

## The *Indigofera trita* complex (Fabaceae: Indigofereae) in Australia

Peter G. Wilson and Ross Rowe

### Abstract

Wilson, Peter G. and Rowe, Ross (National Herbarium of New South Wales, Royal Botanic Gardens, Mrs Macquaries Road, Sydney, NSW, Australia 2000) 1994. The *Indigofera trita* complex (Fabaceae: Indigofereae) in Australia. *Telopea* 5(4):637–645. Usage of the name *Indigofera trita* in Australia is reviewed. The major morphological variants in Australia are compared with the taxonomic concepts adopted by various overseas workers and it is concluded that the variation observed cannot be accommodated within any of the hierarchies of infraspecific taxa recognised in this complex by those workers. Furthermore, the three taxa that can be recognised are here considered to warrant specific rank under the names *I. trita* L., *I. ewartiana* Domin and *I. polygaloides* M. Scott.

### Introduction

*Indigofera trita* sens. lat. is a pantropical complex that has perplexed taxonomists for many years and all attempts to resolve it in a way that is widely accepted have failed.

Early this century it was usual to accept three separate species in this group, *I. trita* L.f., *I. subulata* Vahl ex Poir. and *I. scabra* Roth. Meikle (1950) had experienced much difficulty in separating the African *I. subulata* with three leaflets from the more or less pantropical *I. scabra* with five or more leaflets, and reduced the latter to a variety of the former; he considered that the name *I. trita* had been applied wrongly to African plants, with the possible exception of four specimens. Gillett (1958) agreed in general with Meikle's conclusions but recognised five varieties of which one, var. *maffeii*, embraced Meikle's doubtful specimens. In each of these treatments, the emphasis was on the variation that occurs among African populations.

Ali (1958), working in Pakistan, approached the complex from a statistical point of view with a 'Chi square' analysis of the variation in three characters: length of inflorescence axis, leaflet number and fruit orientation. His results showed that the variation in the character states was not normally distributed and he concluded that a single species, *I. trita*, should be recognised with two subspecies (subsp. *trita* and subsp. *subulata*) based on fruit orientation; within each of these he recognised two varieties (var. *trita* + var. *maffeii*, and var. *subulata* + var. *scabra*). However, in this three-character analysis each variety was separated from the others by only one character, and Ali's argument for the recognition of two subspecies was based largely on the geography of the taxa (Ali 1958: 557). This may be the reason why later authors did not accept his two-tiered scheme and only adopted the varieties.

Gillett (1971) followed Ali in accepting four varieties, but made no reference to the subspecies, and Thulin (1983) followed Gillett's treatment of the complex in his enumeration of Ethiopian *Indigofera* species.

De Kort & Thijsse (1984), in their study of the genus in Malesia, produced yet another arrangement of these taxa. They recognised only three infraspecific taxa in *I. trita*, all

at subspecific rank, viz., subsp. *trita*, subsp. *scabra* and subsp. *subulata*, relegating var. *maffeii* to the synonymy of subsp. *subulata*.

Sanjappa (1984) made a study of the Indian members of this complex using the same approach and characters as Ali. He concluded that five varieties should be recognised for India, var. *trita*, var. *maffeii*, var. *scabra*, var. *marginulata* (from a specific name long placed in synonymy) and var. *purandharensis* (newly described). Sanjappa, also, did not adopt Ali's subspecies.

Isely (1982) described a new variety under the illegitimate name *I. mucronata* for a member of this complex in Florida, without any mention of *I. trita*. McVaugh (1987) accepted, also without mention of *I. trita*, the name *I. jamaicensis* for members of this complex in Mexico; both these names were listed as synonyms of *I. trita* subsp. *scabra* by de Kort & Thijssse (1984). Kartesz & Gandhi (1990), on the other hand, accept that the New World material is correctly placed in *I. trita* and recognise Isely's variety in Florida; they did not clearly state their opinion on the applicability or otherwise of the epithet *scabra* to American material.

It is clear from this survey of the literature that there is a great deal of variation in the treatment of this complex in other parts of the world. This complex is currently under review by a number of workers (Schrire, pers. comm.) and it is to be hoped that a consensus view will emerge that is consistent with taxonomic concepts applied elsewhere in the genus.

Most publications by overseas workers (e.g. Ali 1958, Gillett 1971, Sanjappa 1984 and de Kort & Thijssse 1984) list 'Australia' as part of the distribution of *I. trita* var./subsp. *trita*. Only Gillett (1958) remarked on any variability amongst Australian specimens assigned to this taxon.

### ***I. trita* complex in Australia**

Mueller (1862: 103–104) recorded *I. trita* for Australia but his concept included specimens with a range of inflorescence lengths (about 1.5–15 cm) at odds with contemporary concepts of the species. Bentham (1864: 197) also noted a range of inflorescence lengths and stated 'the racemes sometimes short, dense, and nearly sessile, sometimes pedunculate, interrupted, and attaining several inches'; he noted, too, that the leaves were on rare occasions 5-foliolate. Gillett (1958: 101) also remarked that some Australian specimens of *I. trita* were atypical in having more than three leaflets and longer inflorescences.

A number of workers have attempted to deal with this variation. Bailey (1914: 74) described a specimen with five leaflets and inflorescences exceeding the leaves, which he had received from Hughenden, under the name *I. subulata*. Hacker (1990: 188) treated specimens with this combination of features as *I. trita* var. *maffeii*. Domin (1926) described a plant from Hughenden with these features as a new species, *I. ewartiana*. Such plants differ from typical var. *subulata* in having spreading fruits and from typical var. *maffeii* in having a longer staminal tube, and from both of these in having larger, pink (rather than red) flowers and larger fruits, and frequently being 5-foliolate.

Scott (1915) described a Northern Territory plant with slender, more or less decumbent stems, trifoliolate leaves, long inflorescences and slender, spreading fruits as *I. polygaloides*, and Domin (1926) described a similar plant from Rockhampton as *I. amaliae*. These plants differ primarily from all named variants of *I. trita* in having a thickened, perennating tap-root, pink flowers and a rather narrow fruit.

## Distribution of Characters

As indicated in the discussion above, most workers have concentrated on variation in three characters, viz. inflorescence length, leaflet number and angle of fruit relative to the inflorescence axis. In the present study other characters were also found to be informative, viz. habit, flower colour, flower size and fruit size; fruit angle was of limited value in the analysis of the Australian populations. An examination of the available herbarium material in the light of these characters led to the conclusion that three taxa could be recognised. Further, we conclude that the practice of subsuming all variation to varietal or subspecific rank under a single species, *I. trita*, is unworkable with regard to the Australian populations. Such a ranking would be at odds with the treatment of similar variability elsewhere in the genus. We consider that the extent of morphological and, to some extent, ecological differentiation between them and the apparent lack of intergradation is indicative of taxa of specific rank. The three taxa accepted here are *I. trita*, *I. ewartiana* and *I. polygaloides*.

## Key to species

- 1 Inflorescences usually to 40 mm long, mostly shorter than the leaf, peduncle mostly < 4 mm long; flowers red or orange-red; fruit 20–30 mm long, 2–3 mm diam. .... 1. *I. trita*
- 1\* Inflorescences usually 40–150 mm long, longer than the leaf, peduncle  $\geq$  4 mm long; flowers pink to purple; fruit  $\geq$  30 mm long, or < 2 mm diam.
  - 2 Plant annual,  $\pm$  erect; flowers 6–8 mm long; fruit 30–50 mm long, 2.5–3 mm diam.; leaflets 3–5(–7), 10–35 mm long; inflorescence mostly 60–150 mm long ..... 2. *I. ewartiana*
  - 2\* Plant a perennial herb, often prostrate; flowers 4–5.5 long; fruit 20–30 mm long, 1–1.8 mm diam.; leaflets 3, 5–25 mm long; inflorescence mostly 40–120 mm long ..... 3. *I. polygaloides*

### 1. *Indigofera trita* L.f.

(Linnaeus 1782: 335)

TYPE: 'Habitat in India'; holo LINN 923.3, photo NSW.

*I. timorensis* DC. (Candolle 1825: 223). Type: '? in ins. Timor'; holo G-DC n.v., NSW microfiche.

Erect, annual or short-lived perennial herb, mostly 0.15–0.45 m high, with taproot; young stems ridged, green to grey, strigose; hairs moderately dense to dense, hyaline or white, appressed, equally biramous; older stems green to grey, hairs moderately dense. Leaves trifoliolate, (8–)20–35(–47) mm long; petiole (1.5–)4–10(–15) mm long; rachis furrowed, multicellular hairs between leaflet pairs absent or sparse and inconspicuous, orange, pointed-linear; stipellae absent. Leaflets elliptical to obovate; lateral leaflets (5–)8–17(–22) mm long, (2.0–)3.5–7(–10) mm wide, terminal leaflet (5–)10–20(–25) mm long, 2.5–7(–10) mm wide; upper surface green to grey, hairs moderately dense (rarely sparse), appressed or spreading; lower surface green to grey, hairs moderately dense (rarely sparse), appressed; apex obtuse and shortly mucronate. Stipules linear, or narrow and triangular, (1.0–)1.5–3 mm long, pubescent, not persistent. Inflorescence (5–)10–35(–50) mm long, shorter to longer than the leaf; peduncle

0.5–3(–5.0) mm long; bracts narrow-ovate, 0.5–1.5 mm long; pedicel 0.5–1 mm long. Calyx 2.5–5 mm long; hairs moderately dense, grey, appressed; lobes longer to much longer than the tube, subequal, 1.5–4 mm long. Corolla dull or pale red, sometimes orange-red; standard elliptical to obovate, 5–6 mm high, 3.5–4.5 mm wide, hairs moderately dense, hyaline, apex obtuse and mucronate; wing narrow-obovate to spatulate, 5–6 mm long, 1.5–2.3 mm wide; keel 5–5.7 mm long, 1.5–2 mm deep, hairs along the bottom sparse, hyaline or white, apex rounded, lateral pockets present, 0.5–0.9 mm long. Staminal tube colourless, 3–4 mm long. Ovary sparsely to moderately hairy; stigma capitate. Pod spreading to descending, 4-angled, mostly 20–30 mm long, 2–3 mm diam., yellowish to pale brown, strigose, hairs moderately dense, appressed, apex shortly beaked or pointed, endocarp not spotted. Seeds variable, spherical to elongated-cuboid, mostly 8–10 per fruit, 1.5–2.5 mm long, 1–1.5 mm wide.

**DISTRIBUTION AND HABITAT:** Australia (Western Australia, Northern Territory, Queensland — see Figure 1), Indonesia, Burma, Pakistan, India and Sri Lanka. Found in a wide range of habitats: cracking clay, rich loamy or sandy soils on open plains or amongst rocks of various types on hills.

**NOTES:** Citation of the specimen LINN 923.3 as holotype follows Gillett (1958) who considered that this was the only specimen which it was certain had been seen by the younger Linnaeus; this position requires re-evaluation (Schrire, pers. comm.).

A much fuller synonymy is given in de Kort & Thijssse (1984) under subsp. *trita*. In the present study, special attention was paid only to the type of *I. timorensis*; this name, based on a specimen originating from close to Australia, seemed to be the only synonym likely to be applicable to one of the other taxa recognised herein.

The description above is based primarily on specimens from the Pilbara region of Western Australia, since published descriptions seem to indicate that the populations there match the typical form of *I. trita* most closely. These populations may most readily be distinguished from others in Australia by the hairs on the upper surface of the leaflets being appressed and with equally long arms, a character highlighted by de Kort & Thijssse (1984). The following specimens are representative of these populations.

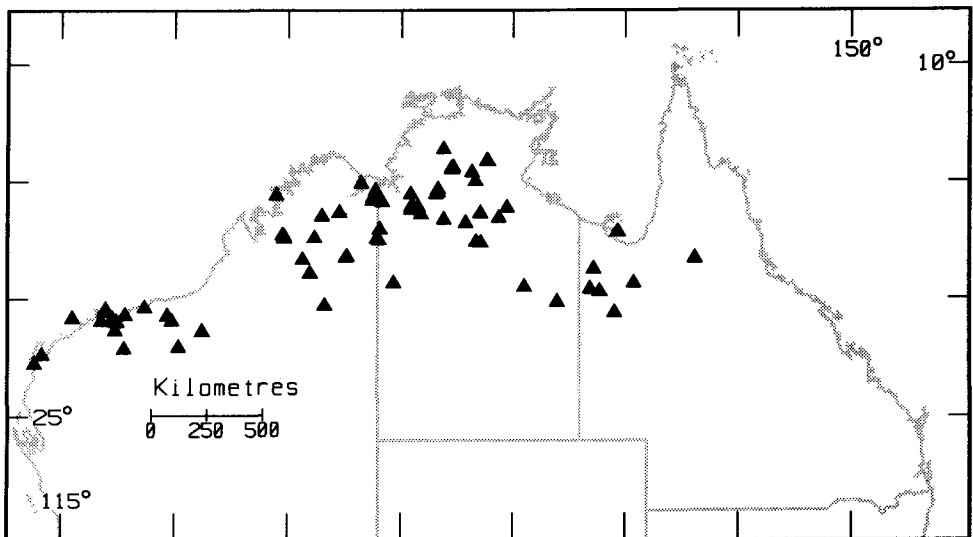


Figure 1. Distribution of *Indigofera trita* in Australia.

SELECTED SPECIMENS: WESTERN AUSTRALIA: Fortescue: Legendre Island, Dampier Archipelago, *Royce* 7259, 9 June 1962 (PERTH); Tanguin Hill, Gregory Range, c. 130 km SE Shay Gap, *Newbey* 10470, 13 July 1984 (CANB). Carnarvon: 23.9 km from Exmouth road on Ningaloo road, *Wilson* 1120 & *Rowe*, 15 Sep 1991 (NSW, PERTH).

The other Australian populations have the hairs on the upper leaflet surface with unequally long arms but also show a significant amount of other morphological variability. Some of this variability may be worthy of recognition at infraspecific rank but such decisions would be dependent on the availability of a broader range of such variant specimens and a more satisfactory resolution of the taxonomy of *I. trita* sens. lat. on a world-wide basis. None of these variants matches any of the infraspecific taxa recognised by workers in other countries. The variation observed amongst herbarium specimens of *I. trita* includes: plant to 1 m high (*Thomson* 942, Gregory National Park); plant with small leaves with very conspicuously spreading hairs (*Dunlop* 5818, Keep River); plants with similar leaves to *Dunlop* 5818 but multistemmed and semi-prostrate (*Hartley* 14460, Weaber Range; *Wilson* 226, Napier Range on limestone); plant with inflorescence to 5 cm long (*Mitchell* 2291, Slate Is.); plant with short fruits, 10–14 mm long (*Dunlop* 4184, near Katherine on limestone); and plant with a few 5-foliolate leaves (*Russell-Smith* 6630, Roper River). The following specimens are representative of the remaining Australian populations:

SELECTED SPECIMENS: WESTERN AUSTRALIA: Gardner: southern slopes of Weaber Range, *Hartley* 14460, 11 Mar 1978 (CANB); Slate Islands, *Mitchell* 2291, 5 Apr 1992 (NSW, PERTH). Fitzgerald: Karunjie Station, *Ritson* 9, Feb 1959 (CANB); Moola Bulla, *Gardner* 10174, 10 May 1951 (PERTH). Dampier: Lennard River, just E of crossing on Gibb River road, *Wilson* 207, 9 May 1988 (NSW, L, PERTH); SW side of Napier Range, *Wilson* 226 & *Jacobs*, 12 May 1988 (NSW, L, PERTH). Hall: Christmas Creek, *Gardner* 9862, 24 Jan 1951 (PERTH). Canning: head of Breaden Valley, Southesk Tableland, *George* 15496, 29 Apr 1979 (PERTH, DNA). NORTHERN TERRITORY: Darwin & Gulf: 11 km NW of Katherine, *Dunlop* 4184, 3 Apr 1977 (DNA, CANB); 4 miles [c. 6.4 km] W Mountain Valley H/S, *Nelson* 243, 10 Apr 1962 (CANB, DNA, MEL, NSW). Victoria River: Keep River, *Dunlop* 5818, 28 Feb 1981 (DNA, CANB); Pondun Waterhole, Muranji Stock Route, *Maconochie* 2301, 10 Jan 1978 (CANB, DNA). Barkly Tableland: 4 miles [c. 6.4 km] ESE of Frewena, *Perry* 661, 29 Apr 1948 (CANB). QUEENSLAND: Burke: 6 miles [c. 9.6 km] E of Undilla Station, *Perry* 1065, 28 May 1948 (BRI, CANB). Cook: Forest Home, Gilbert River, *White* 1340, 10 Feb 1922 (BRI).

## 2. *Indigofera ewartiana* Domin

(Domin 1926: 189)

TYPE: QUEENSLAND: 'Gebüsch und Grasflächen der Rolling Downs am Fusse des Mt. Walker bei Hughenden (Domin II.1910)'; holotype PR 527207.

Erect to spreading, short-lived perennial herb to subshrub, 0.1–0.5(–0.9) m high, with woody rootstock; young stems ridged, grey to green or yellowish, strigose; hairs moderately dense to dense, hyaline to green or golden, appressed, equally biramous; older stems grey to green, hairs sparse to moderately dense. Leaves trifoliolate or 3–5(–7)-foliolate, (12–)25–50(–55) mm long; petiole 4–15 mm long; rachis furrowed, multicellular hairs between leaflet pairs absent, or sparse, inconspicuous, orange (very pale, hyaline to yellowish), club-shaped to pointed-linear; stipellae absent, or inconspicuous, 0.2–1 mm long. Leaflets ovate to elliptical or narrow-elliptical; lateral leaflets (5–)10–30(–38) mm long, (4–)6–12(–16) mm wide, opposite, terminal leaflet (8–)15–35(–40) mm long, (4–)5–15(–17) mm wide; upper surface grey to green, hairs sparse to moderately dense, appressed (rarely spreading); lower surface grey to green, hairs moderately dense, appressed (rarely spreading); apex acute, or obtuse and mucronate. Stipules narrow-triangular to subulate, 2–6 mm long, pubescent, not persistent. Inflorescence (30–)60–150(–240) mm long, longer than leaf; peduncle 4–15(–20) mm long; bracts narrow-triangular, 1–2 mm long; pedicel 0.5–1.5 mm long. Calyx

(1.3-)2-4(-5.5) mm long; hairs sparse to moderately dense, grey or greenish, appressed; lobes longer than the length of the tube (rarely much longer than the tube), subequal to equal, (0.5-)1-2(-3.0) mm long. Corolla pink to purple; standard obovate to elliptical, (5.5-)6.5-8(-9.0) mm high, (3.5-)4.5-6(-8.0) mm wide, hairs sparse to moderately dense, hyaline, or white, apex obtuse (occasionally mucronate); wing narrow obovate to spatulate, (5.0-)6-8(-9.5) mm long, (1.8-)2.5-3.5 mm wide; keel 5-7.5 mm long, 1.5-2.5 mm deep, hairs along the bottom sparse, hyaline, or white, margin ciliate, apex acute and beaked, lateral pockets present, 0.5-1.2 mm long. Staminal tube colourless, 3.5-4 mm long. Ovary sparsely hairy to moderately hairy; stigma capitate. Pod spreading to descending, 4-angled, (10-)30-50 mm long, 2.5-3 mm diam., brown, strigose, hairs sparse to moderately dense, appressed, apex pointed to shortly beaked, endocarp not spotted. Seeds oval to cylindrical, mostly 8-10(-14) per fruit, 1.5-2.8(-3.2) mm long, 1-1.8 mm wide.

**DISTRIBUTION AND HABITAT:** Queensland, Northern Territory, and South Australia (Figure 2). Found almost exclusively on heavy loam soils, cracking clays and black soil plains, particularly in grasslands.

**NOTES:** Domin considered that this species was related to *I. parviflora* (now *Indigastrum parviflorum*, see Schrire 1992) but this was due to the larger number of leaflets and the lack of fruit on his specimens. *Indigastrum parviflorum* differs from this species in having shorter inflorescences, non-angular pods, glabrous corolla and rostrate keel. *Indigofera ewartiana* differs from *I. trita* most conspicuously in having larger, pink (rather than red) flowers and larger fruits. These two species are also ecologically distinct with *I. ewartiana* virtually restricted to heavy soils.

**SELECTED SPECIMENS:** NORTHERN TERRITORY: Darwin & Gulf: approx. 20 miles [c. 32 km] N Daly Waters, *Byrnes 1350*, 4 Feb 1969 (DNA). Barkly Tableland: 15 miles [c. 24 km] E of Brunchilly, *Chippendale 7088*, 17 June 1960 (AD, BRI, CANB, NSW). Central North: 13 miles [c. 20.8 km] SSE Soudan, *Nicholls 875*, 15 June 1968 (BRI, CANB, DNA). SOUTH AUSTRALIA: Lake Eyre: 29 miles [c. 47 km] from Cadelga outstation on Cordillo Downs track, *Lothian 609 & Francis*, 29 Aug 1960 (AD). QUEENSLAND: Burke: 67 km WNW of Mt Isa, 6 km N of Mingera Creek, *Harris 288*, 15 Apr 1989 (BRI, NSW). Gregory North: Breadalbane, N of Bedourie, *Blake 12342*, 23 July 1936 (CANB). Gregory South: Retreat, about 50 miles [c. 80 km] SW of Yaraka, *Heaton s.n.*, Apr 1957 (BRI).

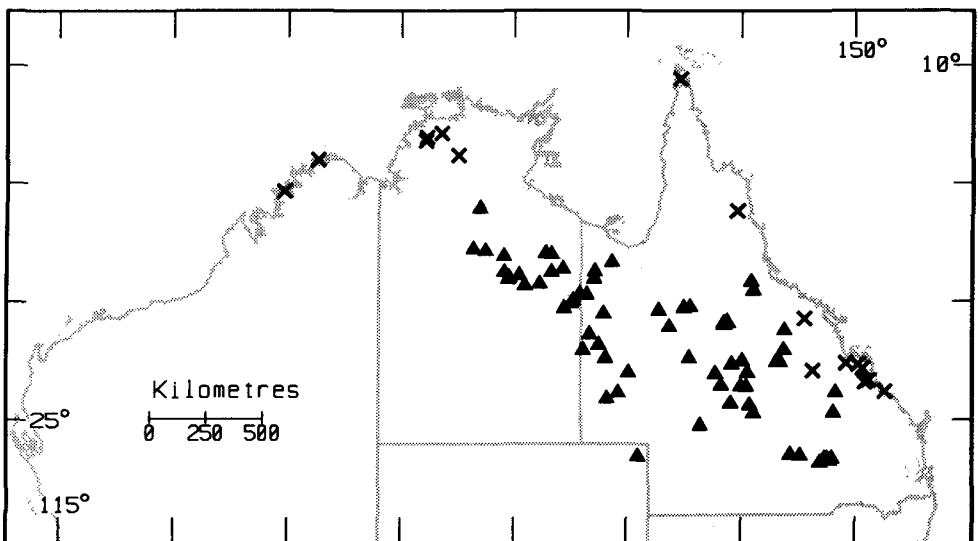


Figure 2. Distribution of *Indigofera ewartiana* (▲) and *Indigofera polygaloides* (x).

Mitchell: Mineeda, 7 miles [c. 11.2 km] E of Blackall, *Everist* 1988, 14 Feb 1940 (BRI). Warrego: Morven, *Blake* 5649, 5651, 1 May 1934 (BRI). South Kennedy: Elgin Downs, *Bisset s.n.*, 7 Nov 1964 (BRI). Maranoa: 8 miles [c. 12.8 km] E of Roma, *Jones* 1941, 19 Apr 1961 (BRI, MEL).

### 3. *Indigofera polygaloides* M. Scott

(Scott 1915: 88) non Gagnepain (1916: 198)

TYPE: NORTHERN TERRITORY: Pine Creek, C.E.F. *Allen* 85, Feb 1914 (holo K, ?iso NSW)

*I. amaliae* Domin (1926: 188). Type: Queensland: [Rockhampton], *Amalie Dietrich* 1854, [Feb 1866]; lecto PR 527202 (here designated); isolecto PR 527203, HBG, CANB 282834, MEL.

Prostrate or suberect perennial herb, 0.1–0.3 m high, with a thickened taproot; young stems ridged, green, strigose; hairs moderately dense, hyaline to white, appressed, equally biramous; older stems green, glabrescent to hairs sparse. Leaves trifoliolate, (12–)5–35(–48) mm long; petiole 3–13 mm long; rachis furrowed, multicellular hairs between leaflet pairs absent; stipellae absent or inconspicuous and 0.3–1 mm long. Leaflets elliptical to obovate; lateral leaflets 5–15(–20) mm long, 3–8(–12) mm wide, opposite, terminal leaflet 5.5–24 mm long, 3–10(–14) mm wide; upper surface green, hairs unequally biramous, sparse to moderately dense, shortly spreading to spreading; lower surface green (paler than above), hairs equally biramous, sparse to moderately dense, appressed; apex obtuse and apiculate. Stipules narrow and triangular, or linear, (1–)2–4 mm long, sparsely pubescent, semi-persistent. Inflorescence (15–)40–120(–360) mm long, longer than leaf; peduncle 5–20(–39) mm long; bracts triangular, 0.5–2 mm long; pedicel 0.5–1 mm long. Calyx (2.0–)2.5–4 mm long; hairs moderately dense, white, appressed; lobes longer than the length of the tube, subequal to equal, (1.2–)1.5–3 mm long. Corolla pink to purple; standard obovate, 4–5 mm high, 3.2–4.7 mm wide, hairs sparse to moderately dense, hyaline to white, apex obtuse; wing narrow obovate to spatulate, 4–5.5 mm long, 1.3–2 mm wide; keel 4.5–5 mm long, 1.2–2 mm deep, hairs along the bottom sparse, hyaline to white, margin ciliate, apex rounded, lateral pockets present, 0.5–1.2 mm long. Staminal tube colourless, 3–4 mm long. Ovary glabrous to sparsely hairy; stigma capitate. Pod ascending to descending, four-angled, (10–)20–30 mm long, 1.5 mm diam., brown, strigose to glabrescent, hairs sparse to moderately dense, appressed, apex acute (sometimes kinked upwards), endocarp not spotted. Seeds cuboid 7–10 per fruit, 1.5–2 mm long, 1 mm wide.

DISTRIBUTION AND HABITAT: Queensland, Northern Territory, and Western Australia (Figure 2). Occurs on stony slopes or plains and generally sandy soils in open woodland or sometimes in cleared areas.

NOTES: The specimen of *Allen* 85 at NSW is a very good match for the type specimen at Kew and could be a piece of the same plant. However, the two labels, both in the collector's own hand, show different localities; 'Pine Creek' on the Kew sheet and 'Bachelor [sic] Farm' on the sheet at NSW. Pine Creek is about 125 km due south-east of Batchelor.

This species is represented by relatively few specimens and hence it is difficult to assess the significance of the variation that is apparent between the types of *I. amaliae* and *I. polygaloides*, and across the geographic range. At present we are treating all specimens as belonging to a single taxon.

Scott distinguished this species from *I. trita* mainly on the basis of its slender habit and very long racemes. This species also differs from *I. trita*, and all its named varieties, in having a thickened tap-root, pink flowers and a very narrow fruit. Geographically, it appears to be restricted to a fairly narrow coastal or subcoastal strip.

The lectotype of *I. amaliae* and its duplicate at PR lack specific collecting details, as do the other specimens originating from HBG; only the duplicate at MEL, which Mueller probably received directly from Amalie Dietrich, has these details.

SELECTED SPECIMENS: WESTERN AUSTRALIA: Gardner: behind Paspaley pontoon in Port George, Mitchell 2328 & Willing, 6 Apr 1992 (NSW, PERTH); Water Supply Creek, Freshwater Bay, Mitchell 2874, 23 Mar 1993 (NSW, PERTH). NORTHERN TERRITORY: Darwin & Gulf: 4 miles [c. 6.4 km] SW Stapleton Railway Siding, Muspratt 104, 4 Mar 1963 (DNA, MEL, NSW); 40 miles [c. 64 km] E Pine Creek, Byrnes 1342, 29 Jan 1969 (DNA); 2 km E of Bark Hut, Cowie 1377 & Booth, 8 Feb 1991 (NSW). QUEENSLAND: Cook: Horn Island, Clarkson 6477, 10 Apr 1986 (BRI, MBA, NSW); 10 km south of the Palmer River crossing on the Peninsula Development road, Clarkson 6667 & McDonald, 4 Mar 1987 (BRI, MBA, NSW, QRS). Port Curtis: 'Nullegar', about 2 km west of house, Anderson 854, 19 Apr 1979 (BRI); 'The Springs', 20 km N of Glen Geddes, Anderson 2944, 2 Mar 1982 (BRI); Neerkool [Neerkol] Creek, Bowman 127, - (MEL). North Kennedy: Bowen River, *unknown coll.*, - (MEL). Leichhardt: Peak Downs, *Mueller s.n.*, - (MEL, NSW).

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