina* (Fabaceae: Millettieae), a north-west Western Australian endemic, and description of two similar species

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Abstract

Butcher, R. & Cowie, I.D. Redefinition of *Tephrosia supina* (Fabaceae: Millettieae), a north-west Western Australian endemic, and description of two similar species. *Nuytsia* 32: 67–83 (2021). The application of the name *Tephrosia supina* Domin is clarified herein, with this species determined as being a north-west Western Australian endemic subshrub with pink-purple flowers; *T. supina s. str.* is differentiated from two similar taxa, which also occur in the Northern Territory and Queensland. These are described herein as *T. insolens* R.Butcher & Cowie and *T. lithosperma* R.Butcher & Cowie, and *T. supina* is lectotypified. Full descriptions and images are provided for these three species and their histories and affinities are discussed.

Introduction

The taxonomic concept of *Tephrosia supina* Domin has long been confused, with a wide variety of forms included under that name across northern and central Australia. Informal segregation of herbarium specimens into putative taxa, Australia-wide, had identified several pink/purple-flowered and orange-flowered entities given the name *T. supina*; however, it had not been confidently applied to any of these forms. The taxonomic uncertainty surrounding this name is evident throughout the literature where the flowers of *T. supina* are variously described as pink/purple (Jessop & Toelken 1986), as orange (Maconochie 1981; Wheeler 1992; Paczkowska & Chapman 2000; Harden 2002), or as both (Hacker 1990); the original description (Domin 1926) does not provide any flower colour information.

Type material of *T. supina* has now been viewed on loan from the Herbarium of the Royal Botanic Gardens, Kew (K), and as a scanned specimen from Domin's herbarium at Prague (PR), and the name is confidently applied to a pink/purple-flowered taxon occurring in north-west Western Australia. Two similar, pink/purple-flowered segregate taxa, namely *T.* sp. Willowra (G.M. Chippendale 4809) and *T.* sp. Magazine Hill (P. Jones 365) [*syn. T.* sp. O.T. Station (S.T. Blake 17659); CHAH 2016], have been confirmed as distinct from *T. supina s. str.*, and they are formally described herein as *T. insolens* R.Butcher & Cowie and *T. lithosperma* R.Butcher & Cowie respectively. These three taxa are similar in their spreading subshrub habit; small, pink-purple flowers; an indumentum of white to golden, spreading hairs on stems, leaves, inflorescences and calyces; persistent stipules and inflorescence bracts; variably reddish primary, secondary, intersecondary and tertiary venation (where visible);

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and laterally compressed pods with gently upturned apices. The orange-flowered entities previously included under *T. supina* do not match any named taxa in Australia and are in the process of being formally described.

Both new species described herein are widespread across the Northern Territory and Queensland, but only relatively recently known from Western Australia and only from a few collections. A specimen of *T. lithosperma* was collected from the Hamersley Range in 1997 as *T. stipuligera* W.Fitzg. and redetermined as *T.* sp. Magazine Hill in 2014; it remains the only specimen from Western Australia to date and represents a large western disjunction for the species. A specimen of *T. insolens* was collected from south-west of the Jimblebar mine site (E of Newman) as *T. supina* in 2013 and redetermined as *T.* sp. Willowra in 2015; later in the same year it was collected from near Lake Mackay (Great Sandy Desert), with two additional Western Australian collections from that area made in 2016.

Following on from Cowie (2004), this paper is the seventh in an ongoing series (Butcher 2012, 2018a, 2018b, 2020, 2021; Butcher & Hurter 2012) that aims to resolve the taxonomy of *Tephrosia* in northern Western Australia and the Northern Territory, and to describe new species.

Materials and methods

All *Tephrosia* specimens housed at PERTH were critically studied, as were the collections housed at AD, BRI, CANB, DNA, MEL, NSW and NT, and on loan from K. Types of all Australian species have been viewed on loan or as images through *Global Plants* (https://plants.jstor.org) and courtesy of PR. Field work in the Carnarvon, Murchison and Pilbara bioregions was undertaken in 2011 and allowed for *in situ* examination of plants. Bioregions referred to in the text and displayed on distribution maps follow *Interim Biogeographic Regionalisation for Australia* (IBRA) v. 7 (Department of the Environment 2013). Abbreviations in taxon distribution statements for each jurisdiction indicate bioregions for Western Australia and the Northern Territory (Department of the Environment 2013) and botanical districts (= pastoral districts) for Queensland (Henderson 1974). To assist in the curation of herbarium collections, and to provide cross-references for grey literature reports, synonymy statements include informal names *in sched.* and the Herbaria at which these have been seen, with abbreviations following Thiers (continuously updated).

Leaf venation terminology follows Ellis *et al.* (2009). The inflorescence is interpreted as a pseudoraceme following Tucker (1987, 2003), where the elongate rachis has fascicles of flowers in the axils of first-order bracts (here termed 'inflorescence bracts'), each flower subtended by a second-order bract (here termed 'floral bract'); paired bracteoles on the pedicel can be present or absent in the genus. Fascicles comprise one or more 3-flowered units, with the first two flowers opening in relatively close succession and the third flower in each unit often delayed developmentally, with anthesis commonly occurring once the first two flowers have developed into fruits. Seed length is measured from the hilar side (point of attachment) to the opposite side, with width measured at 90° to this; terminology surrounding the hilum and rim aril follows Butcher (2020) and references therein.

Taxonomy

Tephrosia supina Domin, *Biblioth. Bot.* 89: 201 (1926). *Type*: 'N.W. Australia. Between the Ashburton and De Gray [Grey] rivers. [*s. dat.*] *Dr E. Clement*' (*lecto*, here designated: K 000217142!; *isolecto*: PR 527277, image seen).

Tephrosia sp. Pilbara (A.L. Payne PRP 1393), Western Australian Herbarium, in *FloraBase*, https://florabase.dpaw.wa.gov.au/ [accessed 27 January 2021].

T. minor Pedley ms, L. Pedley *in sched.* (e.g. PERTH 02925133; PERTH 02925168 [as *T. ?minor*]).

T. sp. aff. *clelandii* sp. nov. Pedley ms, L. Pedley *in sched.* (e.g. PERTH 03080293, PERTH 02923270); '*T.* aff. *clelandii* (after Pedley)' *p.p.*, M.E. Trudgen *in sched*. (e.g. PERTH 01228080, PERTH 02942674).

Low, weakly domed *subshrub*, semi-prostrate to erect, few-stemmed, perennial, 0.15–1 m tall, 0.4–0.6 m wide; rootstock a slender taproot. *Branchlets*, *leaf and inflorescence rachides* indumentum moderately dense to dense, the hairs declined to spreading, hyaline-white through stramineous to yellow-brown, 0.8–1.6 mm long. *Leaves* pinnate, up to 120 mm long including petiole; *stipules* persistent, antrorse to inclined, patent to reflexed with age, attenuate to narrowly deltoid, 1.7–10 mm long, red-brown drying yellow-brown, 1- or 3-nerved, hairy; *petiole* 6.1–20 mm long; *ultrajugal rachis* 0.4–9 mm long; *stipellae* absent; *petiolules* 1–1.5 mm long; *leaflets* 5–11, narrowly elliptic to obovate, flat to slightly keeled in T.S., at least some in the proximal part of the leaf, base cuneate, apex rounded, truncate or retuse, straight, shortly mucronate, mucro 0.3–1.4 mm long; *lateral leaflets* 7.2–33 mm long, 3–13 mm wide, length 1.5–3.5 × width; *terminal leaflet* 1–1.3 × the length of adjacent laterals, 7.6–37 mm long, 3.1–17.5 mm wide, length 1.8–3.3 × width; lamina slightly discolorous, the upper surface lighter than lower; secondary veins in 6–15(–18) pairs, eucamptodromous, brochidodromous at apex of leaflet, the intersecondary veins parallel at base becoming reticulate towards margin; upper surface indumentum moderately dense, occasionally sparse, the hairs soft, ascending to patent, hyaline-white to stramineous; lower surface with raised veins, indumentum moderately dense to dense, rarely sparse, the hairs soft, ascending to patent, hyaline-white to stramineous. *Inflorescence* pseudoracemose, leaf opposed in terminal position, 70–320 mm long, fascicles well-spaced, 3- or 6-flowered; *inflorescence bracts* persistent or falling late, antrorse, patent and apically reflexed with age, lanceolate, acuminate, 2.6–7 mm long; *floral bracts* caducous or falling late, antrorse, subulate to attenuate, acute, 0.8–3.5 mm long; *pedicels* 0.9–4.3 mm long; *bracteoles* absent. *Calyx* 2.1–5.3 mm long, indumentum moderately dense to dense, the hairs ascending to patent, stramineous to yellow-brown; tube 1.2–2.5 mm long, 0.6–1.4 × the length of lateral lobes; lobes deltoid to attenuate; vexillary lobes united higher than lower three, free for 0.45–1.5 mm; lowest lobe 1–3.6 mm long, ±equal to lateral lobes or a little longer. *Corolla* pink to purple, with a yellow-green eye at throat, 6–8.5 mm long; *standard* (4.5–)5.7–7.2 mm long, 6.9–9.4 mm wide, the claw 1–2.3 mm long, the blade broadly ovate to suborbicular, callused at base with a retuse to broadly emarginate apex; *wings* (4.5–)5.5–8 mm long (incl. 1.1–3 mm long claw), 2.7–4.1 mm wide, longer than keel, the blade elliptic to broadly obovate with upper and lower edges ±parallel at base, apex broadly rounded; *keel* 4.6–6.2 mm long (incl. 1.1–2.6 mm long claw), 2.5–3.1 mm wide, usually glabrous but rarely with a few hairs at apex, the blade semicircular. *Staminal tube* 4.1–5 mm long, usually hairy near fenestrae, which are prominently callused on margins towards the apex; vexillary filament usually straight in lower half and callused near base, usually patently hairy on and in front of calluses; anthers narrowly ovate, 0.4–0.5 mm long, 0.3–0.4 mm wide. *Ovary* densely hairy; ovules 5–8. *Style* flattened, gently tapering, glabrous; stigma villous, linear. *Pod* linear, gently upturned [just] at apex, laterally compressed, 24–40 mm long, 2.7–4.6 mm wide, white tissue absent between seeds, tan to yellow-brown, indumentum moderately dense, the hairs patent, stramineous to yellow-brown; beak in line with upper suture, straight to upcurved. *Seeds* 4–8 per pod, 4–5 mm between centres of adjacent seeds, transversely ellipsoid-reniform to pulvinate, laterally compressed, 1.6–2.8 mm long, 2.4–4.2 mm wide; testa smooth, finely mottled cream-tan and brown with black flecks and streaks and an orange area surrounding hilum; hilum excentric or nearly central; caruncle a minute, cream, rim aril 0.1–0.2 mm long. (Figures 1, 5A)

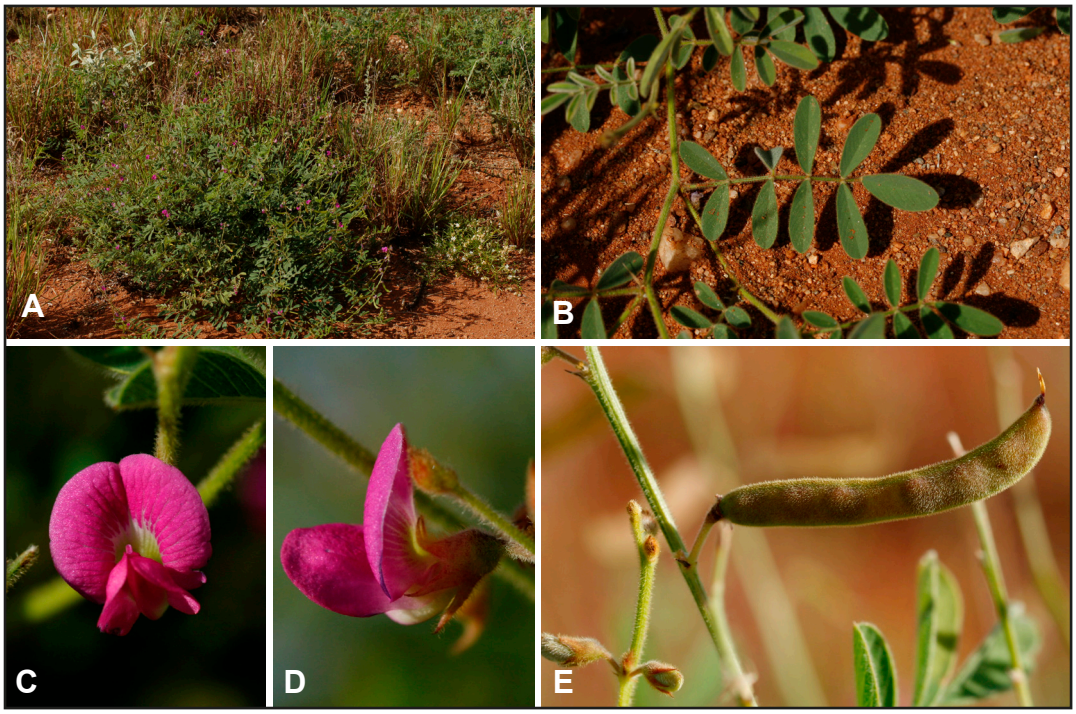

Figure 1. *Tephrosia supina*. A – plant *in situ*; B – 9-foliolate leaves with short petioles and the terminal leaflet not greatly enlarged; C – flower from front; D – flower from side showing calyx lobes *c.* equal to the tube; E – pod. Photographs by R. Butcher from *R. Butcher & S. Dillon* RB 1537 (A, B) & 1486 (C–E).

Diagnostic features. Low subshrub, usually with an indumentum of spreading, usually golden hairs; pinnate leaves with antrorse to divergent stipules, becoming patent to reflexed with age, and 5–11, elliptic to obovate leaflets 7.2–37 mm long, with the terminal leaflet equal to or slightly larger than the laterals (1–1.3 × length); small (6–8.5 mm long) pink to purple flowers with the calyx tube a little shorter than to longer than the deltoid to attenuate lateral lobes, held in pseudoracemes (70–320 mm long) with persistent, antrorse inflorescence bracts; the staminal tube usually hairy near fenestrae, which have prominently callused margins, and filament usually hairy near the base on and around calluses; pods linear, gently upturned just at apex, 24–40 mm long, 2.7–4.6 mm wide, laterally compressed, not strongly depressed between seeds (with patent, stramineous indumentum); transversely ellipsoid-reniform seeds with a mottled, smooth testa (and ±central to slightly excentric hilum).

Selected specimens examined. WESTERN AUSTRALIA: 4.2 km S of Rubin junction, E of Goldsworthy and *c.* 140 km E of Port Hedland, 22 Apr. 2006, *A.R. Bean* 25041 (BRI, DNA, PERTH); 20.3 km from HS between Diorite and Bill Bore, Nyang Stn, 29 May 2004, *G. Byrne* 1013 (PERTH); small granite range on N side of North West Coastal Hwy, *c.* 56 SW of Nanutarra Roadhouse, 20 May 2011, *R. Butcher & S. Dillon* RB 1486 (BRI, DNA, MEL [2 sheets], NSW, PERTH); 60.1 km S of North West Coastal Hwy on Towera Rd, W side of road, 31 May 2011, *R. Butcher & S. Dillon* RB 1537 (K, MO, PERTH, UWC); E Burrup Peninsula, adjacent to NE part of Withnell Bay, Trudgen and Ass. (2002) plot 185, 27 May 2009, *R. Butcher, K.A. Shepherd, J.A. Wege, S. van Leeuwen & V. Long* RB 1393 (DNA, PERTH); ExSB 101, Towera Stn, 4 Aug. 1981, *R.J. Cranfield* 1744 (PERTH [2 sheets]); repeater tower on gas pipeline, 2 km SW of Mt Stuart Rd, 15 km W of Cane River Stn, 80 km SE of Onslow, 25 May 1999, *D.J. Edinger* 1588 (CANB, PERTH); Telfer, *s. dat.*, *E.M. Goble-Garratt* 95 (NT, PERTH); Harding River crossing, 23 km N (by road) along pipeline service track from Snappy Gum Drive, Millstream, *D. Halford* Q 9275 (BRI, DNA, MEL, PERTH); Rudall River region, June

1987, *R.P. Hart* 589 (PERTH); Glenflorrie Stn, Upper Gascoyne, 9 May 1971, *J.N. Hutchinson* 123 (PERTH); site: DRW09, N side of Fortescue River Mouth access track, 6.5 km W of North West Coastal Hwy, 16.1 km NW of Mt Virchow, 67.5 km SW of Dampier, Mardie Stn, 10 Aug, 2005, *S. van Leeuwen et al.* PBS 0285 (DNA, PERTH [2 sheets], UEC); site: MBE07, 500 m S of Chocolate Hill, 7.4 km SSE of The Island Hill, 44.5 km SW of Marble Bar, Panorama Stn, 30 Apr. 2006, *S. van Leeuwen et al.* PBS 0286 (AD, PERTH [2 sheets]); site: OYE04, N side of road, 170 m off road, 3.4 km E of Pannawonica–Cape Lambert railway crossing on Pannawonica–Millstream Rd, 20.3 km NNW of Mt Elvire, 40.9 km ESE of Pannawonica, Yalleen Stn, 30 Aug. 2006, *S. van Leeuwen et al.* PBS 0288 (PERTH); site: PW13, E side of road, 7.2 km N of Python Pool creek crossing on Roebourne–Munjina Rd, 6.6 km ENE of Mt Herbert, 61.7 km SSE of Roebourne, Millstream-Chichester N.P., 17 Aug. 2004, *S. van Leeuwen et al.* PBS 0291 (BRI, PERTH); Anketell Ridge, Great Sandy Desert, 14 May 1979, *A.S. Mitchell* 1208 (DNA, PERTH); 298 km N of Meekatharra on road to Mt Augustus, S of The Pink Hills, 12 Aug. 2002, *S.J. Patrick* 4241 (CANB, PERTH); *c.* 15 km E of Bonney Downs HS, I271, 27 July 1996, *A.L. Payne* PRP 1393 (PERTH); site number: 1087. 8.7 km WSW of Mt Herbert, Millstream-Chichester N.P., Hamersley Ra., 18 Sep. 1997, *M.E. Trudgen* MET 17758 (PERTH); 6.2 km along track to Carawine Gorge, Fortescue District, 4 Sep. 1991, *P.G. Wilson & R. Rowe* PGW 911 (BRI, NSW, PERTH).

Phenology. Flowering is in response to rain; in the Pilbara rain is usually associated with the cyclone season. Most flowering specimens collected from March to September (peaking May to August) with pods present from April to September, and mature seed collected mostly in August and September.

Distribution. Western Australia (CAR, GAS, GSD, LSD, PIL): *T. supina* appears to be endemic to north-west Western Australia, with collections made in the area roughly bounded by Mt Sandiman Station–Mt Augustus in the south-west, Giralia Station (S of Exmouth Gulf) to the west, north-eastward to Anna Plains Station (S of Broome) near the coast and inland to Rudall River (Figure 2). The species has also been recorded from West Lewis Island, Barrow Island and Hermite Island, off the Pilbara coast.

Habitat. *Tephrosia supina* occurs in flat to undulating areas usually associated with watercourses, drainage lines and lower slopes of ridges and hills. Substrate is brown to red-brown sandy loam to red clay, frequently gravelly and often with a cracking surface. Bedrock usually comprises granites. Grows in open tall shrubland dominated by *Acacia* species (e.g. *A. ancistrocarpa*, *A. citrinoviridis*, *A. inaequilatera*, *A. kempeana*, *A. pyrifolia* or open to very open low woodland (including *A. coriacea*, *Corymbia hamersleyana*, *Eucalyptus victrix*, *Terminalia canescens*), over low shrubs, grasses, sedges and herbs, or in *Triodia* hummock grassland.

Conservation status. Widespread across north-west Western Australia and not at risk. Occurs in several conservation reserves and national parks.

Etymology. From the Latin *supinus* (bent backwards, prostrate), possibly in reference to its low and spreading habit, the deflexed hairs on its stems or to the orientation of its lower lateral leaflets.

Typification. *Tephrosia supina* is lectotypified here to remove any confusion arising from the citation of three specimens, representing three different species, in Domin's (1926) protologue. Although Domin clearly noted that one of the specimens ('N.W. Australia. Between the Ashburton and De Gray [Grey] rivers, *Dr. E. Clement* [*s.n.*]') was the basis for the species' description ('planta descripta'), he also noted that the other two ('R. Brown, Iter Australiense, 1802–05, Island Z [Inglis Island, Northern Territory], *R. Brown* Bennett No. 4102 als *Galega* No. 15' and 'R. Brown, Iter Australiense, 1802–05,

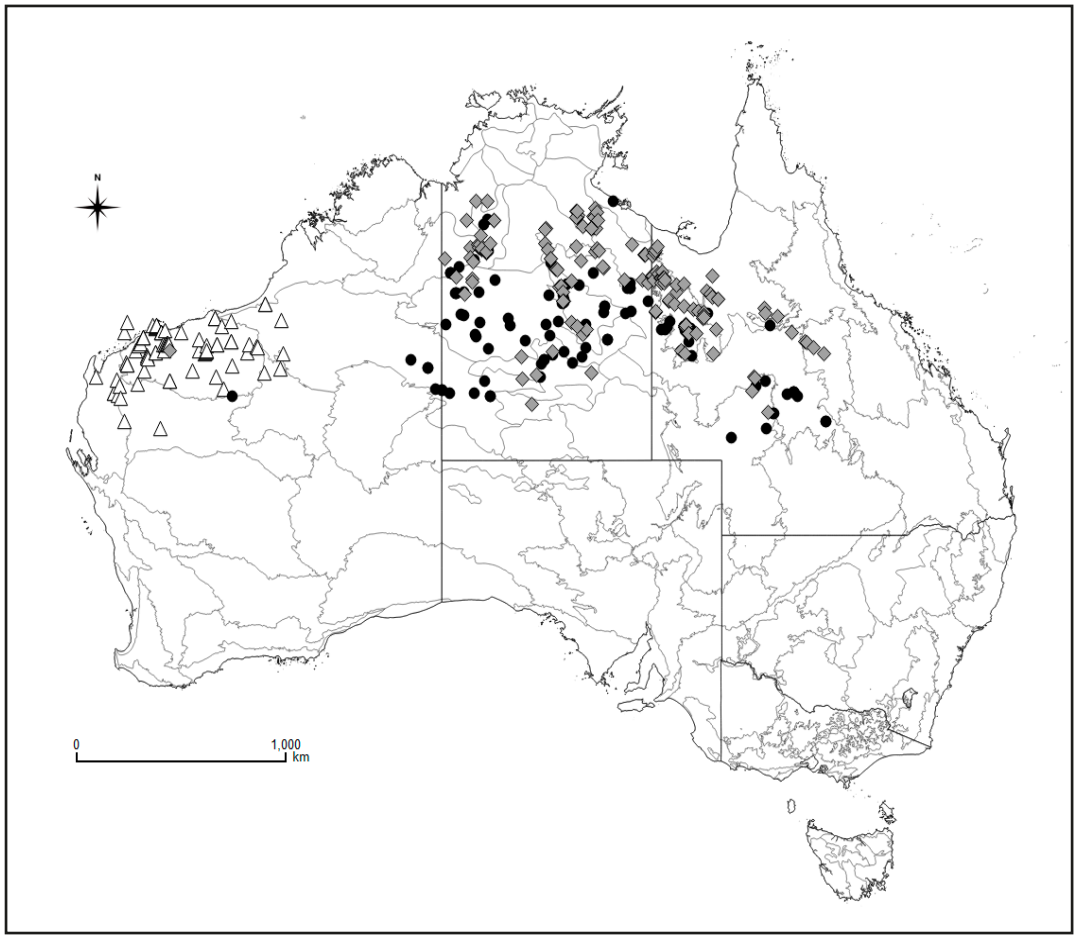

Figure 2. Distribution of *Tephrosia supina* (△), *T. insolens* (●) and *T. lithosperma* (◆) in northern Australia. Both *T. insolens* and *T. lithosperma* have outlying collections from the Pilbara bioregion, Western Australia, within the range of *T. supina*.

North Coast, *R. Brown* Bennett No. 4100 als *Galega supina* R.Br. [name not published]') exhibited different forms of the species as described by him (Domin 1926: 201); we do not agree with Domin's observation. Brown's specimen from 'Island Z' (No. 4102) is superficially similar to Clement's but can be assigned to *T. pumila* (Lamk.) Pers., while his specimen from the 'North Coast' (No. 4100) is *T. remotiflora* Benth. and is cited as a syntype under that name by Bentham (1864: 209).

All three specimens are held at K, with a duplicate of the Clement specimen in Domin's herbarium at PR and duplicates of both Brown specimens at E (seen via *GlobalPlants*). It is probable that Domin saw both Clement specimens while preparing the description of *T. supina*, with the PR sheet having the same Clement label as the K specimen as well as a typed Domin 'Iter Australiense a. 1909–1910' label with the identification '*Tephrosia supina* DOM.n.sp.', and with 'Queensland' struck out and replaced with 'N.W. Austr.: inter flumina Ashburton et De Gray River /planta descripta/'. If this label was not produced by Domin himself it would have been produced by an assistant under Domin's supervision (O. Šída, pers. comm.). While it is known that Domin prepared his descriptions of Australian species for the *Beitrage* while at K, it is not known whether he saw both Clement specimens there, nor when that material arrived at PR and by what route (O. Šída, pers. comm.). As such, *T. supina* is lectotypified on the K sheet of Clement's collection, with the PR sheet designated as an isolectotype.

Affinities and notes. *Tephrosia supina* is morphologically most similar to the two new species described herein. Of the two, *T. insolens* is most similar to *T. supina* in the size and shape of its pods, its seed morphology, and its larger, flatter, elliptic to obovate leaflets, but can be readily distinguished by the following characters: leaves usually with 3 or 5 leaflets; the terminal leaflet distinctly larger (1.3–2.5 ×) than the adjacent laterals in *T. insolens* (vs 1–1.3 × in *T. supina*); the pseudoracemes much shorter; the calyx lobes long, slender and *c.* 1.5–3 × longer than the tube (vs 0.6–1.4 × tube length); the staminal tube and upper filament glabrous (vs usually hairy); the pods with longer, finer hairs and the valve faces with more pronounced indentation between the seeds.

Tephrosia lithosperma can be readily distinguished from *T. supina* by the following characters: finer stems and inflorescence rachides; paler indumentum; longer, more slender, distinctly spreading to recurved stipules; generally smaller leaflets with a more prominent mucro; the lower leaflet surface with darker red veins that are distinctly thickened and raised; smaller flowers (corolla 3.7–5.5 mm vs 6–8.5 mm long); the calyx lobes *c.* 2–3 × longer than the tube; narrower pods with a more strongly upturned apex and a (generally) longer beak (often with style ±persistent); laterally compressed, finely rugose seeds that are uniformly red-brown or flecked with dark brown or black (vs testa smooth, finely mottled cream-tan, brown and black).

Some PERTH specimens from north of the Kennedy Range with very small leaflets (*R.J. Cranfield* 1744, 2 sheets; *R.J. Cranfield* 1753; *A.A. Mitchell* 1208; *D. Wilcox* 44) were determined as '*T. minor* sp. nov.' by L. Pedley in December 1984. Leaf and leaflet size are very variable in *T. supina*, however, and many collections display a range of leaflet sizes on a single plant. Specimen re-collections by RB in 2011 from the same area as Pedley's '*T. minor*' located only plants with larger leaflets suggesting that different climatic conditions between years can influence leaflet size.

A handful of PERTH specimens (*T.E.H. Aplin* 4669; *B. Bignold s.n.* PERTH 03080293; *A.S. George* 3401; *E.C.B. Langfield* 274, 2 sheets; *R.D. Royce* 7364; *D. Rust* 9) were identified as '*Tephrosia* sp. aff. *T. clelandii* sp. nov. from Central Australia' by L. Pedley in December 1984. Of these, two (*B. Bignold s.n.*, Roebourne; *R.D. Royce* 7364, West Lewis Island in the Dampier Archipelago) are slightly hairier specimens of *T. supina s. str.*, two (*D. Rust* 9; *T.E.H. Aplin* 4669; both from station country in the Kimberley) are specimens of *T.* sp. Northern (K.F. Kenneally 11950), and one (*A.S. George* 3401, E of Whim Creek) is a specimen of *T.* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356). The last specimen (*E.C.B. Langfield* 274, Burt Range, E of Kununurra on the Western Australia/Northern Territory border) is densely hairy throughout and differentiated from others in the *T. supina* group by its pods, which have a centrally positioned beak and appressed indumentum; it remains unidentified.

Unfortunately, the name '*T.* aff. *clelandii*' has been taken up by some Western Australian botanists and broadly applied within the PERTH collection, with most of these determinations applied '(after Pedley)' to specimens of *T. supina s. str*. Some recent lodgements at PERTH from the Onslow–Pannawonica area of the Pilbara have also been determined as '*T.* aff. *clelandii*' but these have a closer affinity to *T. remotiflora* than to any taxon previously included under *T. supina*. As '*T. clelandii*' is an unpublished name with a confused taxonomy[1] and without any diagnostic information (see Paczkowska & Chapman 2000: 449), it is strongly recommended that this name, and its derivative '*T.* aff. *clelandii*', should not be used in Western Australia.

[1]Herbarium visits to BRI identified that *T. 'clelandii'* is also known as *T. 'latzii'* there, with these equated to the name *T.* sp. Balcanoona Creek (K. Alcock AQ 457802), a.k.a. *T.* sp. Q 11, recorded as occurring in the Northern Territory, Queensland and South Australia. Two sheets of the voucher specimen for *T.* sp. Balcanoona Creek have been viewed and found to be the same taxon as *T.* sp. Granite (P.K. Latz 12116), a central Australian affiliate of *T. brachyodon* Domin; these informal names have now been reconciled in the APC under *T.* sp. Granite (P.K. Latz 12116).

Because it was widely thought that *T. supina* was an orange-flowered taxon, specimens at PERTH now attributed to *T. supina s. str.* had been segregated and placed under the phrase name *T.* sp. Pilbara (A.L. Payne PRP 1393); that is now an informal synonym.

Tephrosia insolens R.Butcher & Cowie, *sp. nov.*

Type: 16 km south-south-east Sangsters Bore, Tanami Desert, Northern Territory, 12 July 1993, *P.K. Latz* 13250 (*holo*: DNA A0089629!; *iso*: CANB 485365.1!, NSW 582578!, NT A0089629!).

Tephrosia sp. Willowra (G.M. Chippendale 4809), Cowie [Northern Territory Herbarium], in Albrecht, D.E., Dugiuid, A.W., Coulson, H., Harris, M.G. & Latz, P.K. (2007), *Vasc. Pl. Checkl. for the S. Bioreg. of the N. Territory: Nomencl., Distrib. and Cons. Stat.* 2nd Edn: 127; Short, P.S., Albrecht, D.E., Cowie, I.D., Lewis, D.L.& Stuckey, B.M. (ed.) (2011), *Checkl. of the Vasc. Pl. of the N. Territory*: 36.

*Tephrosia '*A4089 Willowra', in Dunlop, C.R., Leach, G.J., Latz, P.K., Barritt, M.J., Cowie, I.D. & Albrecht, D.E. (1995), *Checkl. of the Vasc. Pl. of the N. Territory, Austral.*: 54; Albrecht, D.E., Dugiuid, A.W., Latz, P.K., Coulson, H. & Barritt, M.J. (1997), *Vasc. Pl. Checkl. for the S. Bioreg. of the N. Territory: Nomencl., Distrib. and Cons. Stat.*: 112.

Tephrosia 'quinqefolia', *in sched.* [BRI].

Prostrate, spreading or rounded woody *herb* or erect *dwarf shrub*, multi-stemmed, annual or perennial (based on specimen labels), to 0.6 m tall, to 2 m wide; rootstock a long, semi-woody taproot. *Branchlets*, *leaf and inflorescence rachides* slender, with moderately dense to dense, often very fine, patent to slightly ascending indumentum of usually white, occasionally stramineous hairs, 0.4–1.2 mm long. *Leaves* pinnate, up to 66 mm long including petiole; *stipules* persistent, antrorse at first, diverging to patent with age, then eventually recurved, very narrow, attenuate, 2.7–8 mm long, green with red veins through red-brown to yellow-brown with age, 1- or 3-nerved depending on width, hairy; *petiole* 5–18 mm long; *ultrajugal rachis* 1.8–8 mm long; *stipellae* absent; *petiolules* 0.9–1.8 mm long; *leaflets* 3–5(–7), broadly oblong, elliptic, or narrowly obovate to obovate, usually flat in T.S., all positioned in the distal half of the leaf when 3-foliolate, some in the proximal half when 5(–7)-foliolate, base cuneate to slightly rounded, apex rounded to emarginate, straight but minute mucro (0.5–0.7 mm long) often reflexed; *lateral leaflets* 6–23 mm long, 3.5–10 mm wide, length 1.8–3.3 × width; *terminal leaflet* noticeably larger (1.3–2.5 × the length of adjacent laterals) on most leaves, 11.5–35 mm long, 5.7–17 mm wide, length 2.7–4.3 × width; lamina discolorous, the upper surface olive green, the lower surface dark olive green; secondary veins brochidodromous, in 6–13 pairs, intersecondary veins parallel at base, then reticulating; upper surface with sparse to moderately dense, inclined, straight, white hairs, these soft to quite rigid, hyaline; lower surface with raised veins, these fine, cream to pink-red to deep red, indumentum denser and longer than on upper surface, hairs inclined to patent, straight, white, soft to quite rigid, hyaline. *Inflorescence* pseudoracemose, leaf-opposed, usually with a cluster of axillary flowers at base, 10–100 mm long, with usually 3 flowers developing sequentially at each node, more in axillary clusters; *inflorescence bracts* persistent, antrorse, attenuate, reddish, 2.6–5.3 mm long; *floral bracts* falling late, antrorse, attenuate, 1–2.3 mm long; *pedicel* 1.5–6 mm long; *bracteoles* usually absent (1 flower seen with bracteoles 0.4 mm long at junction of pedicel and calyx tube). *Calyx* 5–7.5 mm long, moderately hairy with patent, white to pale stramineous, hyaline hairs; tube 2.3–2.6 mm long, 0.35–0.75 × the length of lateral lobes; lobes lanceolate at base then filiform; vexillary lobes united slightly higher than the lower three, free for 3–3.5 mm (divided to 70–91% length); lowest lobe 3.6–5 mm long, *c.* equal in length to lateral lobes. *Corolla* pink to scarlet or mauve to purple, 5.5–7 mm

long; *standard* 4.5–6 mm long, 5–7 mm wide, with a broad 1.7–2.1 mm long claw, the blade broadly ovate to suborbicular, slightly and linearly callused at base, with a rounded to slightly emarginate apex; *wings* 5.5–6.7 mm long (incl. 2–2.4 mm long claw), 1.9–2.6 mm wide, longer than keel, the blade ±oblong to broadly obovate with a small pouch in front of spur, the apex rounded, slightly oblique; *keel* 5.2–5.9 mm long (incl. 2.1–2.5 mm long claw), 2.4–3 mm wide, the blade ±semi-circular, gently incurved along upper edge and pouched in front of spur, glabrous. *Staminal* tube 4–4.7 mm long, glabrous, margins of fenestrae inrolled, not significantly thickened and not callused, or slightly thickened with small, rounded calluses at apex; vexillary filament slightly geniculate at base, not or slightly callused, glabrous; anthers narrowly ovate to oblong, 0.4–0.45 mm long, 0.3–0.4 mm wide. *Ovary* densely hairy with inclined, straight hairs, frequently thick-walled; ovules 6–8. *Style* flattened, almost uniform to tapering to *c.* 1/2 width, glabrous; stigma with moderately short flexible hairs at base, linear. *Pods* linear, slightly upturned at apex to curved along length, laterally compressed, the sides indented between seeds at maturity, 30–41 mm long, 3–4.5 mm wide, length 8.2–11.9 × width, tissue absent between seeds, pale yellow to tan at maturity, with a moderately dense, somewhat tangled indumentum of ascending, soft and thin, or patent and more coarse, white to pale stramineous hairs; beak in line with the upper suture, straight to gently uncinate. *Seeds* (3–)5–8 per pod, 4–5.5 mm between centres of adjacent seeds, transversely obloid to narrowly ellipsoid, 2.1–2.8 mm long, 2.6–3.3 mm wide, testa smooth to broadly dimpled, finely mottled orange-light brown and brown with flecks of cream or pinkish light brown and black; hilum ±central to slightly excentric with a minute, annular rim aril (with tongue), this transparent-cream, 0.07–0.1 mm long. (Figures 3, 5B)

Diagnostic features. Low, spreading, woody herb or subshrub with an indumentum of ±patent pale hairs; pinnate leaves with persistent, recurved, red-brown stipules and 3–5(–7), broadly oblong to obovate leaflets 6–35 mm long, with the terminal leaflet usually noticeably larger than adjacent laterals (1.3–2.5 × longer); small (5.5–7 mm long), pink to purple flowers with the calyx tube *c.* 1/3–3/4 the length of the slender lateral lobes, held in short pseudoracemes (to 100 mm long) with persistent, antrorse inflorescence bracts; the staminal tube and vexillary filament glabrous; pods linear, straight with the apex upturned or curved along length, 30–41 mm long, 3–4.5 mm wide, laterally compressed at maturity and depressed between seeds, usually with a slightly tangled indumentum of fine white hairs; transversely obloid to ellipsoid seeds that are not laterally compressed and have a finely mottled, and smooth to broadly dimpled testa, and a ±central to slightly excentric hilum.

Selected specimens examined. WESTERN AUSTRALIA: Kiwirrkurra Indigenous Protected Area; *c.* 1.1 km S of Gary Junction Rd, *c.* 31.7 km due WNW of the NT/WA border on Gary Junction Rd, 4 June 2016, *D.E. Albrecht* 14641 (CANB); 106 km ESE of Kiwirrkurra, 20 June 2016, *A. Schubert* 834 (NT); SW Jimblebar, 40 km E of Newman, 3 Sep. 2013, *R. Tomanovic* SWJ 36.11 (PERTH); 5 km NW of Bibarrd, 31 July 2016, *P. Trickett* DD 1153 (PERTH). NORTHERN TERRITORY: 63 km WSW of Wycliffe Well, 1 Mar. 2009, *D.E. Albrecht & P.K. Latz* 12844 (DNA, NT); 69 mi NW of Willowra HS, 31 July 1958, *G.M. Chippendale* 4809 (AD, CANB, DNA, NSW); sand sheet near Wilson Creek flood out, North Tanami Desert, 30 Apr. 2004, *B. Crase & A. Duguid* 1337 (DNA, MO); Tennant Creek, Peko Rd, 29 Mar. 1994, *J.L. Egan* 3436 (DNA); 40 km W of Sup[p]lejack HS, 30 Sep. 1978, *T.S. Henshall* 2320 (BRI [2 sheets], DNA, NT); Annitowa Stn, 9 May 1977, *P.K. Latz* 7008 (BRI, CANB, K, NT, PERTH); 1 km E of WA border on Kintore Rd. Plot 1181, 27 Apr. 1988, *G. Leach & M.B. Leach* 1954 (BRI, DNA, NT); Mt Putardi area, 5 Apr. 1972, *J.R. Maconochie* 1366 (BRI, CANB, DNA, K, NT); Barkly Tablelands, Mittabah Stn, 13 July 2001, *C.P. Mangion* 1505 *& J.A. Risler* (DNA, LD, MO, NT); NW Wakaya Desert, 10 May 1993, *D.J. Parsons* 534 (CANB, DNA, NT); Humbert River Stn, S fenceline of Cow Speyed Paddock, 25 Apr. 2003, *J.A. Risler & D.L. Lewis* 3073 (DNA, NT). QUEENSLAND: 42.7 km along Silsoe Rd, W of Longreach, 15 May 2004, *A.R. Bean* 22211 (BRI, NSW); May Downs Stn, *c.* 88 km NW of Mount Isa, 27 May 2010, *R. Booth* NWH2-6 *&*

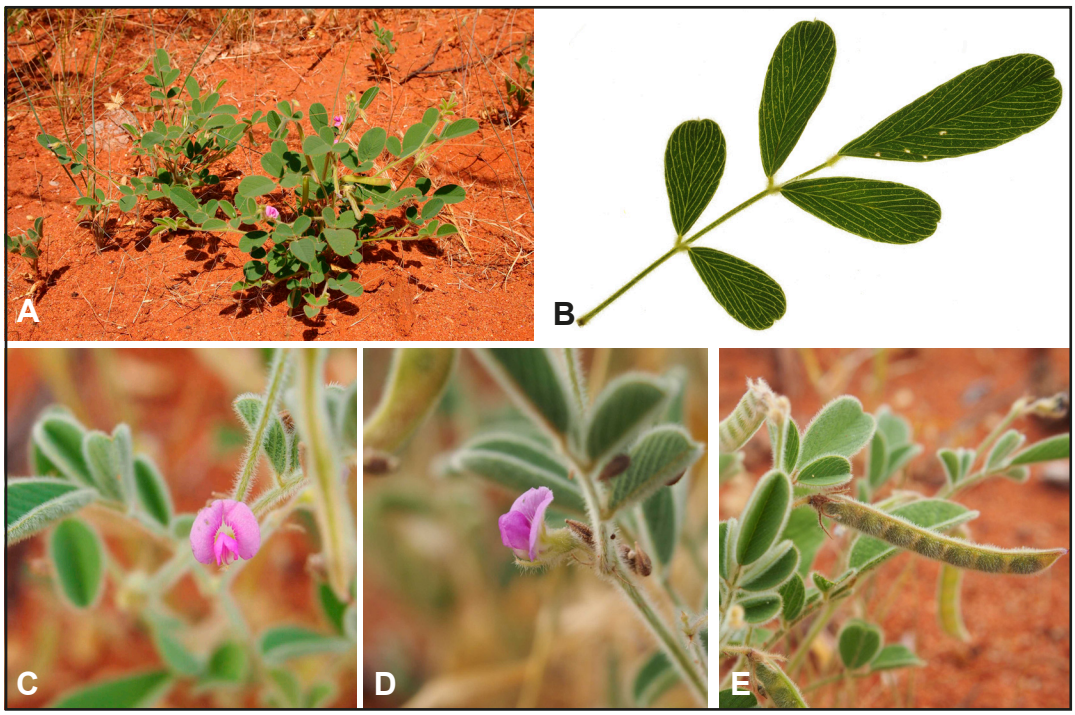

Figure 3. *Tephrosia insolens*. A – flowering plant *in situ* showing spreading habit and leaves with enlarged terminal leaflet, and habitat; B – single leaf showing venation; C – flower from front; D – flower from side showing calyx morphology; E – pod showing calyx lobes much longer than the tube, long indumentum, and indentation between the seeds. Photographs by Mike Marathon (Wikimedia Commons) (A, C–E) and K. Brennan from *K. Brennan* 8914 (B).

D.T. Kelman (BRI); Lochern N.P., Eurondella Back Paddock, 25 Mar. 1998, *P.I. Forster & R. Booth* PIF22367 (BRI); 170 km N of Boulia-Mount Isa Rd [Diamantina Development Rd], 31 May 1984, *J.B. Hyland* BH596 (BRI); 59 km by road S of Winton towards Jundah, Warnambool Downs, 23 Sep. 2005, *M.B. Thomas* 2928 *& D.A. Halford* (BRI, MEL, NSW).

Phenology. From the specimens examined, flowers and fruits occur throughout the year (January to November) probably initiated by localised rainfall events.

Distribution. Western Australia (GSD, PIL), Northern Territory (BRT, DMR, GFU, GSD, GUC, MGD, MII, OVP, TAN) and Queensland (BK, GN, MI): widespread across central Australia in the area roughly bounded by Newman (WA) to the west, Yarralin (NT) to the north, Alice Springs (NT) to the south and Blackall (Qld) to the east, with a north-eastern outlier from Bing Bong Station (NT) on the Gulf of Carpentaria (Figure 2).

Habitat. Most frequently collected from red sand, sandy loam and clay loam in desert country, infrequently from lower scree slopes and gravelly soils with outcropping rock. Associated vegetation is variable and includes very open, low eucalypt woodland with spinifex, mulga woodland, open shrubland, and both tussock and hummock grasslands. The life-form of *T. insolens* is uncertain or variable and it is recorded as annual or perennial on specimen labels. Plants seen by RB near Kiwirrkurra (WA) and around Kintore (NT) in September 2015 were mostly dead across the populations with high numbers of fallen fruits and seeds. Plants were abundant at each site where the species was seen.

Conservation status. This species does not have a conservation listing in Western Australia. Although only known from five collections from two disjunct areas in the State, those from around Lake Mackay are contiguous with collections in the Northern Territory; it is probably widespread throughout the under-collected northern interior. It is ranked as Least Concern in the Northern Territory under the *Territory Parks and Wildlife Conservation Act 2000* (TPWCA) using IUCN guidelines and is not conservation-listed in Queensland.

Etymology. The epithet *insolens* (L. proud, haughty, arrogant) is used here in reference to the 'bigheadedness' of this species' leaves, in which the obovate terminal leaflet is usually prominently enlarged relative to the laterals.

Affinities and notes. *Tephrosia insolens* has characters in common with *T. supina* and *T. lithosperma*, but it is readily differentiated from both by the combination of its lower number of leaflets (usually 3 or 5, sometimes 7) with the terminal leaflet usually distinctly larger than the adjacent laterals; slender, elongate calyx lobes that are *c.* 1.5–3 × longer than the tube; a glabrous staminal tube and upper filament; and longer hairs on its pods, which are prominently indented between the seeds when mature.

Many specimens of *T. insolens* were originally identified as *T. flagellaris* Domin (from Queensland) due to the prominently enlarged terminal leaflet, but *T. flagellaris* can be distinguished by the following characters: 5–9 linear-oblong leaflets per leaf; terminal leaflet up to 4 × longer than the adjacent laterals; larger flowers (8–9 mm long); and broader pods with a straight apex.

Specimens of *T.* sp. Northern from the Northern Territory have been misidentified as *T. insolens* there, presumably because of the enlarged terminal leaflet and very long, slender calyx lobes, but are readily distinguishable by their orange flowers and, if not flowering, by their straight, turgid pods with spongy to membranous tissue between the more-boldly mottled seeds, and the leaves having 7+ leaflets with no indication of reddening of the venation.

There is variation in the size of the terminal leaflet relative to the laterals, this related either to the age of the plant or to the different positions of the leaves throughout the mature plants. Herbarium specimens that are comprised of whole plant samples (i.e. including the taproot) show that the first leaves and those near the base of stems have the terminal leaflets greatly enlarged compared to the laterals, but that this relative enlargement diminishes along stems.

Tephrosia lithosperma R.Butcher & Cowie, *sp. nov.*

Type: Daguragu Land Trust area; near Hughie Creek *c.* 18.3 km south-west of Daguragu, Northern Territory, 28 March 2012, *I.D. Cowie* 12917 (*holo*: DNA-D0223830!; *iso*: BRI, CANB, LD, MEL 2380768A!, PERTH 08616884!).

Tephrosia sp. Magazine Hill (P. Jones 365), Queensland Herbarium, in Holland, A.E. & Pedley, L. in Bostock, P.D. & Holland, A.E. (eds.) (2010), Fabaceae. *Census of the Queensland Fl.,* 2010: 78.

Tephrosia sp. O.T. Station (S.T. Blake 17659), Cowie [Northern Territory Herbarium], in Albrecht, D.E., Dugiuid, A.W., Coulson, H., Harris, M.G. & Latz, P.K. (2007), *Vasc. Pl. Checkl. for the S. Bioreg. of the N. Territory: Nomencl., Distrib. and Cons. Stat.* 2nd Edn: 127; Short, P.S., Albrecht, D.E., Cowie, I.D., Lewis, D.L. & Stuckey, D.M. (eds.) (2011), *Checkl. of the Vasc. Pl. of the N. Territory*: 36.

Tephrosia 'D53770 OT Station', in Albrecht, D.E., Duguid, A.W., Latz, P.K., Coulson, H. & Barritt, M.J. (1997), *Vasc. Pl. Checkl. for the S. Bioreg. of the N. Territory: Nomencl., Distrib. and Cons. Stat.*: 113.

Tephrosia '*carpenteriae'*, *in sched.* [BRI]

[*Tephrosia stipuligera auct. non* W.Fitzg.: J.R. Maconochie, *Fl. Central Austral.*: 156 (1981), as to NT and Qld material].

Low, spreading *woody herb* to *subshrub*, possibly annual, to 0.5 m tall, at least 0.3 m wide, with numerous slender stems arising from a narrow rootstock. *Branchlets*, *leaf and inflorescence rachides* with sparse to moderately dense indumentum of ascending to patent, straight, hyaline, white to pale stramineous hairs, 0.3–1.2 mm long. *Leaves* pinnate, up to 85 mm long including petiole; *stipules* persistent, prominent, divergent through patent to recurved with age, filiform to subulate, 4–9 mm long, red-brown darkening with age, 3-nerved, hairy; *petiole* 1.5–10 mm long, with the first leaves of small, post-fire plants having petioles 20–24 mm long and reducing thereafter; *ultrajugal rachis* 1–7.7 mm long; *stipellae* absent; *petiolules* 0.5–1.2 (to 2 mm on lowest leaves); *leaflets* 5–11(–17), increasing in size from base with the longest towards the centre or at the apex of leaf, most leaves with at least some of the leaflets attached in the proximal half, narrowly elliptic to obovate, flat to V-shaped in T.S., base cuneate, apex acute to obtuse to retuse, straight to gently recurved, mucro often minute (0.2–0.5 mm long), sometimes to 1.6 mm long; *lateral leaflets* 2.9**–**17 mm long, 1.4–6.9 mm wide, length 1.8–4.1 × width; *terminal leaflet* 0.9–1.5 × longer than adjacent laterals, 4.7–24 mm long, 2.1–8.4 mm wide, length 1.9–3.9 × width; lamina discolorous, light green above and mid-green to olive green below; secondary veins brochidodromous on larger leaflets, eucamptodromous becoming brochidodromous just at apex on smaller leaflets, in 7–14 pairs, intersecondary veins parallel, only reticulating towards margin; upper surface indumentum moderately dense, with inclined to patent, fine, straight, hyaline hairs (surface often appearing glabrous), sometimes with loosely appressed, white hairs, glabrescent; lower surface with prominent, thickened, raised, usually reddish to dark red primary and secondary veins, indumentum as for upper surface except longer and denser. *Inflorescence* pseudoracemose, leaf-opposed at apices of branches, often also with axillary flowers at base, 50–165 mm long, with 3 or 6 (or more) flowers in each cluster; *inflorescence bracts* persistent, recurved, filiform-subulate, reddish, 3.3–7 mm long; *floral bracts* commonly persistent with clusters of bracts remaining at inflorescence nodes after flowers and pods have fallen, antrorse, filiform-subulate, reddish, 1.1–2.7 mm long; *pedicel* 1.5–4 mm long; *bracteoles* absent. *Calyx* 3.3–5.3 mm long, moderately hairy with patent, white hairs; tube 1.5–2 mm long, 0.45–0.62(–0.9) × the length of lateral lobes; lobes attenuate to setose in appearance; vexillary lobes united slightly higher to evidently higher than lower three, free for 1.6–2.7 mm (divided to 80–87% length); lowest lobe 2.5–4.5 mm long, a little longer than the lateral lobes. *Corolla* pink-mauve-purple, 3.7–5.5 mm long; *standard* 4.6–6 mm long, 5.7–7.2 mm wide, with a tapering claw 1.7–2.1 mm long, the blade depressed-broadly ovate to flabelliform, scarcely to slightly linearly callused at base, with a rounded to shallowly emarginate apex; *wings* 5.6–7.5 mm long (incl. 1.8–2.5 mm long claw), 2.6–3.7 mm wide, longer than keel, the blade elliptic to broadly ovate, with a deeper curve on the lower edge and a short straight region in front of the spur on the upper edge, the apex rounded, oblique, sometimes with a few hairs on the lower edge towards the claw; *keel* 4.3–5.6 mm long (incl. 2–2.7 mm long claw), 2.1–2.8 mm wide, glabrous, the blade semi-circular, broadly and prominently pouched in front of spur to *c.* 1/2 blade depth. *Staminal tube* 3.8–4.4 mm long, glabrous, slightly callused on margins and at apex of fenestrae to having prominent, rounded calluses at the apex; vexillary filament slightly geniculate in lower half, with scattered hairs (occasionally only 1 or 2) in front of small callosities to extending much of the way along the filament; anthers oblong, ovate, to broadly elliptic, *c.* 0.5 mm long, 0.3–0.4 mm wide. *Ovary* densely hairy (short, inclined hairs); ovules 5–7 (on specimens seen, but number likely to be higher based on seed number in fruit). *Style*

flattened, almost uniform, glabrous; stigma with short hairs at base, linear. *Pods* linear, upturned at apex to curved along length, laterally compressed when immature, almost turgid at maturity but very slightly indented between seeds, 16–38 mm long, 2.5–3.3 mm wide (length 8.4–11.9 × width), tissue absent between seeds, pods stramineous to yellow-brown at maturity, indumentum sparse to moderately dense, hairs patent, white, shorter on the darkened sutures, often longer and finer on the pod faces; beak long, in line with upper suture, straight. *Seeds* (3–)6–9 per pod, 3.2–4.5 mm between centres of adjacent seeds, transversely obloid-reniform to pulvinate, laterally compressed, (1.1–)1.8–2.4 mm long, 2.5–3.8 mm wide, orange-brown to brown, flecked or patterned with darker brown to black and pale pinkish brown, orange around hilum, testa irregularly rugose, depressed in darker-coloured areas; hilum ±central to excentric (positioned *c.* 1/3 of the way along seed), with a small but distinct, whitish, rim aril (with double tongue) 0.1–0.2 mm long within the hilar fissure. (Figures 4, 5C)

Diagnostic features. Low, spreading woody herb to subshrub with an indumentum of ±patent pale hairs; pinnate leaves with persistent, recurved, red-brown stipules and 5–11(–17) narrowly elliptic to obovate leaflets 2.9–24 mm long, with the terminal leaflet not distinctly larger than adjacent laterals (0.9–1.5 × longer); small (3.7–5.5 mm long), pink to purple flowers with the calyx tube *c.* 1/2 length of the slender lateral lobes, held in short pseudoracemes (to 165 mm long) with persistent, recurved inflorescence bracts; the staminal tube glabrous and the vexillary filament with few to numerous hairs in front of the basal callosities; pods linear, with an upcurved apex or curved along length, 16–38 mm long, 2.5–3.3 mm wide, almost turgid at maturity but slightly depressed between seeds, with an indumentum of patent, white hairs; transversely obloid-reniform to pulvinate seeds that are laterally compressed and have a finely mottled and irregularly rugose testa with the hilum usually slightly excentric.

Selected specimens examined. WESTERN AUSTRALIA: [locality withheld for conservation reasons] 25 May 1997, *M.E. Trudgen* MET 18005 (PERTH). NORTHERN TERRITORY: O.T. Stn, *S.T. Blake* 17659 (AD, BRI, DNA, MEL); Savannah Way between Hi-Way Inn and Cape Crawford, 2 Apr. 2016, *K. Brennan* 10598 (DNA); Birrindudu Ra., 2 May 2004, *K. Brennan* 6295 *& P.K. Latz* (DNA); Timber Creek, 4 May 1969, *N. Byrnes* 1574 (DNA, NSW); 94 m[iles] E of Daly Waters, 18 Mar. 1972, *N. Byrnes* 2505 (CANB, DNA [2 sheets], NSW); 144 m[iles] E Stuart Hwy, Borroloola Rd, 4 June 1971, *N.M. Henry* 26 (BRI, CANB, DNA, K, NSW, NT); Newcastle Waters Stn, Ferguson Creek, 46 km S of Elliott, 14 Mar. 1979, *T.S. Henshall* 2599 (BRI, CBG, DNA, K); 8 km E of Bauhinia HS, 5 May 1995, *P.K. Latz* 14413 (BRI, DNA, MEL, NT); SE of Lajamanu, Winnecke Hills, Tanami Desert, 2 May 2004, *C.P. Mangion* 1639 *& D.L. Lewis* (DNA); Wave Hill, 17 Mar. 1997, *C.R. Michell* 629 *& C.P. Mangion* (DNA). QUEENSLAND: near Tonkoro Rd, W of Lochern N.P., SW of Longreach, 12 May 2010, *A.R. Bean* 29759 *& A.J. Emmott* (BRI, E); Tranby, 9 May 1936, *S.T. Blake* 11442 (AD, BRI, DNA, MEL); E of jump-up, 33.6 km (by road) E of Musselbrook mining camp, 175 km N of Camooweal-Lawn Hill N.P., 7 May 1995, *R.W. Johnson* MRS1037 *& M.B. Thomas* (BRI, CANB, DNA, K, NSW, PERTH); 0.7 km NW of Magazine Hill, 10 km N of Silver Star Mine, 18 Apr. 1991, *P. Jones* 365 (BRI); 69.2 km by road towards Julia Creek from Burke Development Rd, near Dugald River, 14 June 2004, *K.R. McDonald* KRM2779 (BRI); Burke and Wills Roadhouse, 198 km by road SW of Normanton, 14 Apr. 2007, *K.R. McDonald* KRM6570 (AD, BRI, DNA, PERTH); Musselbrook section, Lawn Hill N.P., 16 Apr. 2007, *K.R. McDonald* KRM6612 (BRI, CNS); Dugald River crossing, 64 km N of Cloncurry junction, 1 Apr. 2010, *K.R. McDonald & P.D. Dennis* KRM9077 (BRI); 40 km N of Glenariff, 8 Apr. 1997, *J. Milson* JM1250 (BRI); ridge W of Hilton, 20 km N of Mt Isa, 22 Apr. 1983, *A. Schmid* 612 (BRI); 32 km SW of Hells Gate Roadhouse on turn off to [Anthony] Lagoon Stn (Gulf site 335), 4 Apr. 2006, *E.J. Thompson* WES237 *& M. Edgington* (BISH, BRI, DNA, MEL).

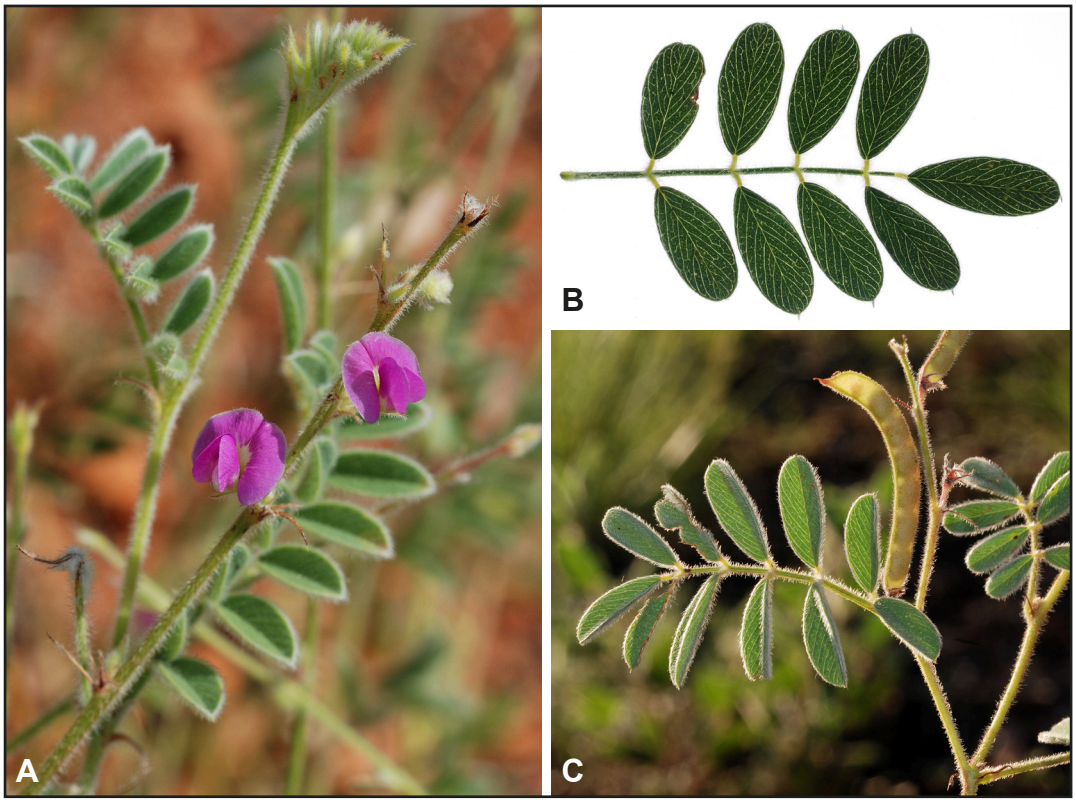

Figure 4. *Tephrosia lithosperma*. A – upper branches showing 11-foliolate leaves with the terminal leaflet not greatly enlarged, as well as persistent, subulate, inflorescence and floral bracts, and pink-purple flowers; B – single 9-foliolate leaf showing mucronate leaflets and venation; C – upper branches showing leaves and curved pod. Photographs by K. Brennan from *K. Brennan* 10598 (A), 8570 (B) & 9039 (C).

Phenology. Flowering and fruiting over a long period of the year, probably in response to rainfall events. Peak flowering from March to July and fruiting March to September, with mature seed present on plants collected in May to October; flowers and fruits also present on specimens collected in January, February, and August to November.

Distribution. Western Australia (PIL), Northern Territory (BRT, DMR, GFU, GSD, MAC, MGD, MII, OVP, STU, TAN, VIB) and Queensland (BK, GN, MI): known from only one collection, to date, in Western Australia, but likely to be found further east of existing localities with further surveys, given its widespread distribution in central Australia. *Tephrosia lithosperma* is found frequently in the area roughly bounded by Mistake Creek (NT) in the west, Timber Creek through to Limmen National Park (NT) in the north and Alice Springs (NT) in the south, extending to Aberfoyle and Longreach (Qld) in the east and south-east, with a Hamersley Range (WA) outlier to the far west (Figure 2).

Habitat. Most commonly collected from stony and rocky slopes of variable geology (limestone, sandstone, basalt, laterite, quartz), but also from clay soils on plains beneath slopes. Grows in open savanna woodland or shrubland, frequently among spinifex. Likely to be an annual or biennial species; frequently noted to occur in post-fire landscapes.

Conservation status. This species was recently listed as Priority One under Conservation Codes for Western Australian Flora (equivalent to IUCN category Data Deficient) under the name *T.* sp. Magazine

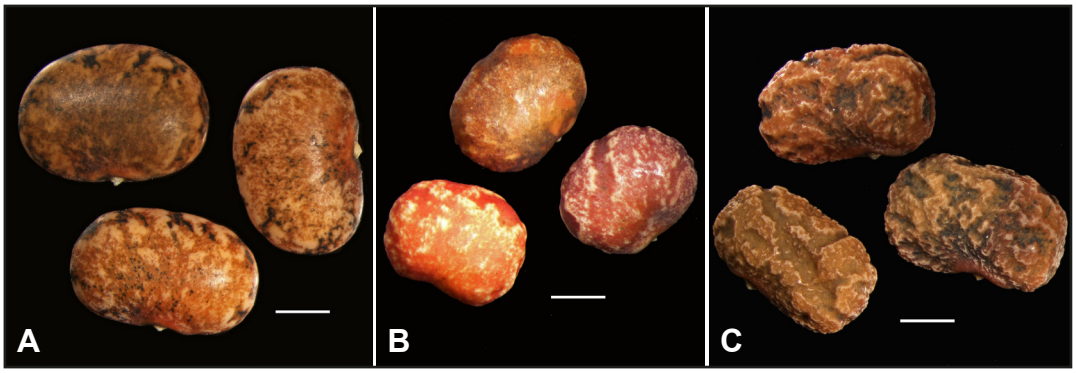

Figure 5. Comparative seed morphology of *Tephrosia supina* (A), *T. insolens* (B) and *T. lithosperma* (C), showing smooth testa and central hilum in *T. supina*, smooth to broadly dimpled testa and central hilum in the smaller seeds of *T. insolens*, and rugose testa and excentric hilum of *T. lithosperma* seeds, which are frequently more laterally compressed than in the other two species. Images taken at ×10 mag. from *M.E. Trudgen* MET 17759 (A), *P. Latz* 26785 (B), & *D.E. Albrecht* 9736 (C). Scale bars = 1 mm.

Hill (P. Jones 365) because it is presently only known from a single collection that is highly disjunct from the nearest known record (in NT). This status may be downgraded if additional populations are found in the intervening and notoriously under-collected area. Assessed in the Northern Territory as Least Concern under their TPWCA using IUCN guidelines, and not conservation-listed in Queensland.

Etymology. From the Greek words *lithos* (stone) and *sperma* (seed) in reference to the rough seeds, which resemble small stones.

Affinities and notes. *Tephrosia lithosperma* shares some characters with *T. supina* and others with *T. insolens*, but can be distinguished from both by the combination of its longer, more slender, distinctly inclined to recurved stipules; generally smaller leaflets with a more prominent mucro; slender, elongate calyx lobes that are *c.* 2–3 × longer than the tube; glabrous staminal tube and variably hairy upper filament; narrower pods with a more strongly upturned apex and a (generally) longer beak; and laterally compressed, reniform to transversely oblong seeds, which are finely rugose and uniformly red-brown or flecked with dark brown or black.

Tephrosia lithosperma is also similar to *T. stipuligera*, which can be distinguished by the following characters: narrowly obovate to spathulate leaflets with prominently recurved apices and longer mucros (0.7–1.2 mm long); eucamptodromous venation with the secondary veins more acutely angled and the intersecondary veins indistinct; flowers and pods barely exceeding the foliage; shorter, broader (frequently ±oblong) pods with the apices almost straight to only slightly upturned; smooth, transversely ellipsoid seeds (1.9–2.2 mm long, 2.6–3 mm wide) that are not compressed and are mottled shades of brown or dark purple-brown, with a more excentric hilum. *Tephrosia stipuligera* was recorded for central Australia by Maconochie (1981) but the misapplication of the name to *T. lithosperma* (as *Tephrosia* 'D53770 OT Station') was recognised by Albrecht *et al.* (1997) and the name was removed from checklists.

Possible annual or short-lived disturbance opportunist perennial. Noted to be abundant on recently burnt rocky slope (*D. Albrecht* 7649 *& P. Latz*), with collections from that habitat of extremely young plants, complete with taproot, already with mature fruit and seed (*D. Albrecht* 7646 *& P. Latz*).

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