

Tephrosia sabulosa (Fabaceae: Millettieae), a new species from Australia's sandhill deserts

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Abstract

Butcher, R. (2021). *Tephrosia sabulosa* (Fabaceae: Millettieae), a new species from Australia's sandhill deserts. *Nuytsia* 32: 109–119. The new species described herein has been segregated from the complexes surrounding *T. rosea* Benth. and *T. brachyodon* Domin, both of which are extremely challenging taxonomically. *Tephrosia sabulosa* R. Butcher is distinctive; however, its relationship with the other members of these complexes is not yet known. It occurs in sandhill habitats on the crests and slopes of dunes and has a disjunct distribution in Australia, with all but one collection being made from the Simpson-Strzelecki Dunefields bioregion of the Northern Territory, South Australia and Queensland; nearly 900 km lies between these collections and that made from the Kiwirrkurra Indigenous Protected Area (Gibson Desert bioregion) in Western Australia. The new species is described and differentiated from similar taxa, and images and a distribution map are provided.

Introduction

The genus *Tephrosia* Pers. (Fabaceae: Millettieae) has not been revised nationally since Bentham (1864), when 24 species were recognised; there are now 82 named and 53 unnamed native taxa in Australia, based on the *Australian Plant Census* (APC), Butcher (2018a, 2018b, 2020, 2021), Butcher and Cowie (2021), and this publication. One of the key aims of current taxonomic research has been the reconciliation of informal names in use across Australia for undescribed *Tephrosia* taxa, names that have proliferated as increased collections have brought to light putatively new taxa, and because many superfluous names have arisen across the country's herbaria as a result of siloed research, different approaches to taxonomic practice, and evolving taxonomic concepts. The objectives of this reconciliation process are to eliminate overinflation of taxon numbers, to determine true taxon distributions and to aggregate information required for taxon resolution and conservation assessment.

Following Barker (2005) and APC protocols, the majority of *Tephrosia* manuscript names in use have been converted to phrase names, with the designation of a voucher specimen against which to compare other collections an integral part of achieving and maintaining taxonomic stability in lieu of formal description and publication. Unfortunately, some taxa have been given multiple manuscript or phrase names (or both) over time, with some names still to be converted to, or reconciled with, existing phrase names because the taxon spans geopolitical boundaries and has not been comprehensively studied across its range, the taxonomic expertise in the group lies outside the institution in which the specimens have been annotated, or the taxon itself occurs outside the State or Territory within which

that institution operates. Where taxa have multiple phrase names their distributions may suspiciously stop at borders, but with so many phrase-named *Tephrosia* taxa in Australia this can be difficult to detect. Less frequently, a single informal name contains more than one taxon, but this hypothesis is only recognised and recorded in-house because research is ongoing. An unfortunate consequence of this is that it is not possible to distinguish the collections in *Australasian Virtual Herbarium* maps and records, which hampers the investigation and resolution of their taxonomic status. In very rare circumstances all of the above apply, and a new taxon has multiple historical informal names whilst also being concealed within an informal name to which it does not belong. The new species *T. sabulosa* R. Butcher, described herein, is one such rarity. The tortuous path of its taxonomic recognition, and associated informal nomenclature, is presented below as a case study of the importance of trans-Australian revisions.

Tephrosia sabulosa—a case study

During study of the *Tephrosia* collection at the Queensland Herbarium (BRI) in 2012, two tag-named forms were noted under the phrase name *T. sp.* Glenormiston (R.W. Purdie 1362): *T. 'deserti'*, a pink/purple-flowered entity usually with spreading to patent hairs, which included the voucher specimen for the phrase name, and *T. 'boylandii'*, a similar, shortly appressed-hairy entity. In Queensland, *T. 'deserti'* and *T. 'boylandii'* occur in close proximity in the interface between the Simpson-Strzelecki Dunefields (SSD) and Channel Country (CHC) bioregions (Department of Environment 2013); however, they have different habitat preferences and reasonably consistent morphological differences. Two collections from Cravens Peak Reserve made on the same day from sites less than 3 km apart are clearly different from one another and are the two different *T. sp.* Glenormiston forms, with *T. 'deserti'* (*P.I. Forster* PIF37482) collected from red sandplain (on the edge of claypan flats) and *T. 'boylandii'* (*P.I. Forster* PIF37501) from the crest of a sand ridge. The correlation between morphological differences (e.g. indumentum, leaflet shape, venation) and substrate differences (i.e. alluvial and clay flats to rocky sites vs deep sands to dune crests) is highly consistent across the collection; however, it was evident from the specimen determinations that these tag-names had been applied only semi-consistently over time, suggesting evolving taxonomic concepts.

Because many of the *T. 'boylandii'* specimens had also been annotated as '*T. rosea* 'desert form'' they were requested on loan from BRI to advance studies at the Western Australian Herbarium (PERTH) on the *T. rosea* Benth. complex. Familiarity with those specimens made it possible to recognise that a single '*T. aff. rosea* var. *clementii* Domin' collection from the Kiwirrkurra Indigenous Protected Area (spanning the Gibson Desert and Great Sandy Desert bioregions in northern Western Australia) needed to be critically compared with *T. 'boylandii'* rather than be shoe-horned into *T. rosea* as yet another atypical form. The extreme disjunction between this collection and those from Queensland was remarkable given the vast areas of seemingly suitable sandhill country between them, so it was pleasing to find a folder of *T. 'boylandii'* specimens at the Northern Territory Herbarium (DNA) during an extended visit in 2019; there, however, they had been identified as *T. brachyodon* var. *longifolia* (Benth.) Domin (a taxon needing lectotypification and splitting), '*T. brachyodon* var. *indet.*' and '*T. brachyodon* var. *indet.* (Simpson Desert dunes form)'. The Northern Territory specimens were from the Simpson Desert, as were two additional collections from north-east South Australia that were identified in 2020 from specimens on loan from the State Herbarium of South Australia (AD) and the Australian National Herbarium (CANB). Even with the discovery of these additional records, the large disjunction remains (Figure 1).

The species represented by the *T. 'boylandii'* form (\equiv *T. sabulosa*), was first recognised as a distinct taxon in the early 1970s by J.R. Maconochie (Northern Territory Herbarium, Alice Springs) who determined

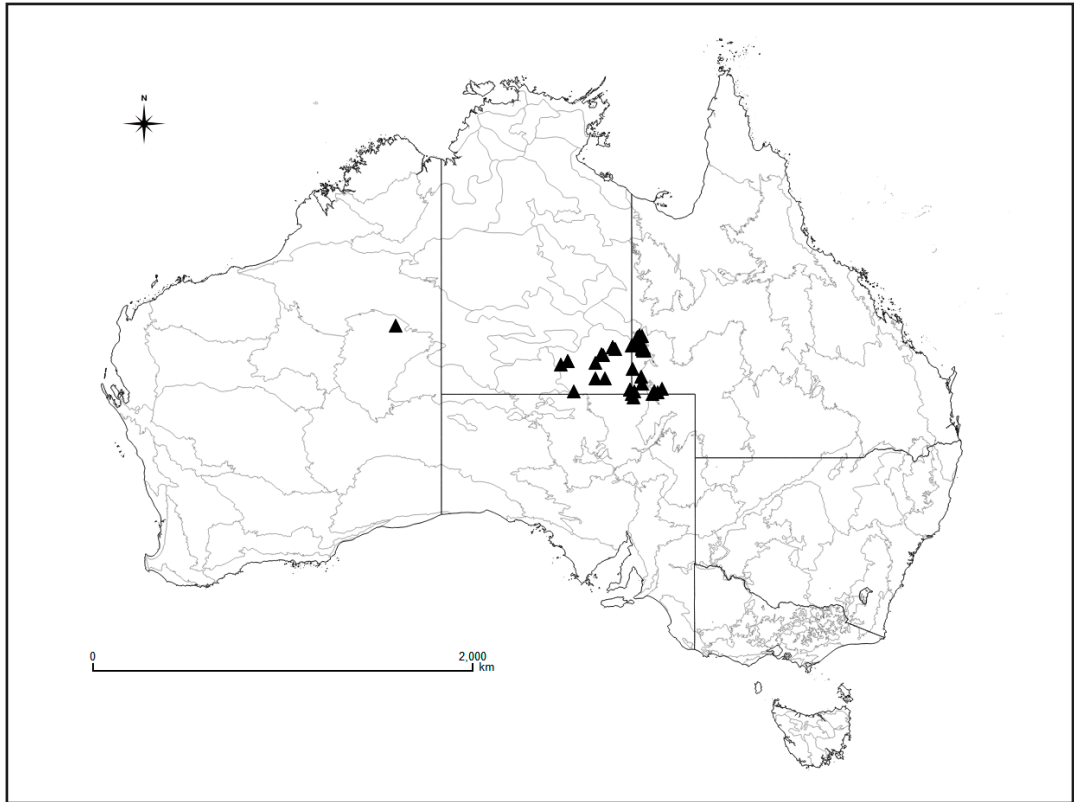


Figure 1. Distribution of *Tephrosia sabulosa* in the central deserts of Australia. The species is found on dunes in sandhill country, including the Gibson Desert (Western Australia) and the Simpson Desert (Northern Territory, Queensland and South Australia). Interim Biogeographic Regionalisation for Australia v. 7 regions (Department of the Environment 2013) shown in grey.

the specimen *N. Henry* 936 (collected 20th Sep. 1973) as '*T. rosea* var. *desertii*'; an orthographic variant of this name was taken up in a specimen determination by M. Crisp (Australian National Herbarium) in April 1978, as '*T. rosea* var. *deserti* J.R.Maconochie' (with 'ms' added to the label in pencil later). Les Pedley (dec.) must have seen this determination, and must have seen it in Canberra¹, because '*T. rosea* var. *deserti*' is written in his hand on the flimsy for *D.E. Symon* 4354 (AD 96715005), a specimen he determined in 1984 to be worth recognising at species rank (along with three other AD sheets) as '*T. eremaea* sp. nov. aff. *T. rosea* F.Muell ex Benth.'. The name '*T. eremaea* Pedley ms' was subsequently adopted at AD for these Northern Territory collections determined by Pedley and also applied de novo to duplicate sheets at AD in May 2003. The only South Australian collection of this species held at AD has until now been filed under *T. sphaerospora* F.Muell., a spreading, orange-flowered subshrub and the most commonly collected *Tephrosia* in the State.

¹Although based at BRI, Pedley was in receipt of four loans to CANB in March 1984—two from AD and one each from DNA and PERTH—(S. Coffey, A. Serkan & H. Vonow, pers. comms), and his determinations on these specimens are nearly exclusively from December 1984 and on 'Australian National Herbarium (CANB)' or 'Herbarium Australiense' labels. He was present at CANB for all of June 1984, and from late November to early December 1984 (J. Palmer, pers. comm.) in order to attend a joint meeting of representatives from Australia's taxonomic journals, held at the Australian National Herbarium on Tuesday 27th Nov. 1984 (Barlow 1985).

It would appear, however, that by the time Pedley saw Queensland material of this new species at BRI, the concept of the new taxon had been remembered but the name ‘*T. eremaea*’ forgotten or rejected in favour of Maconochie’s unpublished varietal name, with Pedley annotating *D.E. Boyland* 282 with a note on the flimsy [*in adnot.*]:

‘I intend making this the type of new species (*T. deserti*). *Crocker* s.n. (AD), *Latz* 8495 (AD, NT), *Symon* 3371 (AD, CANB), *Symon* 4354 (AD, CANB, NSW) also belong here. LP. 11.x.89’

Despite the note on the flimsy, this specimen was only determined as *T. ‘deserti’* in 1994, on the same day that another collection — *L. Pedley* 4479, a good specimen with numerous duplicates for distribution — was also declared (*in adnot.*) to be the proposed type of *T. ‘deserti’*. Unfortunately, even though it has more or less appressed hairs, similar to *D.E. Boyland* 282 and matching specimens (\equiv *T. sabulosa*), *L. Pedley* 4479 was not the same taxon. When the phrase name *T. sp.* Glenormiston (*R.W. Purdie* 1362) was raised (Holland 1997) it was this second taxon to which the phrase name was now linked through its voucher specimen, *R.W. Purdie* 1362 being very similar to *L. Pedley* 4479 but with soft, spreading hairs. The phrase name and the tag name *T. ‘deserti’* were then applied to both taxa for some time, and it has only been in the last decade that annotations such as ‘*T. ‘deserti’* (Simpson Desert form)’ and ‘*T. ‘deserti’* (2) – ‘*boylandii*’” began to appear on BRI sheets and folders to recognise as new, ironically, the taxon first recognised as new and the first taxon proposed to be named *T. deserti*. With an overarching goal of nomenclatural stability in taxonomic work, it was deemed unwise to resurrect any of these manuscript or tag names, thus the new name *T. sabulosa*—reflective of its habitat preference—has been selected for the species represented by the *T. ‘boylandii’* form.

The duplication of manuscript names (and phrase names) for the same taxon across different herbaria has been noted for many new species in *Tephrosia* (see e.g. Butcher 2018). These duplications in no way suggest poor taxonomy, they merely serve to highlight (1) just how many undescribed species there are across Australia, (2) the difficulty in keeping track of novel forms observed over many years across States when focussed primarily on the diversity in one’s own, and (3) the unintended consequences of siloed taxonomic research in widespread groups. The importance of tackling taxonomic revisions across the entire (bioregional) range of a genus cannot be understated. It is only with comprehensive knowledge that taxon boundaries can be properly assessed, new species resolved and described accurately, and the proliferation of superfluous names prevented. There have been similar discoveries of new taxa for Western Australia recently, with highly disjunct collections of two other species (Butcher & Cowie 2021) made from the Pilbara bioregion, while the two new species are widespread across the Northern Territory and central Queensland; knowledge of the genus beyond Western Australia prevented new and superfluous phrase names being raised on the State’s plant census to account for these collections. It is highly likely that we will see this scenario again, given the low number of collections from, and the inaccessibility of, Western Australia’s arid interior.

Materials and methods

All *Tephrosia* specimens at AD, BRI, CANB, DNA, NSW, NT, MEL and PERTH have been viewed, as well as the Australian *Tephrosia* specimens (including types) housed at K, and types available through *GlobalPlants* (<https://plants.jstor.org/>) or as scanned specimens (i.e. from Domin’s Herbarium at PR). Herbarium acronyms follow Thiers (continuously updated). Bioregions (and their standard abbreviations) referred to in distribution statements and maps follow *Interim Biogeographic Regionalisation for Australia* (IBRA) v. 7 (Department of the Environment 2013).

Taxonomy

Tephrosia sabulosa R. Butcher, *sp. nov.*

Type: north-east Simpson Desert, Tobermorey Station, Northern Territory, 25 October 2010, P.K. Latz 18198 (*holo*: BRI AQ649314; *iso*: DNA A0107084, NT A0107084).

Tephrosia rosea var. *desertii* [ined.] (*in sched.*), Northern Territory Herbarium (e.g. DNA A0049128); *T. rosea* var. *deserti* Maconochie ms (*in sched.*), Australian National Herbarium (e.g. CBG 7801597.1).

Tephrosia eremaea Pedley ms (*in sched.*), State Herbarium of South Australia (e.g. AD 98824116).

Tephrosia deserti [ined.] (*in sched.*), Queensland Herbarium (e.g. BRI AQ 238563).

Tephrosia 'boylandii' (*in adnot.*), Queensland Herbarium.

[*Tephrosia* sp. Glenormiston (R.W. Purdie 1362), Queensland Herbarium, *p.p.*, *auct. non R.W. Purdie* 1362.]

Rounded to erect, grey, *subshrub* to *shrub*, multi-stemmed, perennial, 0.3–1 m tall, to 1 m wide; corky at base of stems, rootstock not seen. *Branchlets, leaf and inflorescence rachides* with moderately dense to dense indumentum, the hairs appressed to loosely appressed, silver-white, straight to slightly wavy, 0.2–0.5 mm long, sometimes stramineous on young growth. *Leaves* pinnate, up to 136 mm long including petiole; *stipules* caducous or falling late, antrorse becoming patent with recurved apices, attenuate to deltoid, 1.1–3 mm long, yellow-brown [red-brown under hairs], dark red on mid-rib but obscured by hairs, 1- or 3-nerved, appressed-hairy; *petiole* 10–32 mm long; *ultrajugal rachis* 2.4–16 mm long; *stipellae* absent; *petiolules* 0.9–3.5 mm long; *leaflets* (3–)5–11, narrowly ovate through elliptic-oblong to slightly obovate, flat in T.S.; base rounded-broadly cuneate; apex rounded through truncate to retuse, straight with a minute, reflexed mucro 0.2–0.5 mm long; *lateral leaflets* 8.7–28.5 mm long, 3.3–14 mm wide, length 1.7–3.7 × width; *terminal leaflet* 1.05–2 × the length of adjacent laterals, 15–40 mm long, 4.5–12 mm wide, length 2.7–4.7 × width; lamina discolorous, the upper surface yellowish green to light lime green to mid-green, the lower surface dull green to grey-green; secondary veins in 7–14 pairs, venation craspedodromous with veins curving just before contacting margin, brochidodromous at apex, the intersecondary veins obscure or parallel at base then obscure in upper half; upper surface indumentum sparse to moderately dense, the hairs appressed to patent, straight to slightly wavy, hyaline-white; lower surface with raised veins, indumentum moderately dense, the hairs appressed to ascending, straight to slightly wavy, hyaline-white. *Inflorescence* pseudoracemose, usually also with a cluster of flowers at the base, leaf-opposed in terminal position or with a new branch arising from axil, to 420 mm long, fascicles reasonably crowded to well-spaced, 3–9-flowered; *inflorescence bracts* caducous or falling late, antrorse, attenuate to deltoid, acute, 0.8–2.3 mm long; *floral bracts* caducous, antrorse, subulate to narrowly deltoid, 0.3–1.5 mm long; *pedicels* 1.2–5.2 mm long (to 7.8 mm for pods); *bracteoles* absent. *Calyx* 2.7–4.7 mm long, indumentum moderately dense to dense, the hairs appressed to ascending, mostly white with some stramineous; tube 1.4–2.7 mm long, 0.7–1.6 × the length of lateral lobes; lobes narrowly deltoid to deltoid; vexillary lobes united higher than lower three, free for 0.6–1.7 mm; lowest lobe (1.2–)1.5–3 mm long, ±equal to a little longer than lateral lobes. *Corolla* 5.5–9 mm long, pink to purple, with a yellow eye at throat; *standard* 5.9–8.1 mm long, 7–10 mm wide, the claw 1.6–2.5 mm long, the blade depressed-broadly elliptic or -ovate to suborbicular, callused at base with a rounded to emarginate apex; *wings* 5.8–9 mm long

(incl. claw 1.6–2.8 mm long), 2.9–4.8 mm wide, longer than keel, few hairs present near upper edge to centre of blade, the blade \pm straight-sided at base then broadly ovate to obliquely elliptic with the lower edge more deeply curved, pouched in front of twisted spur, deeply scalariform perpendicular to upper edge within the pouch, with a rounded apex; *keel* 5.3–7.2 mm long (incl. claw 2–2.8 mm long), 2.5–3.5 mm wide, glabrous, the blade semicircular, pouched in front of spur, obtuse at apex. *Staminal tube* 4–5.3 mm long, with antrorse hairs near fenestrae on and in front of callosities and sometimes on upper sides of the tube, fenestrae callused on margins and prominently at apex; vexillary filament geniculate beneath prominent calluses near base, with antrorse to patent hairs on callosities and along filament; anthers broadly oblong to quadrate to suborbicular, 0.5–0.6 mm long, 0.4–0.5 mm wide. *Ovary* densely appressed-hairy; ovules 3–5. *Style* broad and thick at base then flattened and tapering, glabrous; stigma villous, orbicular. *Pod* linear, straight and broader at apex to gently upcurved to upcurved at apex, compressed, (19–)23–42 mm long, 2.9–4.2 mm wide, tissue absent between seeds, yellow-brown or light to dark red-brown, appearing purplish brown under moderately dense, appressed, straight to slightly wavy, white to silver-white hairs; beak in line with upper suture, straight to slightly deflexed. *Seeds* 1–4 per pod, 5.5–7.5 mm between centres of adjacent seeds, transversely narrowly obloid to sub-cylindrical, not compressed, 2–2.6 mm long, 4.1–5.5 mm wide, testa smooth, bicoloured, greenish to tan/light brown with dark green to brown or purplish brown markings (especially around circumference), with orange to dark brown encircling hilum and raised lens; hilum central to slightly excentric, with a creamish, incomplete-annular rim aril (with tongue) 0.15–0.3 mm tall, 0.35–0.45 mm wide. (Figure 2)

Diagnostic features. Short, dense, \pm appressed, silvery white indumentum; stipules short (to 3 mm) and caducous; petioles long relative to the leaf rachis; (3–)5–11, widely spaced, ovate-elliptic-obovate, pale green, discolorous leaflets with pale primary and secondary veins and \pm obscure intersecondary veins; ultrajugal rachis present; elongate pseudoracemes bearing 6+-flowered fascicles of pink/purple flowers with the calyx tube usually a little longer than the lobes, the wings often sparsely hairy near apex, the vexillary stamen densely hairy at base, and 3–5 ovules; \pm straight pods with a straight to slightly deflexed beak; transversely narrowly obloid to subcylindrical seeds, $>2 \times$ wider than long, with a smooth, bicoloured testa and usually central hilum.

Selected specimens examined. WESTERN AUSTRALIA: [locality withheld for conservation reasons] 13 Sep. 2015, *R. Butcher & R. Davis* RB 2062 (BRI, CANB, NT, PERTH). NORTHERN TERRITORY: *c.* 12 km SSE of Lake Caroline, N Simpson Desert, 8 July 2007, *D.E. Albrecht & A. Duguid* 12277 (DNA, NT); NW Simpson Desert, 20 Sep. 1973, *N. Henry* 936 (DNA); W of Colson Track, 81.6 km S of junction with Andado cross track, Simpson Desert, 17 Apr. 2013, *P.C. Jobson* 10421 & *C.E. Nano* (BRI, DNA, NT); NW Simpson Desert, 27 Aug. 1977, *P.K. Latz* 7479 (CBG, MO, NT); NW Simpson Desert, 21 Oct. 1980, *P.K. Latz* 8495 (AD, DNA); 3 km S of Magellan Bore, Allambi Stn, 17 Mar. 1995, *P.K. Latz* 14185 (DNA, NT); 24 km N Mt Dare HS, Andado Stn, 8 May 1997, *P.K. Latz* 15280 (DNA, NT); 105 km SSE of Atula Stn HS, Simpson Desert, 19 Sep. 2001, *P.K. Latz* 18011 (DNA, NT); between Lake Caroline and Plenty River, 8 Oct. 1986, *G. Leach* 1090 (AD, BRI, DNA, MEL, MO, NT); *c.* 24 km NNW of Poeppels Corner, 19 Sep. 1987, *G. Leach* 1462 (AD, BRI, DNA, NSW, NT); Simpson Desert, Amerada Petroleum Corporation No. 1 Hale River, 2 Nov. 1966, *D.E. Symon* 4354 (AD [2 sheets], NSW); *loc. cit.*, *D.E. Symon* 4371 (AD [2 sheets], CANB). QUEENSLAND: Cravens Peak, *c.* 4.7 km from Sand Hill Bore towards Plum Pudding, 14 Aug. 2008, *P. Foreman* CPI55 (BRI); Cravens Peak, 21 km from Ocean Bore and 16 km S along Shotline track to southern boundary with Carlo, Simpson Desert, W of Boulia, 23 June 2010, *P.I. Forster* PIF37501 (BRI, DNA, MEL); Ethabuka Stn, 15.2 km SE of HS, 21 June 2011, *J.S. Gillen* JSG38 (BRI); Cravens Peak, 900 m SW of Pudding Bore on track to Ocean Bore, 135 km SW of Boulia, 22 June 2010, *D. Halford* Q9953 (BRI); Cravens Peak, 8.8 km SE of Ocean Bore on track to 12 Mile Bore, 135 km SW of

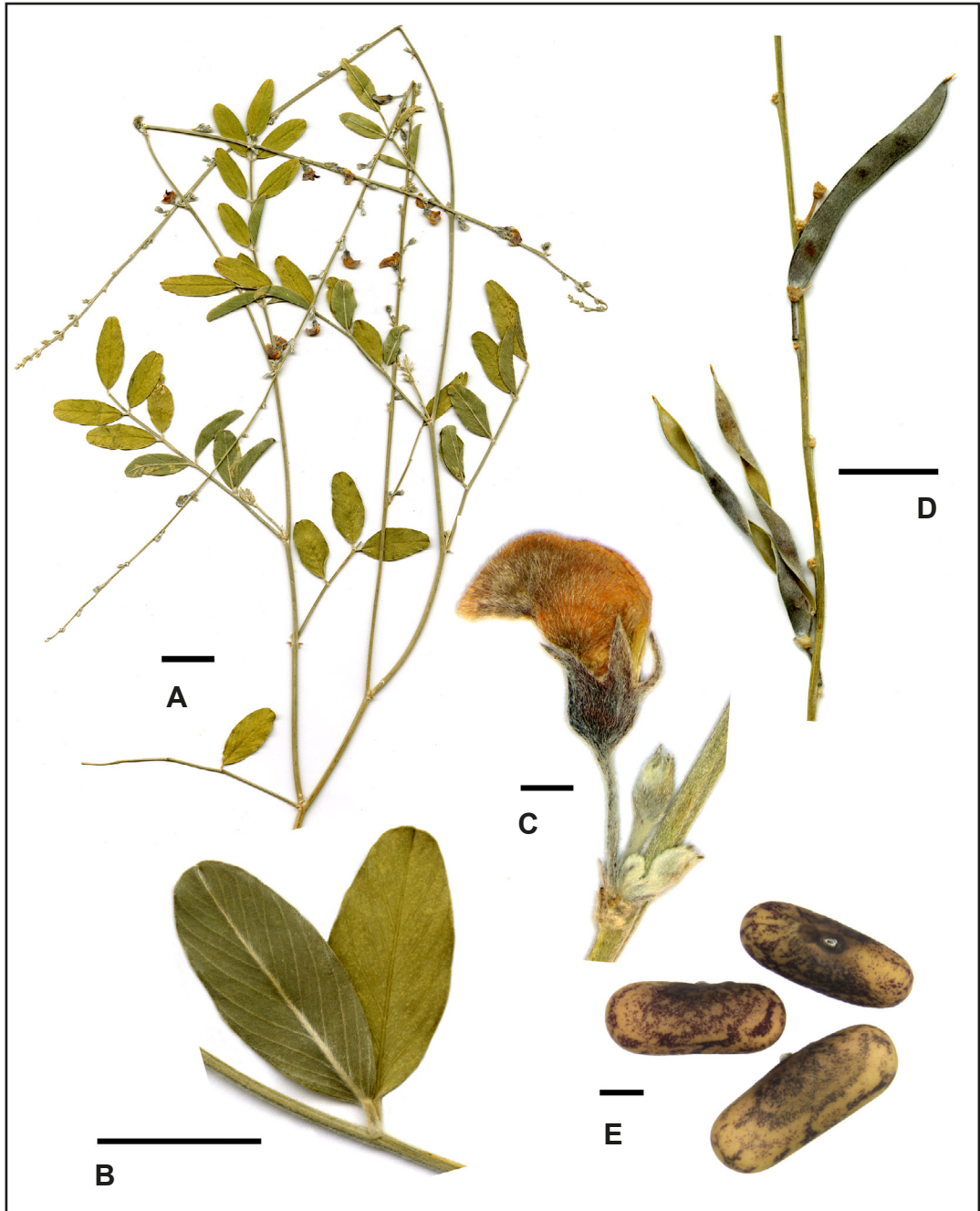


Figure 2. *Tephrosia sabulosa*. A – pressed specimen showing well-spaced, flat, narrowly ovate to elliptic leaflets, minute (caducous) stipules, and moderately long, leaf-opposed pseudoracemes of (pink to magenta) flowers; B – pair of discoloured leaflets showing pale green to yellowish green upper surface and mid-green lower surface with noticeable secondary veins (at *c.* 45°) and obscure intersecondary veins; C – pressed fascicle of flowers and buds with short, subtending inflorescence bract, showing short appressed hairs on rachis and calyces, and calyx with the lateral and lower lobes *c.* equal in length to each other and to the tube; D – part of infructescence showing ±straight 3-seeded pod (1 aborted) with beak in line with the upper suture, and dehiscent pod, with no white tissue on inner surface; E – bicoloured, transversely obloid to subcylindrical seeds with width greater than twice length, smooth testa and central hilum. Scale bars = 10 mm (A, B, D), 1 mm (C, E). Images taken by R. Butcher from *P.I. Forster* PIF37501 (A, C); *P.K. Latz* 14185 (B); *D.E. Albrecht & A. Duguid* 12277 (D, E).

Boullia, 24 June 2010, *D.A. Halford* QM22 (BRI); Ethabuka HS, 12 Oct. 2005, *P.K. Latz* 21383 (BRI, DNA, NT); Simpson Desert, Sep. 1986, *J. Mills s.n.* (BRI); 11 km W of Kuddaree Waterhole, Adria Downs, 6 Aug. 2015, *J.L. Silcock* JLS 1739 (BRI). SOUTH AUSTRALIA: KI Line Simpson Desert Conservation Park, c. 20 km [S] from Poeppel Corner, 13 June 1998, *M. Friebe* S-61 (AD); Simpson Desert, c. 3 km W of Poeppel Corner, 2 Aug. 1982, *R.W. Purdie* 2857 (CANB).

Phenology. Flowers and fruits April–November; seeds on specimens collected in June, July and October.

Distribution. Western Australia (GID), Northern Territory (MAC, SSD), Queensland (CHC, SSD in Gregory North and Gregory South districts) and South Australia (SSD): occurs in the area roughly bounded by Nyinmi outstation in Western Australia (c. 250 km W of the Northern Territory border), eastward to Cravens Peak Reserve and Birdsville in Queensland (Figure 1). Collection records are concentrated in the Simpson Desert (SA, NT and Qld) and the Kiwirrkurra IPA collection is c. 890 km west of the nearest collection in the Northern Territory; it is probable that *T. sabulosa* also occurs in suitable dune country in the intervening desert areas, but it is unusual that it has not been collected there given the significant regional collecting efforts of botanists such as David Albrecht, Peter Latz and John Maconochie.

Habitat. Grows in desert sandhill country on the slopes and crests of sand dunes in deep red sand. Associated with *Triodia basedowii* or *Zygochloa paradoxa* hummock grassland with sparse shrubs (e.g. *Acacia ligulata*, *Crotalaria cunninghamii*, *Goodenia connata*, *Grevillea stenobotrya*, *Lechenaultia divaricata*, *Newcastelia cladotricha*) and forbs (e.g. *Indigofera linnaei*), sometimes with scattered *Corymbia* in the overstorey.

Conservation status. To be listed as Priority One under Conservation Codes for Western Australian Flora in light of its single, and highly disjunct, collection from the State (C. Bourke, pers. comm.). Not conservation assessed in the Northern Territory or South Australia, and not conservation-listed in Queensland.

Etymology. From the Latin word *sabulosus*, ‘sandy, growing in sandy places’, in reference to its dune and deep sand habitats.

Affinities and notes. *Tephrosia sabulosa* was informally recognised as an inland variant of *T. rosea* by L. Pedley and of *T. brachyodon* Domin by I. Cowie (DNA), but it is unclear in the absence of molecular data to which it is most closely allied. It is similarly difficult to define these species (*s. lat.*) with robust sets of characters given the variation currently recognised in each. Like *T. rosea* and *T. brachyodon*, the pink/purple flowers of *T. sabulosa* have prominent callosities at the apex of the staminal tube fenestrae and at the base of the vexillary filament, which is also markedly hairy in all three species, as well as a pronounced scalariform region near the upper margin of each wing petal. This scalariform petal ornamentation is not unique to this taxon group, however, and has been observed in orange-flowered (e.g. *T. virens* Pedley) as well as pink/purple-flowered species. They also have similar calyces, with the vexillary lobes united higher than the lower three, the tube and lateral lobes of similar length, and the lower and lateral lobes narrowly deltoid. The seeds are superficially similar, being wider than long (length being measured from the point of attachment to the placenta to the opposite side; width at 90° to this) and darkly marked, but there are a number of differences (some overlapping) between them. In *T. sabulosa* the seeds are transversely narrowly obloid to sub-cylindrical (width >2 to 3 × length) and appear bicoloured (green to tan with dark brown markings), whereas the other species have seeds varying from transversely ellipsoid to transversely obloid (width rarely >2 × length) and are tricoloured

and mottled. The testa is smooth in *T. sabulosa* and *T. rosea*, but in *T. brachyodon* it is slightly to strongly depressed in darker areas and raised in the palest areas (pinkish tan) where it appears to lift away from the seed. Leaflet venation differs between the three species with the intersecondary veins parallel to closely parallel in *T. rosea* (such that they can be difficult to distinguish from the secondary veins), but parallel just at the base then becoming diffuse or obscure in *T. sabulosa* and *T. brachyodon*; the intersecondary and tertiary venation can be quite red in some varieties and forms of *T. brachyodon*.

Among the formal and informal taxa within *T. rosea*, *T. sabulosa* is most like var. *rosea* and var. *clementii* but is readily distinguished from both by its leaflet venation. With var. *rosea* it shares its longer overall leaf length, longer petioles, higher leaflet number (usually 5 to 11, but up to 17 in *T. rosea* collections from Kimberley islands) and more similar leaflet shape, but var. *rosea* differs markedly in its higher number of secondary veins (15–22 pairs), 6–8 ovules and seeds, and longer pods that curve up at the apex. With var. *clementii* it shares its silver-white indumentum, lower ovule number and shorter, scarcely to slightly curved pods, but this differs in its longer, more persistent stipules, short petioles, lower number (usually 5 or 7) of narrower leaflets, usually with an obtuse apex, and stouter pedicels; var. *clementii* is extremely variable in morphology as well as habitat, with some Pilbara region collections (e.g. R. Butcher & R. Davis RB 1558; H. Demarz 2494; R.D. Royce 1518) from dune crests in deep red sand.

Similarly, the *T. rosea* segregate taxon *T. sp.* Kennedy Range (J.S. Beard 4392) also occurs on dune crests but is restricted to the eastern Carnarvon bioregion of Western Australia. It can be distinguished from *T. sabulosa* by the following combination of characters: a golden-bronze appearance to plants; leaves with short petioles and 5–9, closely spaced, densely hairy, obovate leaflets; long, persistent stipules; short, thick pedicels; calyx lobes that spread open away from the developing pods; golden brown to dark brown indumentum on buds and pods; pods that are curved up just at the apex and have 4–6 seeds. In Western Australia, *T. sabulosa* occurs in the same area as a widespread, inland, ‘small, cuneate leaflet form’ of *T. rosea*, which I observed in 2015 to be common on clayey sand flats around Kiwirrkurra. This taxon is a low-growing shrub with shortly petiolate, short, 5-foliolate leaves with small, cuneate leaflets that are V-shaped in T.S. and have retuse apices.

Many specimens of *T. sabulosa* were originally identified as *T. brachyodon* var. *longifolia*, *T. brachyodon* var. indet. and *T. brachyodon* var. indet. ‘Simpson Desert form’, identifications that give a small insight into the taxonomic complexities within and surrounding *T. brachyodon*. *Tephrosia brachyodon* var. *longifolia* needs lectotypification, with the syntypes of the basionym, *T. purpurea* var. *longifolia* Benth., representing three, possibly four different taxa. The status of *T. brachyodon* var. *cloncurriensis* Domin relative to var. *longifolia* s. lat. is also uncertain.

Among the informal taxa associated with *T. brachyodon*, *T. sabulosa* is most like *T. sp.* Granite (P.K. Latz 12116) and *T. sp.* Glenormiston (R.W. Purdie 1362) [*T. ‘deserti’* form]; the boundaries between these central Australian taxa and *T. brachyodon* var. *longifolia* s. lat. and var. *cloncurriensis* require further study, with intermediate collections observed at BRI and DNA. *Tephrosia* sp. Granite can sometimes have similarly shaped and coloured leaflets to *T. sabulosa*, but it is a smaller, nearly glabrous to appressed hairy subshrub occupying rocky habitats, and has smaller leaves, often with a glabrous upper surface to leaflets, persistent, long-attenuate stipules, shorter inflorescences of smaller flowers with 6–8 ovules, and narrowly oblong, straight to slightly curved pods that are tan at maturity. *Tephrosia* sp. Glenormiston can be distinguished by its usually patent to spreading indumentum, long, attenuate, persistent stipules, narrowly elliptic to elliptic, mid-green leaflets with ±obtuse, mucronate apices and usually pink-red secondary veins with a red reticulum often visible, 5–7 ovules per flower,

and tan to light brown pods that are gently curved along their length. All of these taxa have their secondary veins more sharply angled from the midvein than in *T. sabulosa* (12–20° vs c. 30°).

Two *T. sabulosa* collections have very small leaflets—*D.E. Boyland* 282 (BRI; Poeppl Corner, sandy soil, inter-sand-ridge flat) and *G. Leach* 1462 (AD, BRI, DNA, NSW, NT; c. 24 km NNW of Poeppl Corner, dune slope, red sandy slope). The *Boyland* collection also has small flowers with short, thick pedicels and the sampled plant has the appearance of being stressed or perhaps flowering for a second time in the season; there are a number of elongate spent pseudoracemes, with a few young inflorescences emerging. The only collection from Western Australia (*R. Butcher & R. Davis* RB 2062) was from a population of plants (common on the dune crest) from which most leaves had fallen and the leaves that were present were small, 3- or 5-foliolate, with broadly lanceolate leaflets; it has similarly small flowers with short, thick pedicels, as well as short calyx lobes and a bicoloured (white and stramineous) indumentum on the calyces. While unusual to see these characters in combination, none of them are unique to the Western Australian material (e.g. *M.J. Laidlaw, N. Cuff & V.J. Nelder s.n.*, BRIAQ872969, also has small flowers with short calyx lobes; *P. Foreman* CP155 also has stramineous hairs on the calyces), and the caducous stipules, appressed indumentum, 3-ovulate ovary, and the size and shape of the pods and seeds place this collection in *T. sabulosa* above any other taxon.

The collection *V.T. Garbin* 20 (DNA) is very similar to *T. sabulosa* specimens in having caducous stipules and leaflets of the same shape, size and colour; however, it has a patent to spreading indumentum, reddening primary and secondary veins, a small calyx (2.7–3.2 mm long; at the lower end of the range for *T. sabulosa* with the lower lobe longer than the laterals), glabrous wing petals, sparser and shorter hairs on stamens, and 7 ovules (observation from one flower). This specimen remains of uncertain placement.

Acknowledgements

I would like to thank the curators and staff at AD, BRI and DNA for providing access and assistance during herbarium research visits over the years, and for facilitating specimen loans. The camaraderie experienced at BRI and DNA during extended visits in 2019 was especially valued. Thanks are due to former PERTH curator Kevin Thiele for permitting me to participate in the 2015 BushBlitz at Kiwirrkurra Indigenous Protected Area, which serendipitously allowed this species to be recorded for Western Australia when Rob Davis (PERTH) and I spontaneously stopped the vehicle to investigate a recently burned dune system. Thanks also to the BushBlitz team for organising and funding the expedition, which has done exactly as it set out to do – discover new species. Kudos to your foresight and dedication. Project coordinator Terry Macfarlane (PERTH), the reviewer Peter Jobson, and editor Juliet Wege are thanked for their comments towards the improvement of this paper, and John Huisman (PERTH) is thanked for assistance with the seed imaging. The loans officers at AD (Helen Vonow), CANB (Alasya Serkan) and PERTH (Skye Coffey) are thanked for their help in triangulating Les Pedley's research movements in 1984, via his loan requests; Brendan Lepschi (CANB), lover of a good detective story, assisted. Taxonomic studies of *Tephrosia* in northern Western Australia were funded by Rio Tinto (2011–2014) through a Mesa A Terrestrial Offset, with additional support from BHP. The current project 'Towards an eFlora treatment of *Tephrosia* (Fabaceae: Millettieae): revision of the genus in Western Australia and the Northern Territory' has been funded by the Australian Biological Resources Study National Taxonomy Research Grant Programme (2017–2020).

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