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Additional taxa of *Indigofera* (Fabaceae: Indigofereae) from the Eremaean Botanical Province, Western Australia

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Abstract

Wilson, P.G. & Rowe, R. Additional taxa of *Indigofera* (Fabaceae: Indigofereae) from the Eremaean Botanical Province, Western Australia. *Nuytsia* 25: 251–284 (2015). Twelve new species of *Indigofera* L. are described from the Eremaean Botanical Province: *I. chamaeclada* Peter G.Wilson & Rowe, *I. cuspidata* Peter G.Wilson & Rowe, *I. decipiens* Peter G.Wilson & Rowe, *I. eriophylla* Peter G.Wilson & Rowe, *I. fractiflexa* Peter G.Wilson & Rowe, *I. gilesii* Peter G.Wilson & Rowe, *I. kingiana* Peter G.Wilson & Rowe, *I. melanosticta* Peter G.Wilson & Rowe, *I. occidentalis* Peter G.Wilson & Rowe, *I. oraria* Peter G.Wilson & Rowe, *I. roseola* Peter G.Wilson & Rowe and *I. warburtonensis* Peter G.Wilson & Rowe. A lectotype is designated for the name *I. boviperda* Morrison and three new subspecies, *I. boviperda* subsp. *eremaea* Peter G.Wilson & Rowe, *I. fractiflexa* subsp. *augustensis* Peter G.Wilson & Rowe and *I. chamaeclada* subsp. *pubens* Peter G.Wilson & Rowe, are recognised.

Introduction

The genus *Indigofera* L. has a world-wide distribution and is the third largest genus of legumes with *c.* 750 species. The majority of the species are in the African region but there are significant numbers of species in Asia and lesser numbers in both Australia and the Americas. In Australia there are over 50 endemic species, a number of native species that have wide extra-Australian distributions, and at least ten introduced taxa. Gardner (1930) listed only 13 species of the genus for Western Australia, and this rose to 18 in the second edition of the state's census of plant names (Green 1985). Green's publication included the first new species described for the state in over 30 years, *I. ammobia* Maconochie (Maconochie 1980), and there have subsequently been significant advances in our knowledge of the genus. Schrire (1992) revived the segregate genus *Indigastrum* Jaub. & Spach from synonymy and transferred the native species *Indigofera parviflora* Wight & Arn. to it, and more recently we (Wilson & Rowe 2004) described four new species that occur in the state: *I. ixocarpa* Peter G.Wilson & Rowe, *I. petraea* Peter G.Wilson & Rowe, *I. pilifera* Peter G.Wilson & Rowe and *I. rupicola* Peter G.Wilson & Rowe. In the same period of time, there were three newly recorded adventives: *I. oblongifolia* Forssk. (first collected in Port Hedland in 1982), *I. sessiliflora* DC. (first collected in Port Hedland in 1991) and *I. hochstetteri* Bak. (first collected south of Port Hedland in 2004). In this paper, a further 12 species and three subspecies are named from the Eremaean Botanical Province of Beard (1980). Most of the new taxa are found within the Pilbara, Carnarvon, Gascoyne, and Murchison *Interim*

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Biogeographic Regionalisation for Australia (IBRA) bioregions (Department of the Environment 2013) but a few occur in the Yalgoo, Coolgardie, Central Ranges, Little Sandy Desert, Great Sandy Desert, and Gibson Desert bioregions. The range of one species extends into the northern part of the Geraldton Sandplains bioregion (Southwest Botanical Province). These new species and subspecies account for the majority of unnamed taxa from the Eremaean Botanical Province. Chief amongst the taxa that remain unnamed are a number of segregates from *I. monophylla* DC. *s. lat.* that require further study and are still not fully resolved.

Terminology

The terminology used here is as in our recent papers (Wilson & Rowe 2004, 2008, 2010). Hair density on leaves, in particular, is important in negotiating the key: hairs are described as sparse if they are well separated and the leaf surface is clearly visible, they are described as dense if the leaf surface is obscured, and moderately dense if the density falls between these extremes. Since petals are readily shed, we have attempted to avoid floral features as much as possible in the key. However, staminal tube length is often used as a surrogate for flower size since the staminal tube virtually always persists into fruiting.

Bioregion terminology follows IBRA Version 7 (Department of the Environment 2013).

Key to Indigofereae of Western Australia

1. Standard glabrous; keel rostrate, with a narrow, drawn-out tip; pod somewhat bilaterally flattened; partitions between seeds membranous, endocarp never spotted..... **Indigastrum**

1: Standard with hairs on back; keel only rarely rostrate; pod usually ± round in section (rarely flat and appearing jointed, or somewhat tetragonal); partitions between seeds (when present) usually pithy, endocarp often spotted..... **Indigofera**

Key to species of *Indigofera* in eremaean Western Australia

1. Leaves all unifoliolate or apparently simple **2**

1: Leaves pinnate or trifoliolate..... **7**

2. Leaves apparently simple **3**

2: Leaves unifoliolate, articulate on the petiole..... **5**

3. Pod at least 10 mm long; flowers pink to purple **4**

3: Pod to 3 mm long; flowers red ..... **I. linifolia**

4. Stems covered with small wart-like protuberances; pods viscid..... **I. ixocarpa**

4: Stems lacking wart-like protuberances; pods not viscid ..... **I. ammobia**

5. Leaves densely grey- or white-tomentose; inflorescences to *c.* 45 mm long **6**

5: Leaves grey or greenish, hairs sparse to moderately dense, appressed or spreading; inflorescences often to 120 mm long..... **I. monophylla** s. lat.

6. Leaf with conspicuously impressed veins; calyx lobes 3.5–5.5 mm long; corolla 6–10 mm long..... **I. rugosa**

6: Leaf lacking conspicuously impressed veins; calyx lobes 1.4–2.3 mm long; corolla 3–4 mm long..... **I. petraea**

7. Leaves all trifoliolate (rarely some 1- or 5-foliolate) **8**

7: Leaves pinnate (occasional leaves with 3 leaflets may occur) **9**

8. Leaflets with appressed hairs; pod 4-angled..... **I. trita**

8: Leaflets with spreading hairs; pod terete..... **I. boviperda** subsp. **eremaea**

9. Leaflets alternate..... **10**

9: Leaflets usually regularly opposite..... **12**

10. Pod short, straight, usually <10 mm long; seeds 2–4..... **11**

10: Pod curved, 10–30 mm long; seeds 4–8..... **I. oblongifolia**

11. Sepals distinctly fused at base, to 0.5 mm wide; staminal tube 2.5–3.2 mm long..... **I. linnaei**

11: Sepals only slightly fused at base, to 0.2 mm wide; staminal tube 1.5–1.8 mm long..... **I. sessiliflora**

12. Pods flattened ..... **I. hochstetteri**

12: Pods ± terete **13**

13. Plants with gland-tipped hairs, at least on the pod ..... **I. colutea**

13: Plants lacking gland-tipped hairs **14**

14. Leaflets mostly 15 or more..... **15**

14: Leaflets usually 5–11 ..... **16**

15. Inflorescence to 200 mm or more..... **I. occidentalis**

15: Inflorescence <100 mm long ..... **I. australis** subsp. **hesperia**

16. Upper surface of leaflets glabrous or sparsely hairy **17**

16: Upper surface of leaflets moderately to densely hairy **21**

17. Stipules persistent and spinescent or thickened at the base..... **18**

17: Stipules sometimes persistent but not markedly thickened at the base or spinescent **19**

18. Stipules persistent and spinescent; bracts caducous..... **I. helmsii**

18: Stipules with conspicuous, thickened bases; bracts ± persistent..... **I. warburtonensis**

19. Young stems flexuose; staminal tube 3–4.5 mm long ..... **I. fractiflexa**

19: Young stems not flexuose; staminal tube 4.5–6 mm long..... **20**

20. Leaflets usually narrowly elliptical, 3–7 mm wide; calyx lobes usually ≤ 1 mm long ..... **I. kingiana**

20: Leaflets obovate to elliptical, 5–12 mm wide; calyx lobes usually 1–2.5 mm long..... **I. georgei**

21. Staminal tubes ≥ 5 mm long..... **22**

21: Staminal tubes ≤ 5 mm long (if *c.* 5 mm long, plants decumbent) **27**

22. Leaflets 1.5–3.5 mm wide ..... **I. cuspidata**

22: Leaflets usually at least 5 mm wide **23**

23. Leaflets usually 5–7 (rarely 3 or 9); stipules not thickening **24**

23: Leaflets usually 9–13 (rarely 5); stipules becoming thickened **26**

24. Terminal leaflet sessile; flowers pink ..... **I. roseola**

24: Terminal leaf not sessile; flowers red **25**

25. Mature foliage silvery grey, with dense, appressed hairs; stipules *c.* 1 mm long ..... **I. oraria**

25: Mature foliage greenish to grey, hairs variably dense, with ends spreading; stipules 1.5–2.5 mm long ..... **I. georgei**

26. Inflorescences mostly 15–50 mm long; flowers pink ..... **I. cornuligera**

26: Inflorescences mostly 60–100 mm long when fully expanded; flowers reddish pink ..... **I. gilesii**

27. Stipules linear-subulate, usually >5 mm long; pod deflexed, densely clothed with spreading hairs *c.* 1 mm long ..... **I. hirsuta**

27: Stipules narrowly triangular to subulate, ≤ 5 mm long; pod ascending to descending, with hairs ≤ 0.5 mm long **28**

28. Leaflets with veins impressed above and prominent below ..... **I. boviperda** subsp. **boviperda**

28: Leaflets without such conspicuous veins **29**

29. Young stems with scattered, distinctly pigmented hairs giving a speckled appearance ..... **I. melanosticta**

29: Young stems not as above (but if so, inflorescences ≤ 70 mm long) **30**

30. All vegetative parts very densely tomentose; leaflets 3–5; inflorescences to 135 mm long ..... **I. eriophylla**

30: Branchlets with appressed or sparse to moderately dense, ± spreading hairs **31**

31. Leaflets (3–)5–7; inflorescences to 100 mm long **32**

31: Leaflets (5–)7–9(–13); inflorescences 50–180(–280) mm long ..... **I. psammophila**

32. Branchlets with dense, ± appressed hairs obscuring the stem surface; pods often ascending ..... **I. chamaeclada**

32: Branchlets with sparse to moderately dense, ± spreading hairs (stem surface visible); pods descending ..... **I. decipiens**

Taxonomy

Indigofera boviperda Morrison, *J. Bot.* 50: 166 (1912). *Type citation*: 'Ashburton River, North-west Australia.' *Type*: Minderoo, Ashburton River, Western Australia, 8 October 1905, *A. Morrison s.n.* (*lecto*: E 00022289, here selected; *isolecto*: CANB 320124, K 000217439, PERTH 01022695). *Residual syntype*: between Globe Hill and Uaro [Uaroo], Ashburton River, Western Australia, 1 October 1905, *A. Morrison s.n.* (E 00022290, K 000217440).

Erect, spreading or decumbent *subshrub* or perennial *herb*, 0.15–0.7 m high and to 1 m wide, with woody rootstock; young stems terete, green to grey or yellowish brown, hirsute or tomentose with very dense, hyaline, white, green, golden or red-brown, appressed to spreading, equally or unequally biramous hairs and some red-brown, linear, multicellular hairs; older stems grey, green, yellowish or brown; hairs dense. *Leaves* pinnate, with (1–)3–9 leaflets, 9–45 mm long; stipules narrowly triangular or lanceolate, 1.2–3.7 mm long, pubescent, not spinescent, not persistent; petiole 2.5–10 mm long; rachis furrowed often slightly and appearing terete due to dense hairs; multicellular hairs between leaflet

pairs absent or present and then moderately dense or dense, conspicuous or inconspicuous, orange to red or brown, pointed-linear. *Leaflets* opposite; stipellae absent, inconspicuous or conspicuous, to 1.2 mm long; lamina obovate (some broadly), (2.5–)4–13.5(–20) mm long, 2.5–10 mm wide; upper surface grey to green; hairs moderately dense to dense, appressed to shortly spreading or spreading; lower surface grey to green, generally paler than above; hairs dense, appressed to spreading; apex obtuse and mucronate; veins prominent below, slightly impressed above. *Inflorescences* 15–150 (–220) mm long, longer than leaves; peduncle 4–26(–36) mm long; bracts ovate, triangular or subulate, 0.8–2.7(–3.5) mm long; flowers pink to purple; pedicel 0.5–1.2 mm long. *Calyx* 1.6–3.9 mm long, with unequal or subequal lobes, 0.8–1.9 mm long, equal to longer than the length of the tube, clothed with moderately dense to dense, white, grey or brown, appressed to shortly spreading hairs. *Standard* pink, with a paler spot at base, ovate or broadly elliptical, (4.1–)4.6–6.9 mm high, 3.2–5.6 mm wide; hairs dense, hyaline, golden or brown; apex obtuse and mucronate, some acute. *Wings* spathulate or narrowly obovate, 3.3–6.5 mm long, 1.1–2.5 mm wide. *Keel* 4.3–7 mm long, 1.3–2.4 mm deep; apex generally acute; lateral pockets 0.5–1.5 mm long; upper margin ciliate; tip and adjacent abaxial surface with moderately dense to dense, hyaline, golden or brown hairs. *Staminal tube* 2.7–4.2 mm long, colourless or free ends and tube pigmented. *Ovary* glabrous to densely hairy. *Pods* generally descending, terete, 15–27 mm long, 2–2.5 mm deep, grey to brown, hirsute; hairs dense, shortly spreading to spreading; apex shortly beaked; endocarp spotted. *Seeds* cylindrical, laterally compressed, 3–8 per pod, 1.4–2.1 mm long, 1.2–1.5 mm wide.

Notes. This species occurs in the same general area as *I. melanosticta* and *I. chamaeclada* but can be readily distinguished from them by the venation which is prominent below and slightly impressed above. The pod is cylindrical and not subtorulose.

The species name is a reference to its implication in the death of a large number of cattle that had apparently grazed on it. In the protologue, Morrison states that a preliminary analysis of the plant showed the presence of a poisonous alkaloid. As far as we are aware, no more recent analysis of this plant has been carried out. However, Gardner and Bennetts (1956) express doubt that an *Indigofera* could have caused the deaths and suggest that a species of *Euphorbia* was more likely to have been responsible.

In a follow-up note, Ewart and Morrison (1913: 156, pl. xiv) attributed specimens of *I. georgei* and *I. roseola* to this species. As a result, *I. boviperda* was at times considered a possible synonym of *I. georgei* (e.g. by Maconochie 1981).

Two geographically separated subspecies are recognised.

Key to subspecies

1. Leaves mostly pinnate, leaflets 5–9 (rarely 3)..... subsp. **boviperda**

1: Leaves predominantly trifoliolate (rarely 1- or 5-foliolate) ..... subsp. **eremaea**

Indigofera boviperda Morrison subsp. **boviperda**

Decumbent, spreading or erect *subshrub*, 0.15–0.7 m high; young stems hirsute with very dense, appressed to spreading hairs. *Leaves* pinnate, with (3–)5–9 leaflets; stipules narrowly triangular or lanceolate, 1.2–2.3(–3.5) mm long; petiole 2.5–10 mm long; rachis furrowed. *Leaflets* obovate, (2.5–)4–13(–20) mm long, 2.5–10 mm wide; upper surface of lamina with appressed to shortly

spreading hairs, lower surface with appressed to spreading hairs; stipellae absent or inconspicuous and 0.4–1.2 mm long. *Inflorescences* (15–)40–150(–220) mm long; peduncle 4–26(–36) mm long; bracts ovate, triangular or subulate, (1–)1.5–2.7(–3.5) mm long. *Calyx* 1.7–3.9 mm long. *Standard* ovate or broadly elliptical, (4.1–)5–6.9 mm high, 3.2–5.6 mm wide. *Wings* narrowly obovate or spathulate, 3.3–6.5 mm long, 1.1–2.5 mm wide. *Keel* 4.4–7 mm long, 1.3–2 mm deep; lateral pockets 0.5–1.5 mm long. *Staminal tube* 2.7–4.2 mm long. *Pods* 15–27 mm long, 2–2.5 mm deep; apex shortly beaked. *Seeds* 3–8 per pod.

Selected specimens examined. WESTERN AUSTRALIA: 12 miles [*c.* 19.2 km] S of Onslow, 28 May 1962, *T.E.H. Aplin* 1611 (PERTH); Vlaming Head, North West Cape, 5 Aug. 1991, *B.G. Briggs* 8806 *& L.A.S. Johnson* (MO, NSW, PERTH, PRE); 79 miles [*c.* 128 km] S of Learmonth, 2 June 1961, *A.S. George* 2408 (PERTH); Barrow Island, 2 July 1964, *D.W. Goodall* 1327 (PERTH); 40 km W of Ashburton Downs, 27 June 1976, *A.A. Mitchell* 76/167 (BRI, PERTH); *c.* 20 km W of Yarraloola Homestead near Jungle Bore, 14 Sep. 1995, *A.A. Mitchell* PRP 810 (NSW, PERTH); Tom Price–Nanutarra Rd, *c.* 30 km E of Nanutarra, 2 May 1977, *R. Pullen* 10945 (CANB); 10 km E of Minilya River, Middalya Station, 16 Sep. 1991, *Peter G. Wilson* 1130 *& R. Rowe* (CANB, K, NSW, PERTH).

Distribution and habitat. Western Australia: mostly on red sand or sandy loam, of interdunes or plains. Also recorded from calcareous substrates and braided stream channels. Current records are from the Carnarvon, Pilbara and Gascoyne bioregions (Figure 1).

Conservation status. Not considered to be at risk.

Indigofera boviperda subsp. **eremaea** Peter G.Wilson & Rowe, *subsp. nov.*

A *Indigofera boviperda* subsp. *boviperda* foliis ordinate trifoliolatis differt.

Typus: 1 mile north of Stag Arrow Creek, Western Australia, 16 May 1947, *R.D. Royce* 1709 (*holo*: PERTH).

Indigofera boviperda subsp. Eremaea (E.M. Goble-Garratt 186), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed September 2014].

Erect, spreading or decumbent, perennial *herb* or *subshrub*, 0.25–0.6 m high, to 1 m wide; young stems tomentose with very dense, spreading hairs. *Leaves* trifoliolate (rarely unifoliolate or 5–foliolate); stipules narrowly triangular, 1.5–3.7 mm long; petiole 3–7(–10) mm long; rachis slightly furrowed and often appearing terete due to dense hairs. *Leaflets* obovate to broadly obovate, 4.5–13.5 mm long, 3–9 mm wide, upper and lower surfaces of lamina with dense, spreading hairs; stipellae absent or small, to 0.4(–0.8) mm long. *Inflorescences* 15–75(–105) mm long; peduncle 6–17 mm long; bracts narrowly triangular, 0.8–1.5 mm long. *Calyx* 1.6–2.6 mm long. *Standard* ovate, 4.6–6.5 mm high, 3.5–5.6 mm wide. *Wings* spathulate, 4–6 mm long, 1.1–1.7 mm wide. *Keel* 4.3–5.8 mm long, 1.5–2.4 mm deep; lateral pockets 0.8–1.3 mm long. *Staminal tube* 3.5–4.2 mm long. Pod 15–20 mm long, *c.* 2 mm deep (no mature pods available). *Seeds* 6–8 per pod.

Selected specimens examined. WESTERN AUSTRALIA: near Rudall River, 23 May 1971, *A.S. George* 10820 (CANB, NSW, PERTH); McLarty Hills, Great Sandy Desert, 6 Aug. 1977, *A.S. George* 14687

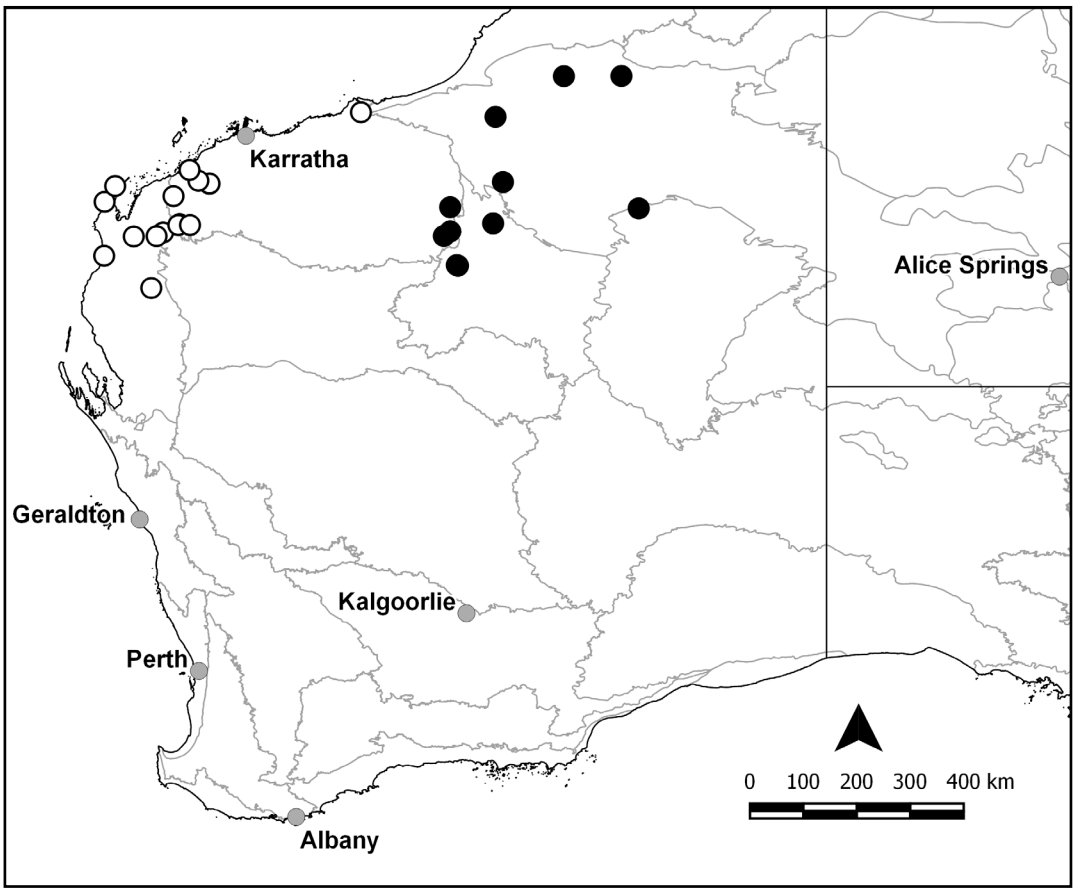

Figure 1. Distribution of *Indigofera boviperda* subsp. *boviperda* (○) and subsp. *eremaea* (●).

(DNA, PERTH); 33 km NE of Mt Divide Homestead, 29 June 1996, *A.A. Mitchell* PRP 1244 (NSW, PERTH); Anketell Ridge, Great Sandy Desert, 14 May 1979, *A.S. Mitchell* 1154 (DNA, PERTH); Kidson Basin, July 1966, *J. Stewart s.n.* (PERTH); 6.5 km W of Old Talawana Well, 6 Sep. 1991, *Peter G. Wilson* 985 *& R. Rowe* (AD, CANB, NSW, PERTH).

Distribution and habitat. Western Australia: found on sand plains in and around the Great Sandy Desert, in the Pilbara, Little Sandy Desert, Great Sandy Desert and Gibson Desert bioregions (Figure 1).

Conservation status. Not considered to be at risk.

Etymology. The epithet is derived from the Greek *eremaios*, desolate or deserted, a reference to the inland habitat of this subspecies.

Affinities. *Indigofera boviperda* subsp. *eremaea* can be distinguished from the type subspecies by the usually trifoliolate leaves.

Indigofera chamaeclada Peter G.Wilson & Rowe, *sp. nov.*

Indigoferae boviperdae et *I. melanostictae* similis sed inflorescentiis brevioribus, fructibus subtorulosis plerumque ascendentibus, differt.

Typus: *c.* 24 km south of Meekatharra on Great Northern Highway, Western Australia, 19 September 1991, *Peter G. Wilson* 1162 *& R. Rowe* (*holo*: NSW 249937; *iso*: CANB, PERTH).

Indigofera sp. Chamaeclada (G.J. Keighery & N. Gibson 1224), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed September 2014].

Prostrate, perennial *herb*, to 0.2 m high, with woody rootstock or taproot; young stems ridged, yellowish brown or green-grey (often with numerous dark brown hairs), strigose with dense, appressed, equally biramous hairs. *Leaves* pinnate, with (3–)5–7 leaflets, (10–)20–50 mm long; stipules narrowly triangular or subulate, 1.5–5 mm long, pubescent, not spinescent, not persistent; petiole 2–10 mm long; rachis furrowed; multicellular hairs between leaflet pairs sparse to moderately dense, inconspicuous to conspicuous, red, pointed-linear. *Leaflets* opposite; stipellae inconspicuous, 0.3–1 mm long; lamina obovate, (2–)4–20 mm long, (1.5–)2–10 mm wide; upper and lower surface grey-green (generally paler below), with moderately dense to dense, appressed to shortly spreading hairs; apex obtuse and emarginate or shortly mucronate; veins not prominent. *Inflorescences* 8–70 mm long, shorter to longer than leaves; peduncle 3–20 mm long; bracts ovate to triangular, 1–3 mm long; flowers pink to purple; pedicel 0.3–2 mm long. *Calyx* 2–4 mm long, with subequal to equal lobes 1–2.5 mm long, less than to longer than the length of the tube, clothed with moderately dense to dense, grey to almost black, appressed to spreading hairs. *Standard* purple to pink, orbicular, obovate or ovate, 5.2–8.8 mm high, 4.2–8 mm wide; hairs moderately dense to dense, hyaline to dark brown; apex obtuse. *Wings* spathulate to narrow-obovate, 5–8.7 mm long, 1.5–3 mm wide. *Keel* 5–8 mm long, 1.6–2.5 mm deep; apex acute to rounded; lateral pockets 0.7–1.7 mm long; upper margin ciliate; tip and adjacent abaxial surface with sparse to moderately dense, hyaline to dark brown hairs. *Staminal tube* 3.3–5 mm long, free ends and tube pigmented. *Ovary* moderately to densely hairy. *Pod* ascending to spreading, rarely descending, terete and somewhat torulose, (15–)20–28 mm long, 2–3 mm deep, brown, pubescent to tomentose or strigose; hairs moderately dense, appressed or shortly spreading; apex shortly pointed to shortly beaked; endocarp spotted. *Seeds* cuboid to cylindrical, 8–11 per pod, 1.5–2 mm long, 1.5 mm wide.

Etymology. The name is derived from the Greek *chamae*-, on the ground, and *clados*, branch or shoot, with reference to the low-growing habit.

Affinities. This species is distinguished from other species in the area with a similar habit by having pods that are usually ascending. In addition to this, it differs from *I. boviperda* by the shorter inflorescences, lack of prominent venation on the undersurface of the leaflets and by the somewhat torulose pods. It differs from *I. melanosticta* Peter G.Wilson & Rowe by the shorter inflorescences also, as well as by the lack of conspicuous 'speckles' on the young stems. Two subspecies are recognised; these can be distinguished using the key below.

Key to subspecies

1. Lower surface of leaflets with appressed hairs; inflorescence 8–35 mm long; standard 6.5–8.8 mm long, 6–8 mm wide; staminal tube 4–5 mm long.....subsp. **chamaeclada**

1: Lower surface of leaflets with spreading hairs; inflorescence 30–70 mm long; standard 5.2–6.2 mm long, 4.2–5.5 mm wide; staminal tube 3.3–4 mm long.....subsp. **pubens**

Indigofera chamaeclada Peter G.Wilson & Rowe subsp. **chamaeclada**

Prostrate, perennial *herb*, to 0.05 m high; young stems slightly ridged, green or grey (often with numerous dark brown hairs), strigose with dense, appressed, equally biramous hairs. *Leaves* pinnate, with (3–)5–7 leaflets; stipules subulate, 1.5–3 mm long, pubescent; petiole 2.5–8.5 mm long. *Leaflets* 4–13(–19) mm long, 2–7(–9.5) mm wide; upper and lower surface of lamina green or grey, with dense, appressed hairs; apex obtuse and emarginate or shortly mucronate; stipellae 0.5–1 mm long. *Inflorescences* 8–35 mm long; peduncle 3–11 mm long; bracts ovate or triangular (often narrowly), 1–3 mm long; pedicel 1–2 mm long. *Calyx* 2–4 mm long; lobes subequal, less than or equal to the length of the tube; hairs dense, grey or almost black, appressed. *Standard* purple, orbicular or broadly ovate, 6.5–8.8 mm high, 6–8 mm wide. *Wings* (6–)7–8.7 mm long, 2–3 mm wide. *Keel* 6.5–8 mm long, 2–2.5 mm deep; apex acute; lateral pockets 0.9–1.7 mm long; tip and adjacent abaxial surface with moderately dense, hyaline to dark brown hairs. *Staminal tube* 4–5 mm long. *Ovary* densely hairy. *Pod* ascending to spreading, (15–)20–28 mm long, 2.5–3 mm deep, brown, strigose; hairs moderately dense, appressed.

Selected specimens examined. WESTERN AUSTRALIA: Mt Augustus, on flats near homestead, 23 July 1986, *M.G. Corrick* 9870 (MEL); Long Pool, 'Boolardy', 21 Aug. 1950, *A.W. Humphries s.n.* (PERTH); along fence, 10 km N of Mooloogool Homestead, 29 Aug. 1985, *A.A. Mitchell* 1398 (PERTH); Mt Clere Station, Range monitoring site 29, 22 Apr. 1985, *J. Stretch* 22 (PERTH); 5.1 km E of Chiddle Well, Sherwood Station, 18 Sep. 1991, *Peter G. Wilson* 1158 *& R. Rowe* (K, NSW, PERTH).

Distribution and habitat. Western Australia: has been recorded as growing on sand banks, on red clayey sand in open scrub, and along flow lines in the Gascoyne and Murchison bioregions (Figure 2).

Conservation status. Not considered to be at risk.

Indigofera chamaeclada subsp. **pubens** Peter G.Wilson & Rowe, *subsp. nov.*

A subsp. *chamaeclada* foliolis indumento subter patenti, inflorescentia plerumque longiore, vexillo minori et tubo staminum breviore differt.

Typus: 20 km north of Carnarvon, Western Australia, 17 October 1991, *A.A. Mitchell* 1888 (*holo*: NSW 252426; *iso*: PERTH).

Prostrate or spreading, perennial *herb*, 0.05–0.2 m high; young stems ridged, yellowish brown or green to grey, pubescent or tomentose with dense to very dense, appressed to spreading, equally biramous hairs. Leaves pinnate, with 5–7 leaflets; stipules narrowly triangular, 1.5–5 mm long, pubescent; petiole 2–10 mm long. *Leaflets* (2–)5–20 mm long, (1.5–)3–10 mm wide; upper surface of lamina grey to green, with moderately dense, appressed to shortly spreading hairs, lower surface grey to green (generally paler than above), with moderately dense, shortly spreading hairs; apex obtuse and mucronate; stipellae 0.3–0.8 mm long. Inflorescences (10–)30–70 mm long; peduncle 3–20 mm long; bracts ovate to triangular, 1.5–2.5 mm long; pedicel 0.3–0.8 mm long. *Calyx* 2–3.5 mm long; lobes subequal to equal, equal to or longer than the length of the tube; hairs moderately dense, grey to brown, appressed to spreading. *Standard* purple to pink, obovate to orbicular (rarely ovate), 5.2–6.2 mm high, 4.2–5.5 mm wide. *Wings* 5–5.5 mm long, 1.5–2.2 mm wide. *Keel* 5–5.5 mm long, 1.6–2 mm deep; apex acute to rounded; lateral pockets 0.7–1 mm long; tip and adjacent abaxial surface with sparse, hyaline to brown hairs. *Staminal tube* 3.3–4 mm long. *Ovary* moderately hairy. *Pod* usually ascending (sometimes descending), 20–25 mm long, 2–2.5 mm deep, brown, pubescent or tomentose; hairs moderately dense, shortly spreading.

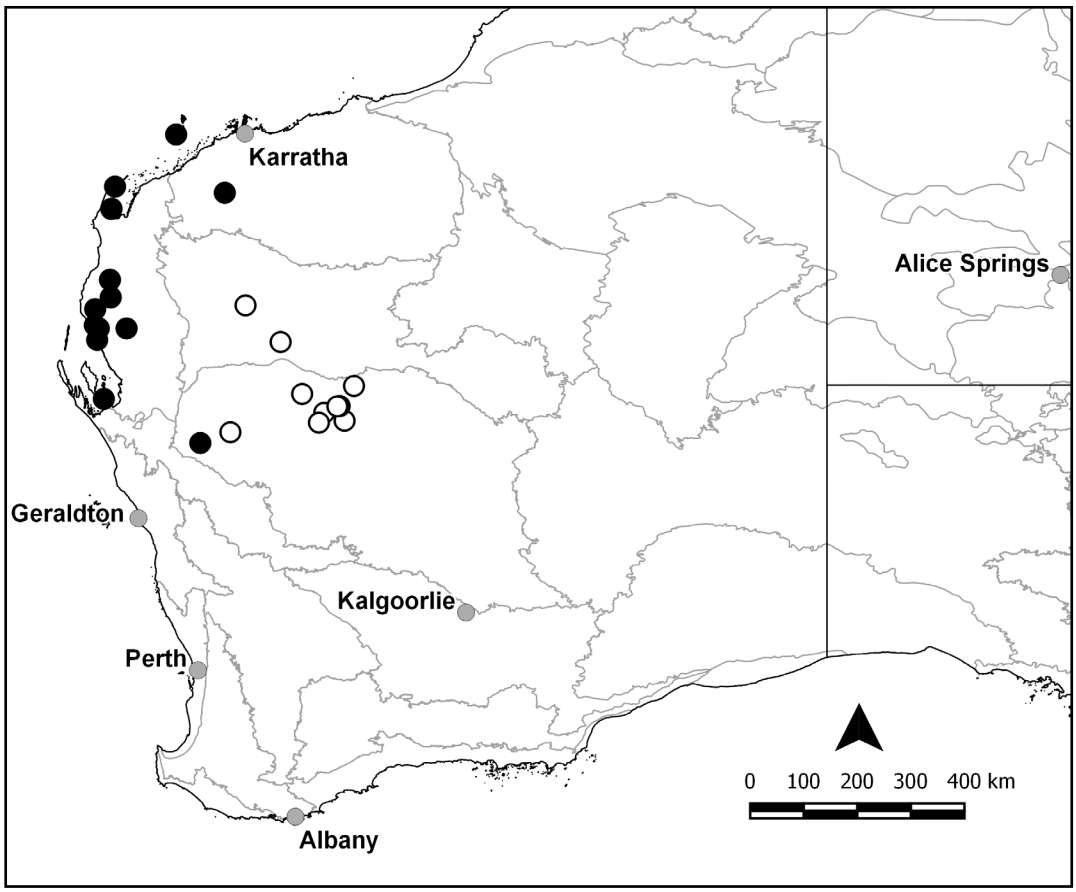

Figure 2. Distribution of *Indigofera chamaeclada* subsp. *chamaeclada* (○) and subsp. *pubens* (●).

Selected specimens examined. Western Australia: 563 miles, North West Coastal Hwy, 13 June 1970, *A.M. Ashby* 3196 (AD, KRA, PERTH); 548 mile peg W side of North West Coastal Hwy, 25 June 1975, *A.M. Ashby* 5166 (AD, CANB, PERTH); Fortescue: Barrow Island, 24 Aug. 1973, *W.H. Butler* 121 (PERTH); Hamersley Range, near Mt Rica, 26 Oct. 1941, *C.A. Gardner* 6427 (PERTH); Minilya River, N of Shark Bay, 1882, *J. Forrest s.n.* (MEL 586686); 1 km W of Wogatti Well, Exmouth Gulf Station, 15 Sep. 1991, *Peter G. Wilson* 1118 *& R. Rowe* (AD, CANB, NSW, PERTH).

Distribution and habitat. Western Australia: mostly found in the Carnarvon bioregion, with a few records from the adjacent Pilbara and Murchison bioregions (Figure 2). Collections were largely from shrubland on red sand country and dunes; at the only upland site, near Mt Rica in the Hamersley Range, the vegetation and soil type was not recorded.

Conservation status. Not considered to be at risk.

Etymology. The epithet is derived from the Latin *pubens*, meaning 'pubescent' but also 'flourishing', a reference to the spreading indumentum and more erect habit of this taxon compared to subsp. *chamaeclada*.

Notes. There is some variation; the cited specimens from Barrow Island and Wogatti Well, near Exmouth, are atypical in having descending pods. Another specimen, collected along the road to Denham (*P.G. Wilson* 1210 *& R. Rowe*), lacks subtorulose pods and may represent an intergrade with *I. boviperda*.

Indigofera cuspidata Peter G.Wilson & Rowe, *sp. nov.*

A *Indigofera fractiflexa* foliolis angustioribus, floribus maioribus, fructibus cuspidatis plus pilosisque differt.

Typus: Sipa Gold Mining Lease, south of Turee Creek, Western Australia, 8 June 2006, *Peter G. Wilson* 1776 *& E. Toma* (*holo*: NSW 734107; *iso*: K, PERTH 08028583).

Indigofera sp. Cuspidata (Peter G. Wilson & E. Thoma PGW 1776), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed September 2014].

Erect *shrub*, 1–2 m high; young stems ridged, reddish brown, strigose with moderately dense, appressed, equally biramous hairs. *Leaves* pinnate, with 7–11 leaflets; stipules narrowly triangular, (1.5–)2–2.5 mm long, glabrescent, not spinescent, not persistent; petiole 2.5–4.5 mm long; rachis furrowed; multicellular hairs between leaflet pairs sparse to dense, conspicuous or inconspicuous, red, linear to club-shaped. *Leaflets* opposite; stipellae absent; lamina narrowly obovate, 6–17 mm long, 1.5–3.5 mm wide; upper and lower surfaces grey-green, with moderately dense appressed hairs; apex obtuse and mucronate; veins not prominent. *Inflorescences* 60–130(–140) mm long, longer than leaves; peduncle 6–14 mm long; bracts narrowly triangular, 0.9–1.3 mm long; flowers pink; pedicel 0.8–2.2 mm long. *Calyx* 2–2.5 mm long, with subequal lobes equal to longer than the length of the tube, clothed with moderately dense to dense, grey, appressed hairs. *Standard* pink with pale striations, ovate, 8–9 mm high, *c.* 6.5 mm wide. *Wings* deep pink, narrowly obovate or spathulate, 7–7.5 mm long, 2.5–3 mm wide. *Keel* 8–8.5 mm long, 2–2.5 mm deep; apex acute; lateral pockets 0.9–1.2 mm long; upper margin ciliate; tip and adjacent abaxial surface with moderately dense, coppery brown hairs. *Staminal tube* 5.5–6.5 mm long, pigmented at free ends. *Ovary* appressed-hairy. *Pod* spreading to ascending, terete, (17–)20–27 mm long, 2.5–3 mm deep, brown, strigose; hairs moderately dense, appressed; apex elongated, hardened; endocarp spotted (sometimes very obscurely). *Seeds* ellipsoidal to irregularly ellipsoidal, 4–6 per pod, 1.6–2 mm long, 1.1–1.5 mm wide. (Figure 3)

Other specimens examined. WESTERN AUSTRALIA: 33.9 km N of Pretty Pool, 24 June 2005, *D.J. Edinger* 5090 (PERTH); 50 km from Mt Vernon Homestead on the Mt Vernon–Mininer track, 29 June 1976, *A.A. Mitchell* 76/184 (PERTH); 10 km W of Ashburton Downs Homestead, 22 Sep. 1991, *A.A. Mitchell* 1872 (NSW); 14.1 km E of Ashburton Downs Station, 12 May 1997, *A.A. Mitchell* 4726 (NSW, PERTH); Sipa Gold Mining Lease, S of Turee Creek, 7 June 2006, *Peter G. Wilson* 1775 (NSW); Sipa Gold Mining Lease, S of Turee Creek, 8 June 2006, *Peter G. Wilson* 1777 *& E. Thoma* (NSW).

Distribution and habitat. Western Australia: known from the Pilbara and Gascoyne bioregions (Figure 4) where it is recorded growing on rocky slopes or along creek lines on red (Ashburton) shale in *Acacia* woodland or shrubland.

Conservation status. Not considered to be at risk.

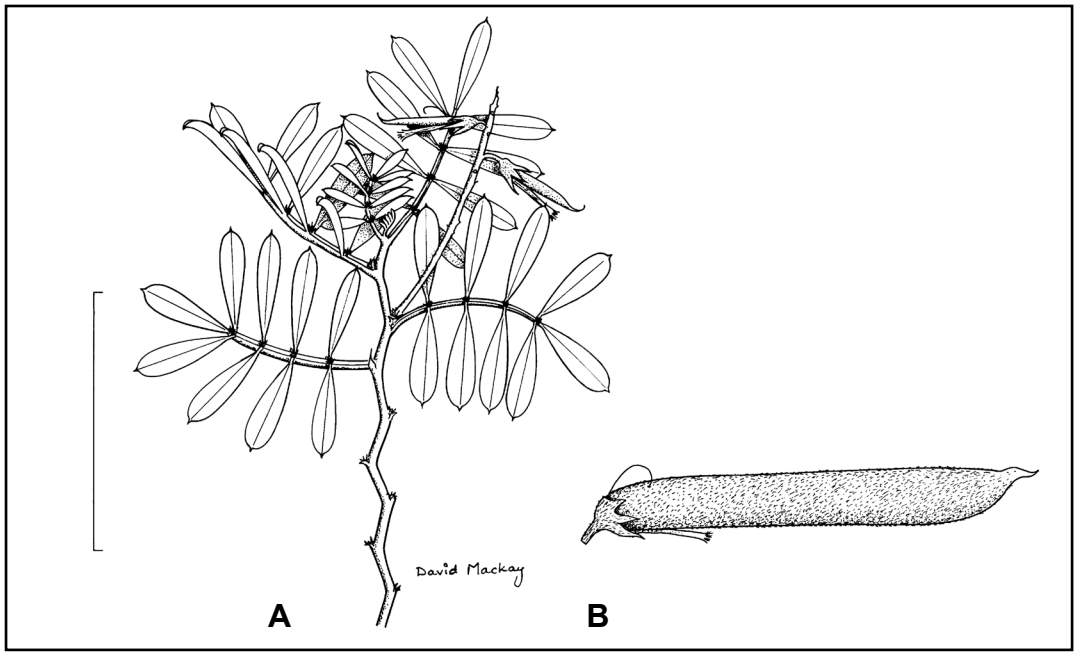

Figure 3. *Indigofera cuspidata*. A – habit ; B – pod. Scale bar = 20 mm (A); 15 mm (B). Drawn by David Mackay from *A.A. Mitchell* 76/184.

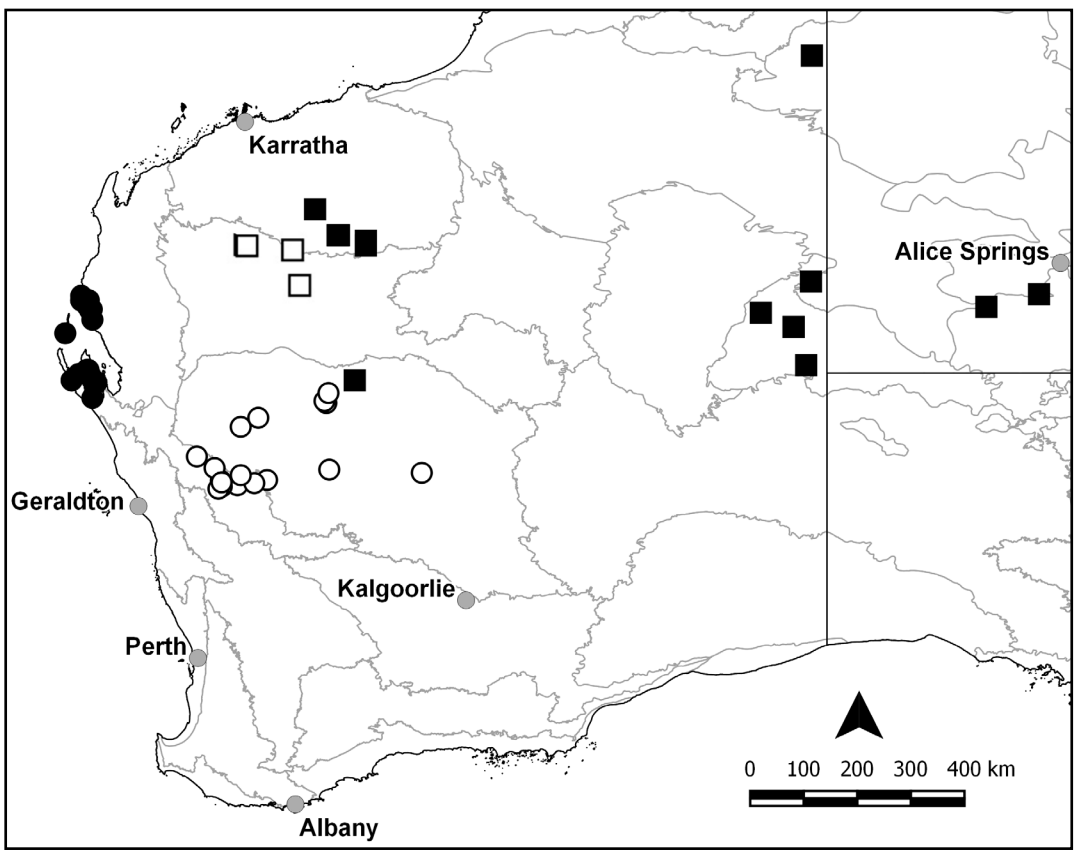

Figure 4. Distribution of *Indigofera cuspidata* (□), *I. gilesii* (■), *I. kingiana* (○) and *I. melanosticta* (●).

Etymology. The epithet is derived from the Latin *cuspidatus*, pointed, in reference to the distinctly beaked apex of the pod of this species.

Affinities. This species appears to be most closely allied to *I. fractiflexa* Peter G.Wilson & Rowe, which it resembles in having zig-zag stems, but differs in the leaflet shape and indumentum (± equally hairy on both surfaces) and in the pods being distinctly appressed-hairy and having an elongated, hardened apex.

Note. This species was represented in the analysis of Schrire *et al.* (2009) as '*I.* Australia Gp. sp. nov. 2'.

Indigofera decipiens Peter G. Wilson & Rowe, *sp. nov.*

Indigoferam hirsutam simulans sed foliis pilis ± aeque biramosis, inflorescentiis brevioribus, floribus roseis, fructibus tomentosis differt.

Typus: Barlee Range Nature Reserve, 3.2 km west of Wongida Well. 12.7 km south-west of Mount Florrie, 9.8 km north-west of Minnie Spring, Western Australia, 11 August 1993, *S. van Leeuwen* 1557 (*holo*: NSW 410069; *iso*: PERTH 04203755).

Indigofera sp. Decipiens (Peter G. Wilson & J. Palmer PGW 1777), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed September 2014].

Low or prostrate *shrub* 0.1–0.3 m tall, with woody rootstock; young stems terete, reddish brown, bearing sparse, white to brown, spreading, equally biramous hairs. *Leaves* pinnate, with (3–)5–7 leaflets; stipules subulate, 2–3.5 mm long, sometimes bearing coarse, orange hairs as well as biramous hairs; petiole (2–)3–7 mm long; rachis bearing groups of rather long, coarse, orange hairs between the leaflet pairs. *Leaflets* opposite; stipellae absent; lamina broadly obovate to cuneate, 4–7.5(–14.5) long 2.5–5(–7) mm wide; upper and lower surfaces with ± equally dense spreading hairs; apex obtuse to emarginate, mucronate; veins not prominent. *Inflorescences* 30–100 mm long, longer than leaves; peduncle 5–17 mm long; bracts narrow-triangular, 2–2.5 mm long; flowers pink to pale purple; pedicel 0.5–1 mm long. *Calyx* 2.5–4 mm long; lobes subequal, 2–3 mm long, longer than the tube. *Standard* 6–8 mm long, 3–5.5 mm wide, the outside bearing white to brown hairs, the inside glabrous. *Wings* oblong-spathulate, 4.5–6 mm long, 1.5 mm wide. *Keel* 6–7 mm long, 2–2.5 mm deep; lateral pockets 1–1.5 mm long; upper margin sparsely hairy; tip and adjacent abaxial surface with sparse hyaline or golden brown hairs. *Staminal tube* 3.5–4 mm long. *Ovary* densely pubescent; style glabrous; stigma capitate. *Pod* cylindrical to subtorulose, 16–42 mm long, 2–3 mm diam., pale brown; hairs short, spreading; endocarp with dark, orange-brown spots. *Seeds* elongated cuboid, 5–8 per pod, 3–3.8 mm long, 1.2–2 mm wide. (Figure 5)

Selected specimens examined. WESTERN AUSTRALIA: N of Gascoyne Junction on Mt Augusta road *c.* 2 km S of turn-off to Eudamullah Homestead, 21 July 1986, *M.G. Corrick* 9846 (MEL); 3.7 km E of Christmas Bore, Koonmarra Station, 29 Aug. 1986, *R.J. Cranfield* 6017 (NSW, PERTH); Pretty Pool, on Elliot Creek, 28 June 2005, *D.J. Edinger* 5152 (PERTH); 'Warrambi' [Warambie], 14 Oct. 1941, *C.A. Gardner s.n.* (PERTH); 10 km W of 'Ashburton Downs' Homestead, 1 July 1977, *A.A. Mitchell* 428 (NSW, PERTH); Kennedy Range, NE of 'Mooka', 30 July 1969, *Paul G. Wilson* 8462 (PERTH); tributary of Seven Mile Creek, *c.* 15 km from Paraburdoo on the 'Mininer' road, 7 June 2006, *Peter G. Wilson* 1770 *& J. Palmer* (K, NSW, PERTH).

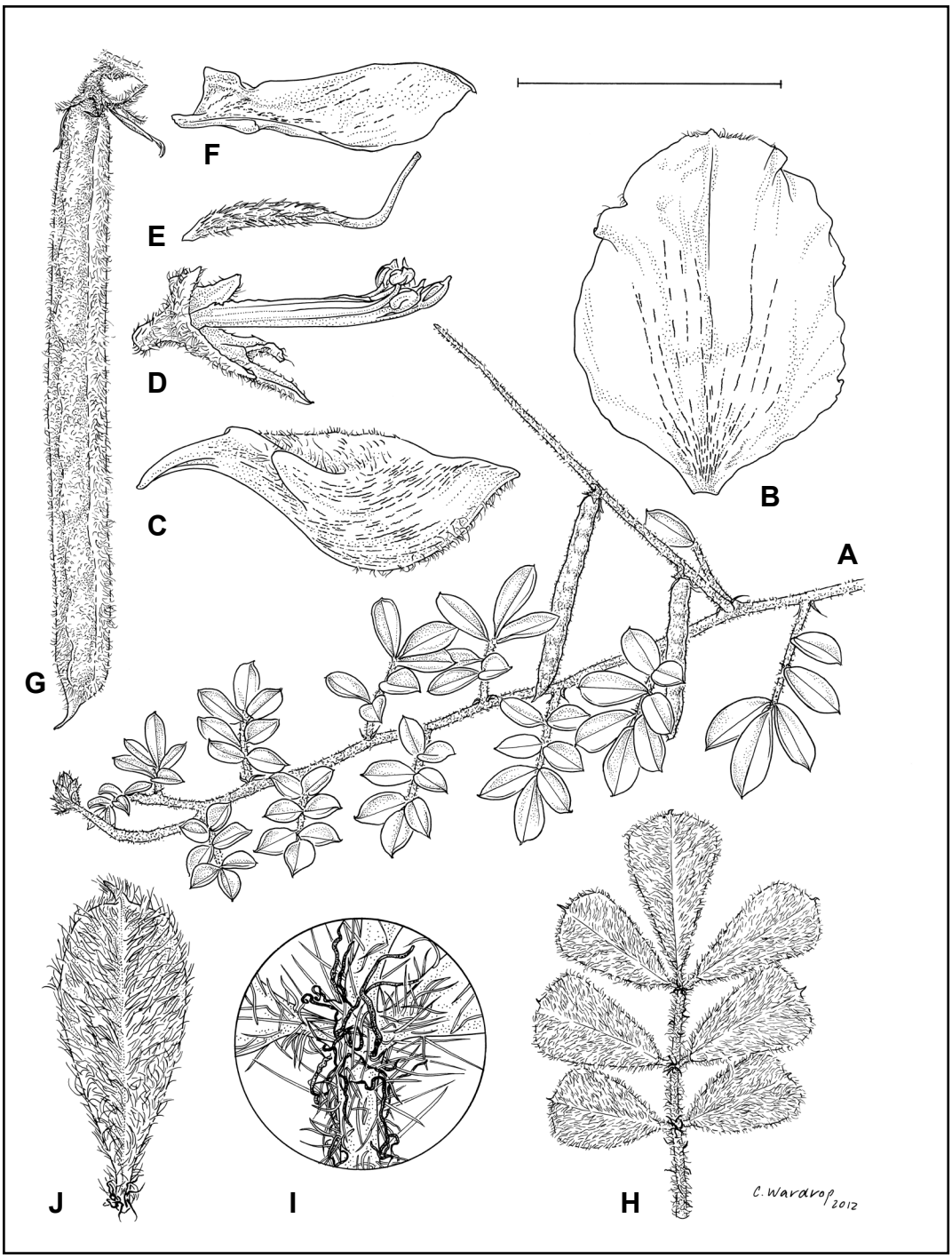

Figure 5. *Indigofera decipiens*. A – habit; B – standard; C – keel; D – lateral view of calyx and androecium; E – gynoecium; F – wing; G – pod; H – leaf; I – detail of rachis showing linear multicellular hairs; J – terminal leaflet. Scale bar = 50 mm (A); 5 mm (B–F); 15 mm (G, H, J); 2 mm (I). Drawn by Catherine Wardrop from *P.G. Wilson* 1084 *& J. Palmer* (A, G–I), *R.J. Cranfield* 6017 (B–F) and *S. van Leeuwen* 1557 (J).

Distribution and habitat. Western Australia: known from relatively few collections from widely separated localities west of 118° E and north of 27° S, in the Pilbara, Gascoyne, Carnarvon and Murchison bioregions (Figure 6). All specimens are from range areas with one collection specifically stating that the plant was growing on granite.

Conservation status. Not considered to be at risk.

Etymology. The epithet is taken from the Latin *decipiens*, deceiving, a reference to the deceptive superficial resemblance of this species to *I. hirsuta* L.

Affinities. This species is superficially like *I. hirsuta* due to the spreading indumentum on the vegetative parts, the rather long calyx lobes, and the subulate stipules. However, there are major differences, primarily in the hairs being ± equally biramous, the inflorescence much shorter, the flowers pink rather than red, and the pod tomentose rather than stiffly hairy. This species is likely be most closely related to *I. roseola* Peter G.Wilson & Rowe.

Note. This species was represented in the analysis of Schrire *et al.* (2009) as '*I.* Australia Gp. sp. nov. 1'.

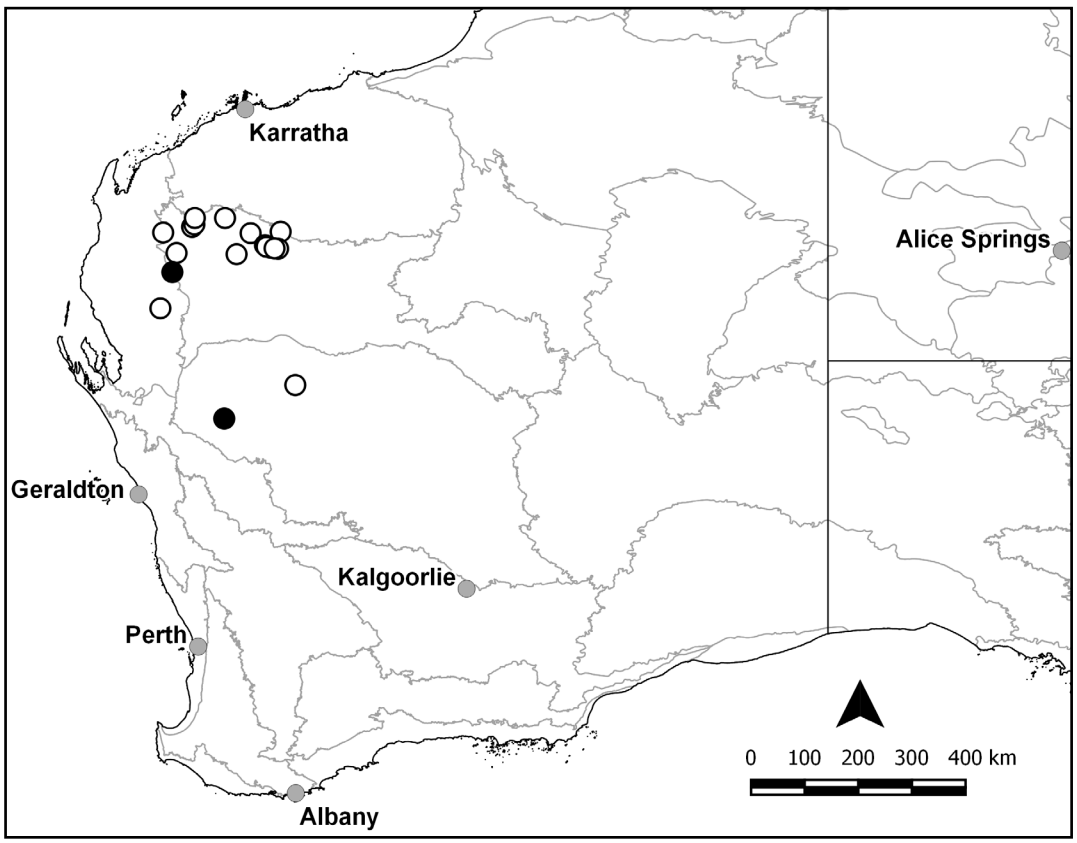

Figure 6. Distribution of *Indigofera decipiens* (○) and *I. eriophylla* (●).

Indigofera eriophylla Peter G. Wilson & Rowe, *sp. nov.*

Indigoferae leucotrichae caulibus foliisque densissime pubescentibus similis sed foliolis 3–5 vice 7–11, fructibus angustioribus, floribus minoribus differt.

Typus: Bidgemia Station, Western Australia [precise locality withheld for conservation reasons], 14 June 1999, *J. Stretch s.n.* (*holo*: NSW 436397; *iso*: PERTH 05406110).

Indigofera sp. Eriophylla (J. Stretch s.n. PERTH 05406110), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed Sep 2014].

Erect *subshrub*, 0.2–0.3 m high, with woody rootstock; young stems terete, white and grey or yellowish, hirsute with very dense, spreading, equally biramous hairs. *Leaves* pinnate, with 3–5 leaflets; stipules subulate or narrowly triangular, 2.5–5.5 mm long, densely pubescent, not spinescent, not persistent; petiole 6–10 mm long; rachis terete to slightly furrowed; multicellular hairs between leaflet pairs sparse, inconspicuous, orange to red, pointed-linear. *Leaflets* opposite; stipellae inconspicuous to 0.5 mm long; lamina obovate, 6–15 mm long, 5–11 mm wide; upper and lower surfaces grey to white (yellowish when young) with dense, spreading hairs; apex obtuse and shortly mucronate; veins not prominent. *Inflorescences* 60–135 mm long, longer than leaves; peduncle 6–27 mm long; bracts subulate, 2.5–4.2 mm long; flowers pink to purple; pedicel 0.5–1 mm long. *Calyx* 2.5–4.5 mm long, with subequal lobes longer than the length of the tube, clothed with dense, white or grey, spreading hairs. *Standard* deep pink, obovate to ovate, 4.8–6 mm high, 3.5–4.5 mm wide. *Wings* spathulate or narrowly obovate, 4–4.5 mm long, 1.3–1.9 mm wide. *Keel* 4.8–5.5 mm long, 1.5–2 mm deep; apex rounded; lateral pockets 0.4–0.8 mm long; upper margin sparsely hairy; tip and adjacent abaxial surface with moderately dense, white to brown hairs. *Staminal tube* 3–4.5 mm long, pigmented. *Ovary* densely hairy. *Pods* descending, terete to slightly torulose, (7–)17–28 mm long, 1.5–2.0 mm deep, white to grey, tomentose; hairs dense, spreading; apex shortly pointed; endocarp spotted. *Seed*s (immature) 7–9 per pod. (Figure 7)

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 26 June 1985, *R.J. Cranfield* 5222 (PERTH); 10 July 1981, *A. Holm s.n.* (PERTH); 1882, *Pollack s.n.* (MEL 586680); 15 Sep. 1999, *J. Stretch s.n.* (NSW 436398, PERTH 05406129).

Distribution and habitat. Western Australia: known only from the Carnarvon and Gascoyne bioregions (Figure 6). It is recorded as growing on sandy rises.

Conservation status. Recently listed as Priority One under Department of Parks and Wildlife Conservation Codes for Western Australian Flora, as *I.* sp. Eriophylla (J. Stretch s.n. PERTH 05406110) (Western Australian Herbarium 1998–). The two known localities of this species are hundreds of kilometres apart, so further investigation of likely sites is required to assess its conservation status.

Etymology. The epithet is derived from the Greek prefix *erio*-, woolly-, in reference to the dense, spreading indumentum of this species.

Affinities. This species resembles *I. leucotricha* E.Pritz. from Central Australia in having very densely pubescent stems and leaves but it differs by having leaves with 3–5 leaflets rather than 7–11, and by the narrower pods and smaller flowers.

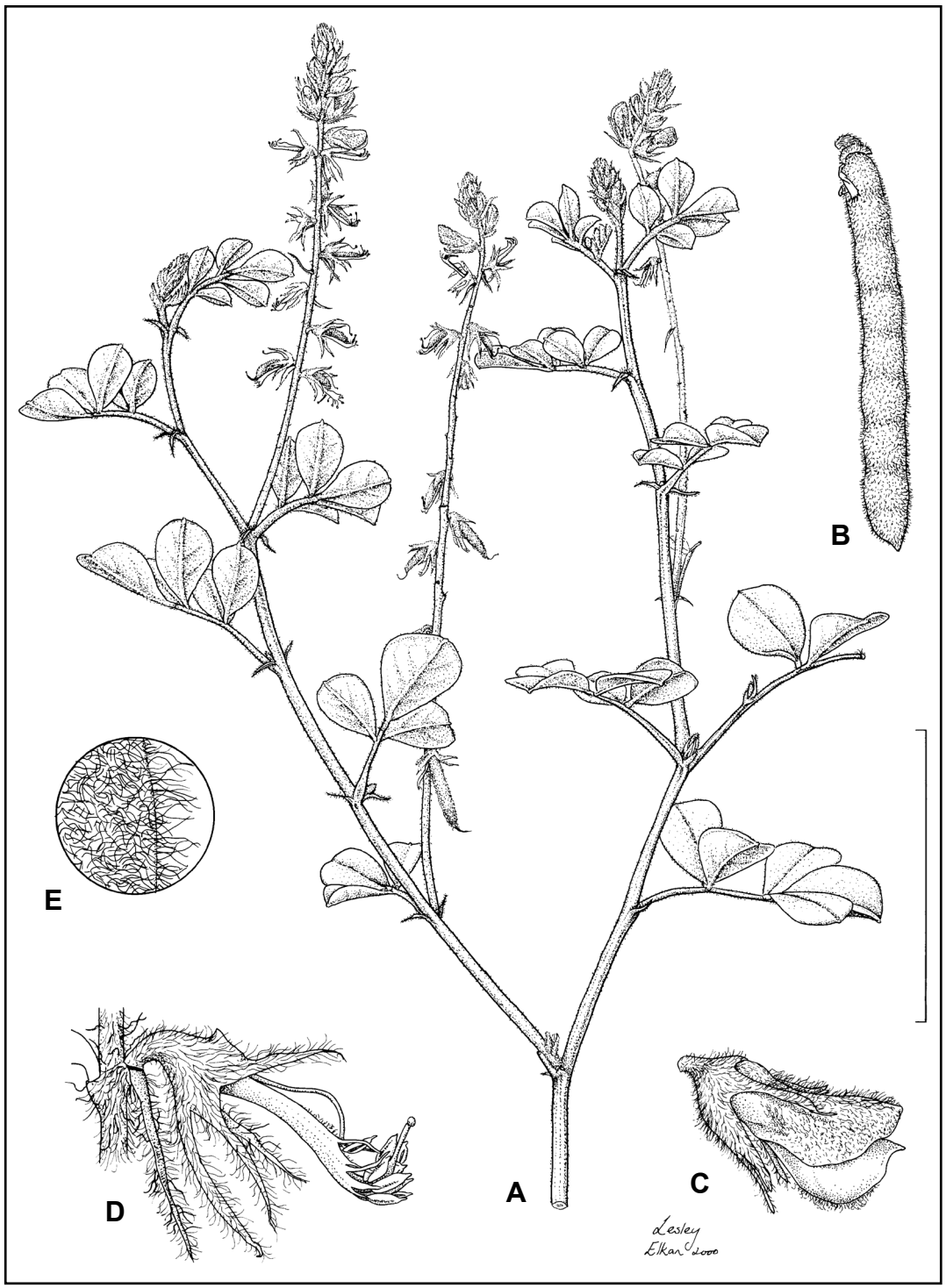

Figure 7. *Indigofera eriophylla*. A – habit; B – pod; C – flower at early anthesis; D – lateral view of calyx and androecium; E – detail of leaf hairs. Scale bar = 40 mm (A), 20 mm (B), 7.5 mm (C); 6 mm (D); 2.5 mm €. Drawn by Lesley Elkan from *J. Stretch s.n.* (NSW 436397; A, D, E) and *J. Stretch s.n.* (NSW 436398; B, C).

Notes. This species was first collected by Mr Pollack, an associate of the then Deputy Surveyor General John Forrest, in 1882, but seems not to have been recognised as a new species by Mueller. It is presumably uncommon since it was not re-collected for almost 100 years.

Indigofera fractiflexa Peter G.Wilson & Rowe, *sp. nov.*

I. helmsii affinis sed stipulis non spinescentibus distinguitur.

Typus: Mount Lois, Western Australia, 11 September 1991, *Peter G. Wilson* 1033 *& Ross Rowe* (*holo*: NSW 248838; *iso*: AD, CANB, K, MEL, PERTH).

Indigofera sp. Fractiflexa (S. van Leeuwen 3773), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed September 2014].

Erect or spreading *shrub*, 0.2–1.2 m high, with woody rootstock; young stems terete, green to brown (often reddish), strigose with sparse to moderately dense, appressed, equally biramous hairs and sometimes with scattered, red multicellular hairs. *Leaves* pinnate, with (5–)7–9(–11) leaflets; stipules narrowly triangular, 1.5–6 mm long, glabrescent, often recurved, not spinescent, bases sometimes persistent but never conspicuously thickened; petiole (2–)5–20 mm long; rachis furrowed; multicellular hairs between leaflet pairs sparse to dense and sometimes extending along the rachis, conspicuous or inconspicuous, red, club-shaped. *Leaflets* opposite; stipellae absent or to 1.8 mm long; lamina obovate to elliptical, 5.5–20 mm long, (2.5–)3.2–9(–11.5) mm wide; upper surface green, glabrous or with sparse to moderately dense appressed hairs; lower surface green, with sparse to moderately dense appressed hairs; apex obtuse and mucronate or emarginate; veins not prominent. Inflorescences (20–)25–110 mm long, shorter or longer than leaves; peduncle 1–10 mm long; bracts ovate to narrowly triangular, 0.8–2.5 mm long; flowers pink to deep pink; pedicel 0.5–1.2 mm long. *Calyx* 1.5–3 mm long, with unequal to subequal lobes equal to or longer than the length of the tube, clothed with moderately dense to dense, grey, appressed hairs. *Standard* pink, with a paler spot at base, ovate to orbicular, 6.2–7.1 mm high, 4.2–6 mm wide. *Wings* narrowly obovate or spathulate, 5.5–6.2 mm long, 2–2.5 mm wide. *Keel* 6–7 mm long, 2–2.5 mm deep; apex acute; lateral pockets 1–1.2 mm long; upper margin sparsely hairy; tip and adjacent abaxial surface with moderately dense, hyaline to dark brown hairs. *Staminal tube* 3–4.5 mm long, colourless. *Ovary* appressed-hairy. *Pods* ascending to descending, terete, 15–35 mm long, 2.5–4.5 mm deep, brown or red-brown, strigose or glabrescent; hairs sparse to moderately dense, appressed; apex shortly pointed (occasionally elongated); endocarp spotted. *Seeds* elongated cuboid to subglobose, 2–6 per pod, 2.1–2.7 mm long, 2–2.2 mm wide.

Etymology. The epithet is derived from the Latin for 'zig-zag' with reference to the characteristic growth habit.

Affinities. This species appears to be most closely allied to *I. helmsii* Peter G.Wilson but is distinguished from that species by the lack of distinctly spinescent stipules. It differs from other species in the area, except *I. cuspidata*, by having stems that 'zig-zag' to varying degrees.

Note. There is some geographically based variation and we recognise two subspecies.

Key to subspecies

1. Upper surface of leaflets with appressed hairs; pods with sparse, appressed white hairs ..... subsp. **fractiflexa**

1: Upper surface of leaflets glabrous; pods with scattered, appressed dark hairs ..... subsp. **augustensis**

Indigofera fractiflexa Peter G.Wilson & Rowe subsp. **fractiflexa**

Spreading or erect *shrub*, 0.2–1.2 m high, rarely to 2 m. *Leaves* with (5–)7–9 leaflets; stipules 2–6 mm long; petiole 4.5–20 mm long. *Leaflets* 5.5–20 mm long, (2.5–)3.5–9(–11.5) mm wide; stipellae inconspicuous or to 1.8 mm long. *Inflorescences* 30–110 mm long; bracts narrowly triangular, 1.5–2.5 mm long; pedicel 0.5–1 mm long. *Calyx* 1.5–3 mm long. *Standard* ovate, 6–7 mm high, 5–6 mm wide. *Wings* 5.7–6.2 mm long, 2.5 mm wide. *Keel* 6–6.5 mm long, 2–2.5 mm deep. *Staminal tube* 3–4.5 mm long. *Pods* 15–35 mm long, 2.5–4.5 mm deep. *Seeds* 2–6 per pod. (Figure 8)

Selected specimens examined. WESTERN AUSTRALIA: Wittenoom Gorge, Eastern Creek area, 2 May 1966, *J.V. Blockley* 182 (CANB, PERTH); base of Drillers Ridge on track leading to radio masts, 1.4 km N of Mt Hanwright, 7.5 km SSW of Mt Watkins, Hamersley Range, 24 Sep. 1991, *S. van Leeuwen* 1062 (NSW, PERTH); Barlee Range Nature Reserve, 5.5 km W of Mt Palgrave, 12 June 1994, *S. van Leeuwen* 1701 (NSW, PERTH); Barlee Range Nature Reserve, 23.2 km SSE of Mt Florry, 13 Sep. 1995, *S. van Leeuwen* 2294 (NSW, PERTH); Joffre Falls Lookout, 12 Sep. 1991, *Peter G. Wilson* 1059 *& R. Rowe* (AD, NSW, PERTH); Bee Gorge, Hamersley Range, 12 Sep. 1991, *Peter G. Wilson* 1067 *& R. Rowe* (NSW); Yampire Gorge, 14.8 km from Wittenoom road, 13 Sep. 1991, *Peter G. Wilson* 1071 *& R. Rowe* (NSW, PERTH); N end of Rio Tinto Gorge, 13 Sep. 1991, *Peter G. Wilson* 1076 *& R. Rowe* (K, NSW, PERTH); *c.* 1 km from summit of Mt Nameless, 14 Sep. 1991, *Peter G. Wilson* 1084 *& R. Rowe* (CANB, K, NSW, PERTH).

Distribution and habitat. Western Australia: recorded from the Hamersley and Barlee Ranges in the Pilbara and Gascoyne bioregions (Figure 9). This subspecies has been found on rocky mountain tops and the edges of gorges.

Conservation status. Not considered to be at risk.

Indigofera fractiflexa subsp. **augustensis** Peter G.Wilson & Rowe, *subsp. nov.*

A *Indigofera fractiflexa* subsp. *fractiflexa* foliolis supra glabris, fructibus pilis fuscis differt.

Typus: Mount Augustus, Western Australia [precise locality withheld for conservation reasons], 17 September 1991, *Peter G. Wilson* 1132 *& Ross Rowe* (*holo*: NSW 249883; *iso*: PERTH).

Indigofera sp. Mount Augustus (S. Patrick & A. Crawford SP 4737), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed September 2014].

Spreading or diffuse *shrub*, 0.5–1 m high. *Leaves* with (5–)7–9(–11) leaflets; stipules 1.5–3.5 mm long; petiole 3.5–11 mm long. *Leaflets* 5.5–19 mm long, 3.2–8 mm wide; stipellae absent. *Inflorescences* (20–)25–50(–110) mm long; bracts narrowly triangular, 0.8–1.2 mm long; pedicel 1–1.2 mm long. *Calyx* 2–3 mm long. *Standard* ovate to orbicular, 5.7–7.1 mm high, 4.2–5.7 mm wide. *Wings* 5.5–6.2 mm long, 2–2.5 mm wide. *Keel* 6–7 mm long, 2–2.5 mm deep; lateral pockets 1–1.2 mm long. *Staminal tube* 3–4 mm long. *Pods* 17–32 mm long, 2.5–3.5 mm deep. *Seeds* 2–6 per pod.

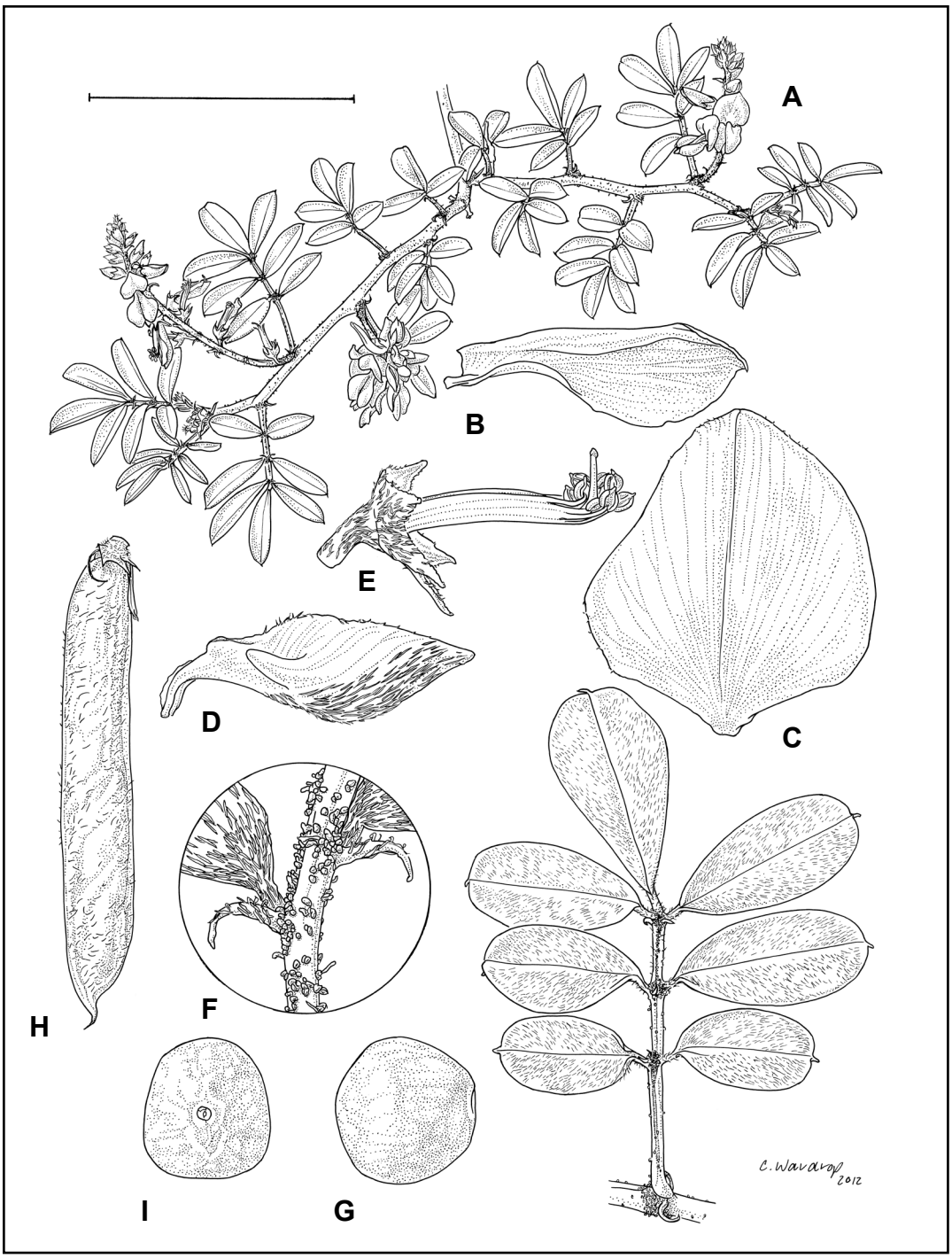

Figure 8. *Indigofera fractiflexa* subsp. *fractiflexa*. A – habit; B – wing; C – standard; D – keel; E – lateral view of calyx and androecium; F – detail of multicellular hairs on inflorescence axis; G – leaf; H – pod; I – seed ventral and lateral views. Scale bar = 40 mm (A); 5 mm (B–E); 3.3 mm (F); 15 mm (G, H); 4 mm (I). Drawn by Catherine Wardrop from *P.G. Wilson* 1084 *& R. Rowe* (A–G) and *P.G. Wilson* 1033 *& R. Rowe* (H, I).

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 2 Aug. 1991, *B.G. Briggs* 8792 *& L.A.S. Johnson* (NSW); 22 July 1986, *M.G. Corrick* 9857 (MEL); 17 Sep. 1991, *Peter G. Wilson* 1133, 1134 *& R. Rowe* (NSW, PERTH).

Distribution and habitat. Western Australia: originally thought to be restricted to Mt Augustus, a relatively isolated monolith in the Gascoyne bioregion, but there are also a number of records of this taxon from the Robinson Range area, *c.* 250 km south-east of there (Figure 9), although there are unresolved questions regarding this population. At the type locality, the species is found on the Mount Augustus Sandstone formation. On the Robinson Range, specimens referred to this taxon are recorded from banded ironstone substrates, more commonly the habitat of subsp. *fractiflexa*.

Conservation status. Recently listed as Priority Two under Department of Parks and Wildlife Conservation Codes for Western Australian Flora, as *I.* sp. Mount Augustus (S. Patrick & A. Crawford SP 4737) (Western Australian Herbarium 1998–). All known individuals at Mt Augustus occur within the reserve.

Etymology. Named for its occurrence on Mt Augustus.

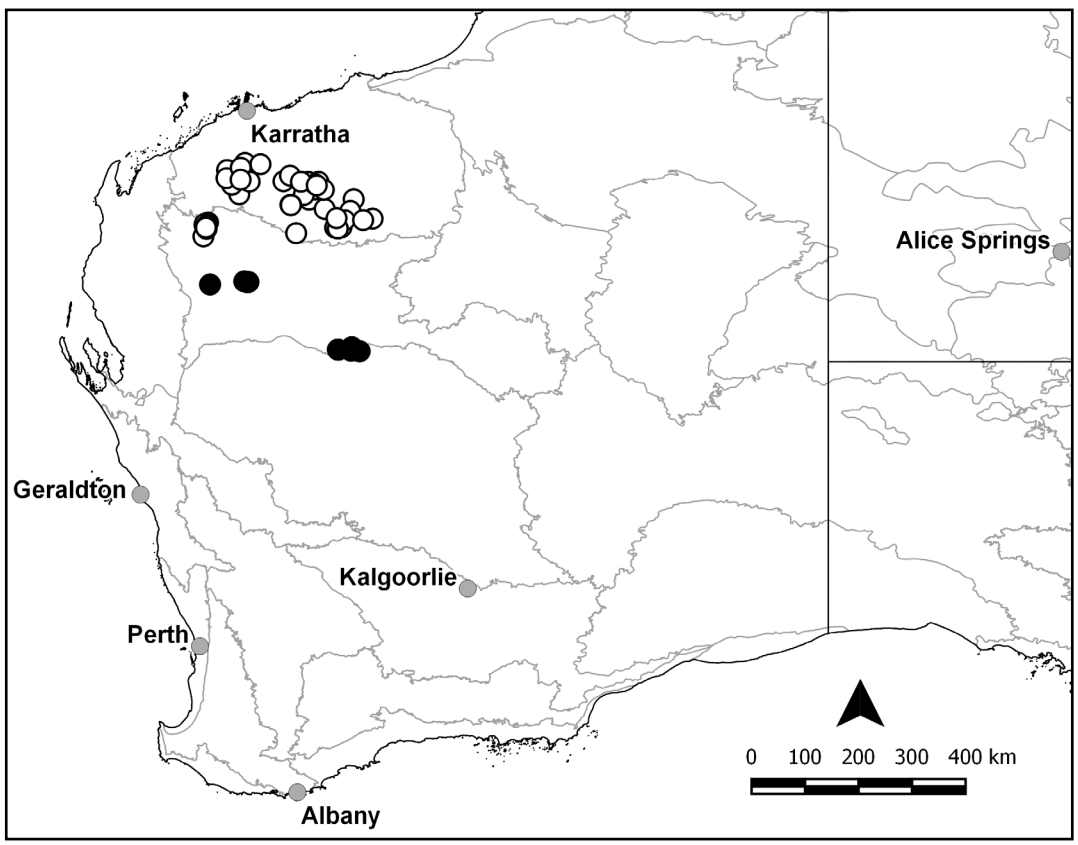

Figure 9. Distribution of *Indigofera fractiflexa* subsp. *fractiflexa* (○) and subsp. *augustensis* (●).

Indigofera gilesii Peter G.Wilson & Rowe, *sp. nov.*

Indigoferae cornuligerae affinis sed internodiis inflorescentiisque longioribus differt.

Typus: Hamersley Range, Western Australia [precise locality withheld for conservation reasons], 8 May 1995, *S. Deluca* 46 *& M.E. Trudgen* (*holo*: PERTH 04117557).

Indigofera sp. Gilesii (M.E. Trudgen 15869), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed September 2014].

Spreading *shrub* or *subshrub*, 0.3–0.75 m high, with woody rootstock; young stems terete, green to yellowish or brown, strigose to tomentose with dense to very dense, appressed to shortly spreading, equally biramous hairs. *Leaves* pinnate, with (5–)9–13(–15) leaflets; stipules triangular (thickened), 2–5 mm long, pubescent or glabrescent (hairs sparse), spinescent (tips often breaking off over time to leave the thickened base), persistent; petiole 4–13.5 mm long; rachis furrowed; multicellular hairs between leaflet pairs sparse to moderately dense, inconspicuous to conspicuous, red to dark brown, club-shaped. *Leaflets* opposite; stipellae inconspicuous, (0.2–)0.5–0.9 mm long; lamina obovate to elliptical, (5–)8–15(–23) mm long, (3–)5–8(–10) mm wide; upper surface green, with moderately dense appressed hairs; lower surface grey to green (paler than upper), with moderately dense (denser than upper) appressed hairs; apex obtuse and mucronate; veins not prominent. *Inflorescences* (45–)80–150(–210) mm long when fully expanded, longer than leaves; peduncle (10–)15–28 mm long; bracts triangular (sometimes thickened), 1.2–2.7 mm long; flowers deep pink to purplish; pedicel 0.8–1.5(–2) mm long. *Calyx* (1.7–)2–4 mm long, with subequal lobes less than or equal to the length of the tube, clothed with dense, brown to almost black (very rarely grey), appressed to shortly spreading hairs. *Standard* purple to pinkish red, ovate to orbicular, (6.5–)7–8.5 mm high, 6.5–8 mm wide. *Wings* spathulate or narrowly obovate, 6.5–8 mm long, 2.5–3.5 mm wide. *Keel* 6.5–8.5 mm long, 2.5–3.5 mm deep; apex rounded to apiculate; lateral pockets 0.8–1.5 mm long; upper margin ciliate; tip and adjacent abaxial surface with moderately dense to dense, golden to dark brown hairs. *Staminal tube* 5.5–7 mm long, free ends and tube pigmented. *Ovary* sparsely to densely hairy. *Pods* spreading to descending, terete, 25–35 mm long, 3–3.5 mm deep, brown to dark brown, strigose; hairs sparse to moderately dense, appressed; apex shortly pointed; endocarp spotted. *Seeds* cuboid, 6–9 per pod, 1.7–2.5 mm long, 1.5–1.8 mm wide.

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 20 June 1958, *G.M. Chippendale* NT4533 (DNA, NSW, PERTH); 6 May 1998, *K.F. Kenneally* 11989 (NSW, PERTH); 5 Aug. 1958, *N.H. Speck* 1142 (CANB, MEL, NSW, PERTH); 1 Aug. 1962, *D.E. Symon* 2312 (AD); 1 Oct. 1998, *S. van Leeuwen* 4235 (NSW, PERTH); 2 June 2006, *Peter G. Wilson* 1741 (NSW, PERTH). NORTHERN TERRITORY: 9 Oct. 1966, *A.C. Beauglehole* 20313 (MEL); 7 Aug. 1967, *A.C. Beauglehole* 24620 (MEL, NSW); 19 June 1974, *G.W. Carr* 3032 *& A.C. Beauglehole* 45811 (MEL, NSW); 20 July 1966, *J.H. Willis s.n.* (MEL 586688).

Distribution and habitat. Central Australia: occurs in south-western parts of the Northern Territory and in a number of apparently disjunct populations in Western Australia, extending to the Pilbara bioregion (Figure 4). It is mostly found in ranges or on stony ground in red, sandy soil.

Conservation status. Listed by Jones (2014) as Priority Three under Department of Parks and Wildlife Conservation Codes for Western Australian Flora, as *I.* sp. Gilesii (M.E. Trudgen 15869). This indicates that it is not believed to be under immediate threat but is nevertheless in need of further assessment.

Etymology. The epithet honours the explorer Ernest Giles, who collected this species in the ranges south of Haasts Bluff in 1872 (MEL 585701). The name is also appropriate in that this species has often been collected near the Giles Weather Station in Central Australia.

Affinities. Although this species is similar to *I. cornuligera* Peter G.Wilson & Rowe in its somewhat thickened stipules, it has a more open habit, with longer internodes, and usually has much longer inflorescences with flowers that are more strongly reddish pink. The stipules in *I. gilesii* are variable; they are often longer but not as conspicuously thickened at the base as in *I. cornuligera*. Also, the clusters of multicellular hairs between leaflet pairs are less well developed in *I. gilesii* than in *I. cornuligera*.

Notes. As defined here, this species is rather variable across its extensive range and further study of the disjunct populations should be undertaken. Species with thickened, ± persistent stipules form something of a mosaic through central parts of Australia and there is evidence of some intergradation. For example, a specimen that fits the general description of *I. gilesii*, *A.S. George* 4831 from Mt Fanny, NE of Blackstone Range (PERTH), shows in its thickened inflorescence bracts possible evidence of gene flow from *I. warburtonensis* Peter G.Wilson & Rowe.

Indigofera kingiana Peter G.Wilson & Rowe, *sp. nov.*

Indigoferae australi subsp. *hesperia* similis sed foliolis paucioribus, indumento multicellulari ad stipulas deficienti et carina tenuirostri differt.

Typus: Gabyon Station, 1 km west of Littles Bore, Western Australia, 14 August 1993, *S. van Vreeswyk* 3767 (*holo*: PERTH 04535812)

Indigofera sp. Kingiana (S. van Vreeswyk 3767), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed September 2014].

Erect *shrub*, 0.3–1.5(–2.4) m high, with woody rootstock; young stems terete or slightly ridged, grey or green to brown, strigose with moderately dense to dense, appressed, equally biramous hairs; older stems glabrescent, brown. *Leaves* pinnate, with (3–)7–11(–13) leaflets; stipules triangular, 1–3 mm long, pubescent or glabrescent, not spinescent, not persistent to persistent; petiole 5–15 mm long; rachis furrowed; multicellular hairs between leaflet pairs absent or sparse, inconspicuous, orange to red, club-shaped. *Leaflets* opposite; stipellae absent or inconspicuous, 0.3–0.5 mm long; lamina narrowly elliptical to obovate, (5.5–)10–21 mm long, (2–)3–7(–9) mm wide; upper surface green, glabrous; lower surface green (generally paler than above), with sparse to moderately dense, appressed hairs; apex obtuse and mucronate; veins not prominent. *Inflorescences* (13–)20–70(–100) mm long, shorter to longer than leaves; peduncle (3–)8–25 mm long; bracts triangular, 0.5–1.2 mm long; flowers pink to purplish; pedicel 1.5–3 mm long. *Calyx* 1.5–3 mm long, with subequal to equal lobes less than the length of the tube, clothed with moderately dense, brown, appressed hairs. *Standard* deep pink to crimson, ovate, elliptical or obovate, 7–10 mm high, 4.5–7.5 mm wide. *Wings* oblong to spathulate, 7–9 mm long, 2–2.7 mm wide, with patch of hairs near base. *Keel* 7.5–9.5 mm long, 2–3 mm deep; apex distinctly beaked or acuminate, to 2 mm long; lateral pockets 1–2 mm long; upper margin ciliate; tip and adjacent abaxial surface with sparse to moderately dense, hyaline to white or brown hairs. *Staminal tube* 4.5–6 mm long, free ends and tube pigmented. *Ovary* sparsely to moderately hairy. *Pods* spreading to descending, terete, (14–)20–43 mm long, 2.5–3 mm deep, brown, strigose to glabrescent; hairs sparse to moderately dense; apex shortly pointed, often with short persistent style; endocarp spotted. *Seeds* cuboid, (4–)8–10(–12) per pod, 1.5–1.7 mm long, 1–1.2 mm wide.

Selected specimens examined. WESTERN AUSTRALIA: 41.6 miles S of Woolshed Rd junction or 220 miles [*c.* 350 km] N of Mullewa, 1 July 1973, *A.M. Ashby* 4772 (AD); Meekatharra, 20 July 1931, *C.A. Gardner* 2356 (PERTH); near Lake Austin, 1886, *H.S. King s.n.* (MEL 585882); 5 km E of Meekatharra on S side of Airport road, 23 Aug. 1992, *A.A. Mitchell* 2681 (NSW, PERTH); 6.3 miles [*c.* 10 km] from highway on road to Gabyon, 27 Oct. 1984, *B.H. Smith* 507 (MEL, NSW, PERTH); near Bullawadgee, 15 km E of Yuin homestead, Aug. 1995, *J.F. Taylor* 61 (PERTH); 27 km N of Yalgoo, 23 Sep. 1991, *Peter G. Wilson* 1229 *& R. Rowe* (K, NSW, PERTH).

Distribution and habitat. Western Australia: Yalgoo and Murchison bioregions (Figure 4), found on granitic soils on low rises or in sandy creek beds; often occurring with shrubs of *Acacia* spp.

Conservation status. Not considered to be at risk.

Etymology. This species is named for the first collector, H.S. [Henry Sanford] King, who was a surveyor under the direction of Sir John Forrest, the Surveyor-General and Commissioner of Crown Lands at the time.

Affinities. This species appears to be closely related to *I. australis* Willd. and has frequently been misidentified as that species. However, it differs from Western Australian specimens of *I. australis* subsp. *hesperia* Peter G.Wilson & Rowe in having fewer leaflets, stipules that lack multicellular hairs in their axils, and a more compact inflorescence with generally larger, crimson flowers that have distinctly beaked keels.

Indigofera melanosticta Peter G. Wilson & Rowe, *sp. nov.*

Ab *Indigofera chamaeclada* inflorescentia multo longiore et ab *I. psammophila* surculis pilis fuscatis pallidisque valde punctatis differt.

Typus: Denham Lookout, *c.* 3 km east-south-east of Denham, Western Australia, 11 August 1991, *B.G. Briggs* 8841 *& L.A.S. Johnson* (*holo*: NSW; *iso*: CANB, K, PERTH).

Decumbent, perennial *herb*, 0.2–0.3 m high, with woody rootstock; young stems slightly ridged, grey to green or dark brown (stems generally greyish with dark brown speckles), strigose with dense, appressed and some shortly spreading, equally or unequally biramous hairs. *Leaves* pinnate, with 5–9 leaflets; stipules subulate, 1.5–5 mm long, pubescent, not spinescent, not persistent; petiole 3–10 mm long; rachis furrowed (some slightly or very narrowly so); multicellular hairs between leaflet pairs sparse, inconspicuous, orange to red, pointed-linear. *Leaflets* opposite; stipellae absent; lamina obovate to elliptical, 4–17 mm long, 3–9 mm wide; upper surface grey or green, with moderately dense to dense, appressed hairs; lower surface grey or green, with dense, appressed hairs; apex obtuse and mucronate; veins not prominent. *Inflorescences* (75–)90–150(–175) mm long, longer than leaves; peduncle (15–)20–35(–45) mm long; bracts ovate to subulate, 1.3–2.5 mm long; flowers pink to purple; pedicel 1–1.5 mm long. *Calyx* 3–5.5 mm long, with unequal lobes equal to or longer than the length of the tube, bearing dense, grey to almost black appressed hairs. *Standard* pink to red, broadly ovate to orbicular, 6.5–8.5 mm high, 6–7.5 mm wide. *Wings* spathulate, 7–8 mm long, 2–3 mm wide. *Keel* 7–8 mm long, 2–2.5 mm deep; apex acute; lateral pockets 1–1.6 mm long; upper margin ciliate; tip and adjacent abaxial surface with moderately dense, hyaline to grey hairs. *Staminal tube* 4.3–5.2 mm long, free ends and tube pigmented. *Ovary* densely hairy. *Pods* descending, slightly torulose, 23–27 mm long, 1.75–2.5 mm deep, brown (immature pods often with grey and dark brown hairs), strigose; hairs moderately dense to dense, appressed; apex shortly beaked; endocarp spotted. *Seeds* compressed-cylindrical, (8–)10–11 per pod, 1.4–2.1 mm long, 1.2–1.5 mm wide. (Figure 10)

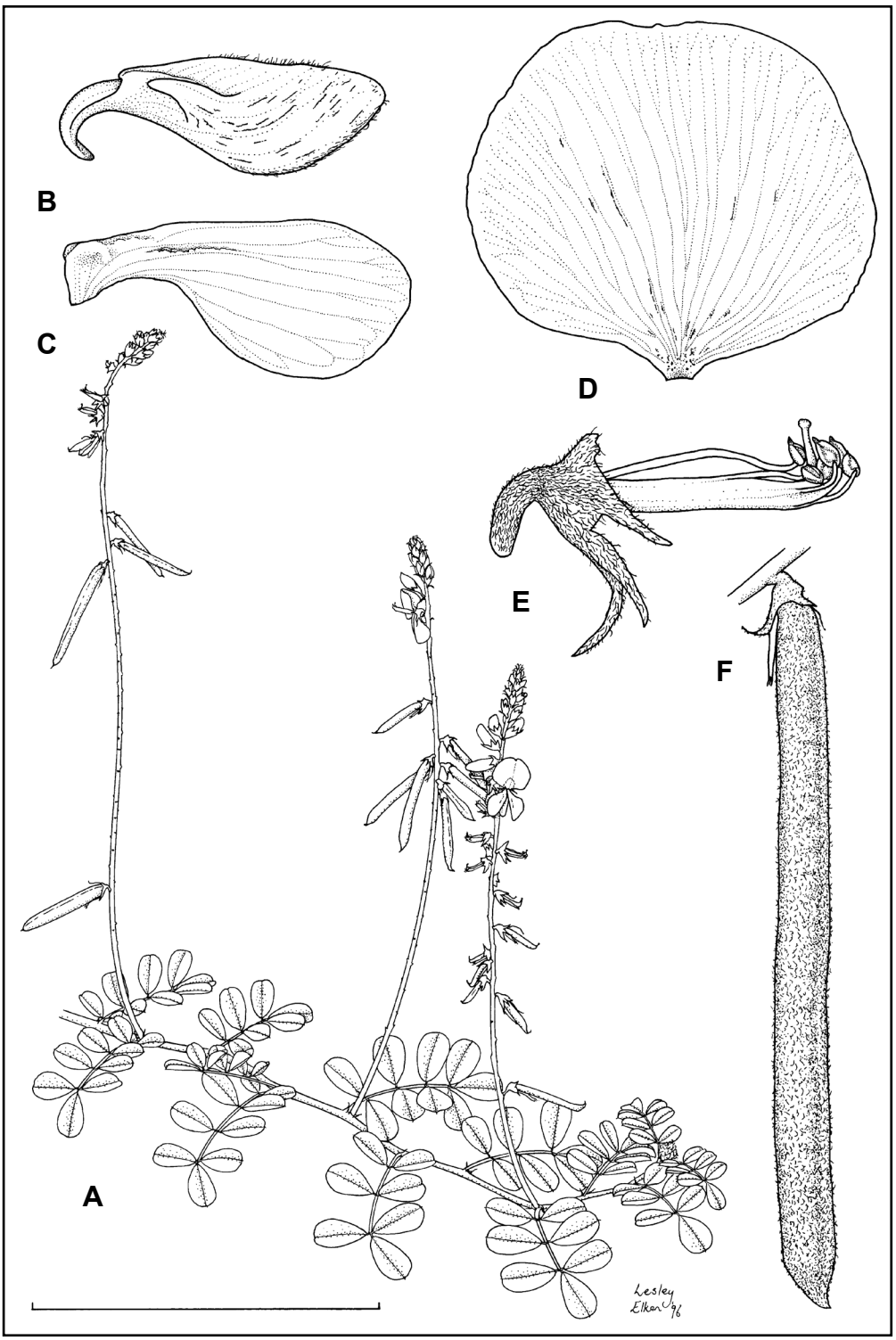

Figure 10. *Indigofera melanosticta*. A – habit; B – keel; C – wing; D – standard; E – lateral view of calyx and androecium; F – pod. Scale bar = 75 mm (A); 7.5 mm (B–E); 20 mm (F). Drawn by Lesley Elkan from *P.G. Wilson* 1212 *& R. Rowe* (A–E) and *P.G. Wilson* 1201 *& R. Rowe* (F).

Selected specimens examined. WESTERN AUSTRALIA: Baudin Island, Freycinet Estuary, 14 Sep. 1989, *J.J. Alford* 1371 (PERTH); 1.2 km N of Cape Ransonnet, Dirk Hartog Island, 2 Sep. 1972, *A.S. George* 11388 (CANB, NSW, PERTH); Dorre Island, Shark Bay, 15 July 1959, *R.D. Royce* 5908 (PERTH); *c.* 10 km N of Point Quobba, 18 Aug. 1986, *P.S. Short* 2506*, N.S. Lander & B.A. Fuhrer* (MEL); 30 km S of Denham, 21 Sep. 1991, *Peter G. Wilson* 1212 *& R. Rowe* (NSW).

Distribution and habitat. Western Australia: recorded from a relatively restricted area in the Carnarvon bioregion, extending from Shark Bay north to Quobba (Figure 4). The plant occurs in open, heathy vegetation on sandy soil or dunes.

Conservation status. Not considered to be at risk.

Etymology. The epithet is derived from the Greek *melano*-, dark, and *stictos*, spotted, in reference to the speckled indumentum.

Affinities. Readily distinguished from other species by the marked speckled appearance of the young stems resulting from the mixture of dark and light hairs. In its habit and long inflorescences, this species most nearly approaches *I. psammophila* Peter G.Wilson but may also be closely related to *I. chamaeclada*, which it resembles in having subtorulose pods, but differs in having a much longer inflorescence. *Indigofera chamaeclada* subsp. *chamaeclada* also has hairs of mixed colours on its young stems but these are paler and the contrasting colours are barely discernible. There is also a possibility that *I. melanosticta* intergrades with *I. chamaeclada* subsp. *pubens* where their ranges overlap in the Shark Bay area.

Indigofera occidentalis Peter G.Wilson & Rowe, *sp. nov.*

Indigofera australi interdum confusa sed distinguitur stipulis longioribus, foliolis discoloribus supra glabris vel subglabris flavovirentibusque, lobis calycis longioribus, indumento patenti; a *I. georgei* facile distinguitur foliolis plus numerosis et indumento brunneolo.

Typus: 3.3 km south of Mount Narryer Homestead, Western Australia, 20 September 1991, *Peter G. Wilson* 1186 *& R. Rowe* (*holo*: NSW 249974; *iso*: K, PERTH).

Indigofera sp. Occidentalis (D.J. Edinger 1259), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed September 2014].

Erect *shrub* or *subshrub*, 0.2–1 m high, with a woody rootstock; young stems terete or slightly ridged, grey or green to brown, strigose or tomentose with moderately dense to very dense, appressed to spreading, equally or unequally biramous hairs. *Leaves* pinnate, with (9–)15–21(–31) leaflets; stipules triangular to subulate, 3–5(–6.5) mm long, pubescent, not spinescent, not persistent; petiole (4–)5–10(–18) mm long; rachis furrowed; multicellular hairs between leaflet pairs absent or sparse, conspicuous, orange to red or brown, club-shaped. *Stipellae* absent or very rarely small and inconspicuous, to 0.5 mm long; lamina ovate, elliptical or obovate, 5–16(–21) mm long, 2.5–6(–10) mm wide; upper surface green to greyish, glabrous to sparsely hairy with appressed hairs (rarely with moderately dense spreading hairs); lower surface green to grey (generally paler than above), glabrescent or with sparse to dense, appressed to spreading hairs; apex obtuse and mucronate; veins not prominent. *Inflorescences* (40–)80–200(–290) mm long, longer than leaves; peduncle (5–)15–35 mm long; bracts triangular, 1–3.5(–5) mm long; flowers pink to purple; pedicel 1–2(–2.5) mm long. *Calyx* 1.5–4 mm long, with subequal lobes equal

to longer than the length of the tube, clothed with moderately dense to dense, grey to almost black, appressed to spreading hairs. *Standard* purple to pink, ovate to obovate, 6–10 mm high, 4.5–8.5 mm wide. *Wings* narrowly obovate to spathulate, 5.5–9 mm long, 1.5–4 mm wide. *Keel* 6.5–10 mm long, 2–3.5 mm deep; apex rounded to acute; lateral pockets 1–2.5 mm long; upper margin ciliate; tip and adjacent abaxial surface with sparse to dense, hyaline to dark brown hairs. *Staminal tube* 4–8.5 mm long, colourless to free ends and tube pigmented. *Ovary* glabrous to densely hairy. *Pods* spreading to descending, terete, 20–40 mm long, 2–3 mm deep, brown, sometimes greyish due to hairs or green when immature, tomentose or glabrescent; hairs sparse to moderately dense, appressed to spreading; apex shortly pointed; endocarp spotted. *Seeds* cuboid, 9–13 per pod, 1.4–2 mm long, 1.2–1.5 mm wide. (Figure 11)

Selected specimens examined. WESTERN AUSTRALIA: N of Paynes Find, 26 Aug. 1963, *T.E.H. Aplin* 2557 (AD, MEL, NSW, PERTH); 11.9 km E of Norseman Post Office, Eyre Hwy, 10 June 2001, *B. Archer* 1883 (MEL *n.v.*, PERTH); Kennedy Range 80 miles [124 km] NE of Carnarvon, 4 miles [6.4 km] W of Merlinleigh Homestead, 23 Aug. 1965, *J.S. Beard* 4399 (PERTH); 9 mile [14.4 km] post on Ajana–Kalbarri road, just S of Murchison River, 25 Aug. 1968, *A.C. Burns* 42 (PERTH); 48 km N of Southern Cross on the Koolyanobbing road, 6 Sep. 1980, *R.J. Cranfield* 1618 (PERTH); Byro Station, 8.5 km W of Mt Rebecca, 21 June 1985, *R.J. Cranfield* 5164 (CANB, PERTH); 27 km S of Youanmi, 22 Sep. 1980, *H. Demarz* 8262 (PERTH); Kununoppin, 18 Nov. 1912, *W. Grasby s.n.* (NSW 256938); 20 miles (32 km) W of Red Kangaroo Hill, 13 Nov. 1891, *R. Helms s.n.* (MEL 585883, NSW 256933); Coolgardie, Mar. 1899, *R. Helms s.n.* (CANB 320125, E); 1.5 km S of Carnarvon on the North West Coastal Hwy, 21 Sep. 1991, *Peter G. Wilson* 1203 *& R. Rowe* (CANB, NSW, PERTH); junction of Yuna–Tenindewa Rd with Byrons North Rd, 23 Sep. 1991, *Peter G. Wilson* 1222, 1223 *& R. Rowe* (NSW); 9.1 km W of Coonana airstrip, Trans Access Rd, 3 Aug. 2003, *Peter G. Wilson* 1603 *& G. Towler* (NSW).

Distribution and habitat. Western Australia: widely distributed along the boundary between the Eremaean and Southwest Botanical Provinces, occurring in the Carnarvon, Geraldton Sandplains, Yalgoo, Murchison and Coolgardie bioregions (Figure 12). Collectors' notes on specimens indicate that they were usually found growing on red sand with one record from grey-brown sandy soil and another from white clay soil.

Conservation status. Not considered to be at risk.

Etymology. The epithet is derived from the Latin *occidentalis*, pertaining to the west. We have chosen this name since the species is restricted to Western Australia and also because there is a specimen of it at PERTH (*Oldfield s.n.*) annotated 'I. brevidens var. occidentalis Meissn.'. As far as we can ascertain, this varietal name was never published by Meisner.

Affinities. Although this species has often been misidentified as *I. australis*, its affinities lie with *I. georgei* E.Pritz. and *I. psammophila*, which it resembles in the long inflorescence, the calyx with well-developed lobes, and the habit. The species differs from *I. australis* in its longer stipules, discolorous yellowish green leaflets, longer sepals and spreading indumentum; it can be readily distinguished from *I. georgei* by the number of leaflets per leaf and the colour of the indumentum, and from *I. psammophila* by the larger flowers.

Notes. There are considerable differences between populations, especially in inflorescence length (although the inflorescence always exceeds the leaf) and in the size of the floral parts. One specimen,

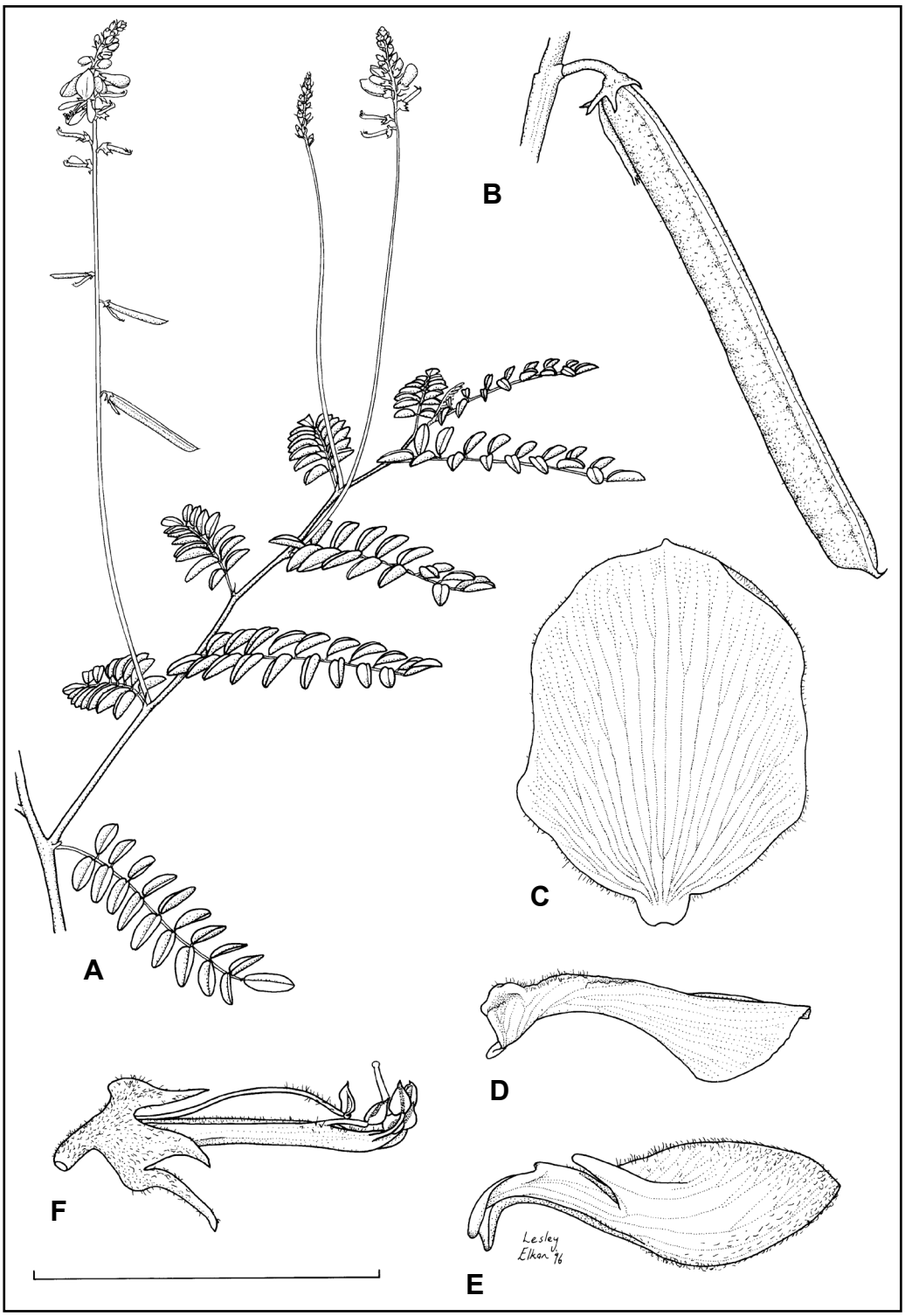

Figure 11. *Indigofera occidentalis*. A – habit; B – pod; C – standard; D – wing; E – keel; F – lateral view of calyx and androecium. Scale bar = 100 mm (A); 20 mm (B); 10 mm (C–F). Drawn by Lesley Elkan from *P.G. Wilson* 1185 *& R. Rowe* (A, C–F) and *P.G. Wilson* 1196 *& R. Rowe* (B).

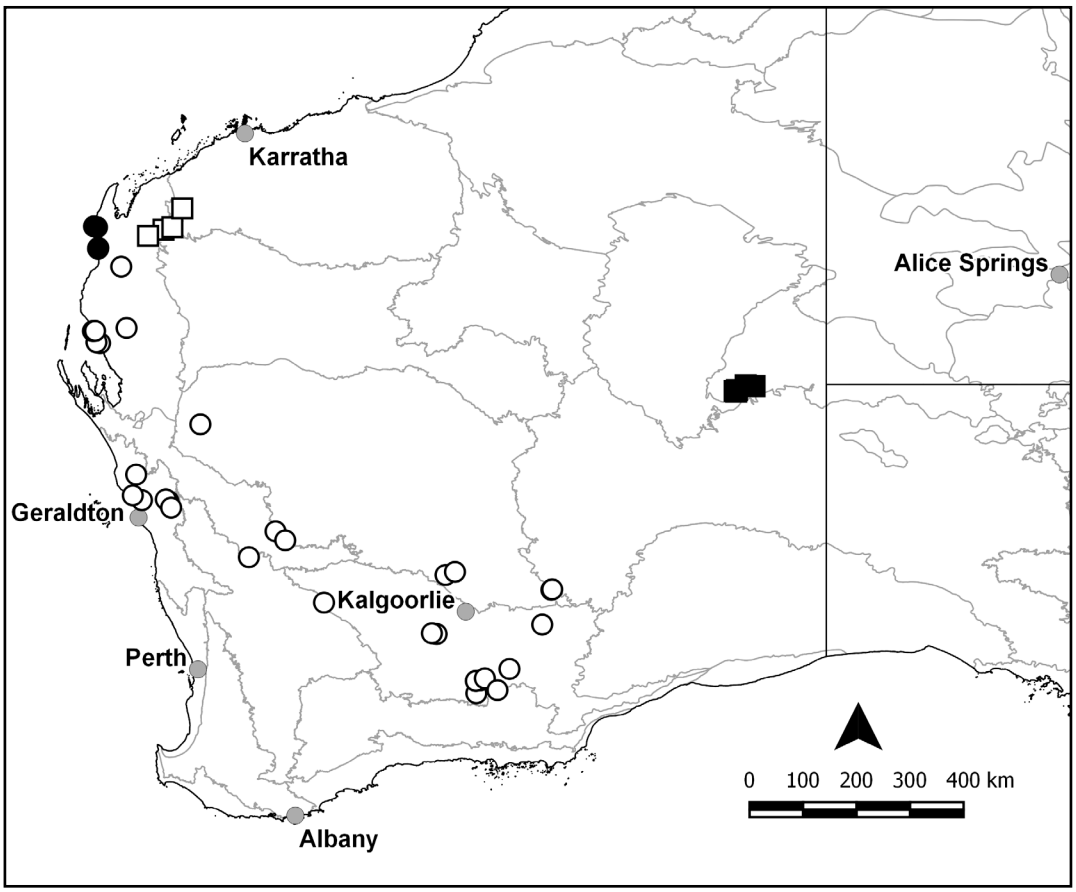

Figure 12. Distribution of *Indigofera occidentalis* (○), *I. oraria* (●), *I. roseola* (□) and *I. warburtonensis* (■).

R.J. Cranfield 1618 from north of Southern Cross, is particularly anomalous: its leaves have a much higher number of leaflets (15–31), the inflorescence is barely longer than the leaves, the floral parts are up to half the size of those on some other specimens, and it was the only specimen recorded as growing on a clay soil. It is possible that this specimen may have come from a hybrid individual. Despite this variation, the species is readily identifiable by the form, colour and distribution of the indumentum on both the vegetative parts and the flowers.

Indigofera oraria Peter G. Wilson & Rowe, *sp. nov.*

Indigoferae melanostictae et *I. georgei* propter inflorescentias elongatas similis sed indumento densiore argenteo differt.

Typus: Coral Bay, Western Australia [precise locality withheld for conservation reasons], 16 September 1991, *Peter G. Wilson* 1122 *& R. Rowe* (*holo*: NSW 249866; *iso*: CANB, PERTH).

Spreading *subshrub*, 0.2–0.3 m high, with woody rootstock; young stems ridged, silvery white to grey or greenish, strigose with dense to very dense, appressed, equally biramous hairs. *Leaves* pinnate, with (3–)5–7 leaflets; stipules narrowly triangular, *c.* 1 mm long, pubescent, not spinescent, not persistent; petiole 3–11 mm long; rachis furrowed; multicellular hairs between leaflet pairs sparse to moderately

dense, inconspicuous, red, pointed-linear. *Leaflets* opposite; stipellae absent; lamina narrowly obovate, 5.5–15(–20) mm long, 3–7(–12) mm wide; upper and lower surface grey, with dense, appressed hairs; apex obtuse and mucronate or emarginate; veins not prominent. *Inflorescences* 60–170 mm long, longer than leaves; peduncle 10–32 mm long; bracts triangular, 1–2 mm long; flowers red or orange-red; pedicel 1–2 mm long. *Calyx* 1.5–3.5 mm long, with subequal to equal lobes less than the length of the tube, clothed with dense, white or grey, appressed hairs. *Standard* red, broadly ovate, 7–9 mm high, 6.5–8 mm wide. *Wings* narrowly obovate, 6.5–8.5 mm long, 2.5–3 mm wide. *Keel* 7–8.5 mm long, 2.5–3 mm deep; apex acute or rounded; lateral pockets 1–1.5 mm long; upper margin glabrous; tip and adjacent abaxial surface with moderately dense, white hairs. *Staminal tube* 5–6 mm long, free ends and tube pigmented. *Ovary* densely hairy. *Pods* spreading to descending, terete, 15–32 mm long, 2.5–3 mm deep, grey to brown; hairs dense, appressed; apex shortly pointed; endocarp spotted. *Seeds* cuboid, 7–9 per pod, 1.5–2.5 mm long, 1.5–2 mm wide. (Figure 13)

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 10 Aug. 1985, *M.E. Ballingall* 1861 (PERTH); 28 July 2003, *M.E. Trudgen* 21949 *et al.* (PERTH); 15 Sep. 1991, *Peter G. Wilson* 1121 *& R. Rowe* (CANB, K, MEL, MO, NSW, PERTH, UPS).

Distribution and habitat. Western Australia: known, so far, only from sand dunes immediately adjacent to coastline in the vicinity of Coral Bay and Ningaloo, in the Carnarvon bioregion (Figure 12).

Conservation status. To be listed as Priority One under Department of Parks and Wildlife Conservation Codes for Western Australian Flora (A. Jones pers. comm.). Apparently a species of limited range and narrow habitat preference which might be vulnerable if there were, for example, changes in land-use along this stretch of coast. This species is known from few collections, on lands that do not appear to be adequately conserved.

Etymology. The epithet is derived from the Latin *orarius*, pertaining to the coast, in reference to the habitat of this species.

Affinities. Readily distinguished by the very dense, appressed, silvery indumentum that completely obscures the surface of the leaflets. The rather long inflorescence probably indicates a relationship with *I. melanosticta* and *I. georgei* (and other similar species).

Indigofera roseola Peter G.Wilson & Rowe, *sp. nov.*

Indigoferae georgei similis sed habitu gracile erectaque, foliolis terminalibus sessilibus, floribus roseolis vice rubris differt.

Typus: south of the Ashburton River, Western Australia [precise locality withheld for conservation reasons], 13 June 2006, *Peter G. Wilson* 1805 (*holo*: NSW 868891; *iso*: K, PERTH).

Erect *shrub*, 0.6–1.3 m high, with woody rootstock; young stems terete, white or grey, tomentose with dense to very dense, spreading, equally biramous hairs. *Leaves* pinnate, or palmately trifoliolate, with 3–5(–7) leaflets; stipules narrowly triangular, 1.5–3 mm long, pubescent, not spinescent, not persistent; petiole (1.5–)3–9 mm long; rachis furrowed; multicellular hairs between leaflet pairs sparse to dense, conspicuous or inconspicuous, red, pointed-linear. *Leaflets* opposite; stipellae absent or inconspicuous, 0.3–0.6 mm long; lamina obovate, (3.5–)5–17 mm long, (2.5–)3.5–11 mm wide, terminal leaflet sessile, larger than laterals; upper surface grey to green, with dense, spreading hairs; lower surface grey (paler

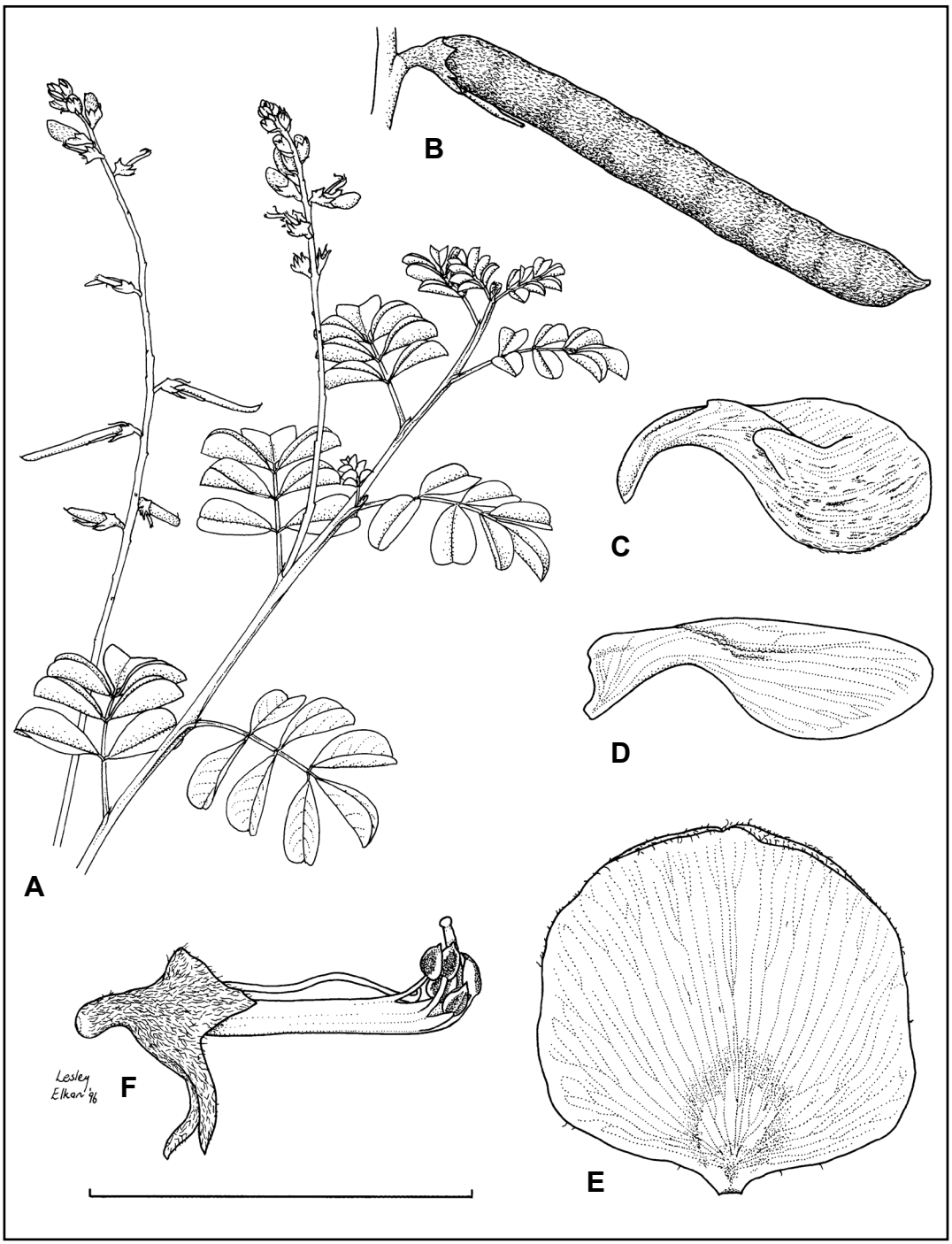

Figure 13. *Indigofera oraria*. A – habit; B – pod; C – keel; D – wing; E – standard; F – lateral view of calyx and androecium. Scale bar = 100 mm (A); 20 mm (B); 10 mm (C–F). Drawn by Lesley Elkan from *P.G. Wilson* 1121 *& R. Rowe*.

than above), with dense, spreading hairs; apex obtuse and mucronate or emarginate; veins prominent to not prominent. *Inflorescences* (25–)40–160 mm long, longer than leaves; peduncle (2–)5–20 mm long; bracts triangular, 1–2 mm long; flowers pink; pedicel (0.2–)0.5–1 mm long. *Calyx* 2.5–3.5 mm long, with subequal to equal lobes equal to longer than the length of the tube, clothed with moderately dense to dense, white to grey, shortly spreading to spreading (some red, multicellular) hairs. *Standard* pink, broadly ovate, 7–8 mm high, 6 mm wide. *Wings* spathulate to narrowly obovate, 6.5–7.5 mm long, 1.8–2.3 mm wide. *Keel* 7–8.5 mm long, 2.5 mm deep; apex acute; lateral pockets 1.3–1.7 mm long; upper margin ciliate; tip and adjacent abaxial surface with moderately dense, hyaline to brown hairs. *Staminal tube* 5–5.5 mm long, apparently colourless. *Ovary* densely hairy. *Pods* spreading to descending, terete, 20–34 mm long, 2.5–3 mm deep, grey to pale brown, tomentose; hairs moderately dense to dense, shortly spreading to spreading; apex shortly beaked; endocarp spotted. *Seeds* elongated cuboid, sometimes constricted in the middle, 8–10 per pod, 2.2–3.1 mm long, 1–1.5 mm wide.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 1883, *S. Carey s.n.* (MEL 585902); 15 Sep. 1991, *Peter G. Wilson* 1107 *& R. Rowe* (NSW); 15 Sep. 1991, *Peter G. Wilson* 1108 *& R. Rowe* (K, NSW, PERTH); 15 Sep. 1991, *Peter G. Wilson* 1114 *& R. Rowe* (NSW, PERTH); 13 June 2006, *Peter G. Wilson* 1808 (NSW, PERTH).

Distribution and habitat. Western Australia: known only from a few collections from around Nanutarra where it occurs on red sandy loams of the upper parts of sand dunes. The area of occurrence is near the junction of the Carnarvon, Pilbara and Gascoyne bioregions (Figure 12).

Conservation status. To be listed as Priority One under Department of Parks and Wildlife Conservation Codes for Western Australian Flora (A. Jones pers. comm.). The species could occur throughout the extensive dune field between the North West Coastal Highway and the Exmouth Gulf. However, it is currently only known from four locations and warrants further survey.

Etymology. The epithet is derived from the Latin *roseolus*, pink or pale rose, in reference to the pink flowers of this species in contrast to the red flowers of *I. georgei*.

Affinities. This taxon is superficially quite similar to *I. georgei* but differs by the slender, erect habit, the pink flowers and the sessile terminal leaflets. Furthermore, the linear form of the multicellular hairs between leaflet pairs indicates a possible relationship between this species and *I. decipiens*.

Indigofera warburtonensis Peter G.Wilson & Rowe, *sp. nov.*

Indigoferae helmsii habitu similis sed stipulis basi incrassatis, bracteis in axe inflorescentiae saepe persistentibus differt.

Typus: east of Warburton Mission, Western Australia [precise locality withheld for conservation reasons], 29 August 1973, *A.A. Munir* 5209 (*holo*: AD; *iso*: PERTH 01960334, NT *n.v.*).

Indigofera sp. Warburton (A.A. Munir 5209), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed September 2014].

Erect or spreading *shrub*, 0.35–1 m high, with woody rootstock; young stems somewhat flexuose, terete, green to brown, strigose with moderately dense, appressed, equally biramous hairs. *Leaves* pinnate, with (3–)5–7(–9) leaflets; stipules triangular, generally strongly thickened and tip often recurved, 1–3 mm

long, glabrescent, spinescent, persistent; petiole 3–5(–8) mm long; rachis furrowed; multicellular hairs between leaflet pairs sparse, inconspicuous, red to dark brown, club-shaped. *Stipellae* absent or inconspicuous, 0.2–0.4(–1) mm long; lamina elliptical to obovate, 5–12(–17) mm long, 1.5–5 mm wide; upper surface green, with sparse, appressed hairs; lower surface grey to green (paler than above), with sparse to moderately dense, appressed hairs; apex obtuse and mucronate; veins not prominent. *Inflorescences* 20–60(–85) mm long, equal to or longer than leaves; peduncle 3.5–8(–15) mm long; bracts triangular to ovate, 1–2 mm long, thickened and often persistent; flowers deep pink to purple to red; pedicel 0.5–1.3 mm long. *Calyx* 1.5–3(–3.5) mm long, with subequal to unequal lobes equal to the length of the tube, clothed with sparse to moderately dense, grey to brown, appressed hairs. *Standard* deep pink to red, orbicular, 6–7 mm high, 6–7 mm wide. *Wings* narrowly obovate, 6.5–7 mm long, 2–3 mm wide. *Keel* 6.5–7.2 mm long, 2.2–3 mm deep; apex rounded to acute; lateral pockets 0.8–1.2 mm long; upper margin ciliate; tip and adjacent abaxial surface with hairs moderately dense, hyaline to brown, . *Staminal tube* 5.5–6 mm long, free ends and tube pigmented. *Ovary* sparsely to moderately hairy. *Pods* spreading to descending, terete (not seen mature). *Seeds* perhaps 8–9 per pod (estimated from ovule count).

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 28 July 1967, *R.C. Carolin* 5961 (NSW); 1874, *J. Forrest s.n.* (MEL 586506); 22 Aug. 1962, *A.S. George* 3856 (PERTH); 7 July 1963, *A.S. George* 4736 (PERTH).

Distribution and habitat. Western Australia: apparently restricted to an area east of Warburton, in the Central Ranges bioregion (Figure 12) where it is recorded as growing in stony soils on rocky hills.

Conservation status. Recently listed as Priority One under Department of Parks and Wildlife Conservation Codes for Western Australian Flora, as *I.* sp. Warburton (A.A. Munir 5209) (Western Australian Herbarium 1998–).

Etymology. The epithet is a reference to the settlement of Warburton since this species appears to be restricted to the nearby area.

Affinities. This species shows an interesting combination of characters. It is reminiscent of *I.* sp. Areyonga (D.J. Parsons 30) and *I. helmsii* in its habit and the appearance of its leaflets but the stipules are much more like those of *I. cornuligera* and *I. gilesii*, with thickened bases, and the clusters of clavate hairs between leaflet pairs are inconspicuous. It is also distinctive in having rather persistent inflorescence bracts, thickened similarly to the stipules.

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References

Beard, J.S. (1980). A new phytogeographic map of Western Australia. *Western Australian Herbarium Research Notes* 3: 37–58.

Department of the Environment (2013). *Australia's bioregions (IBRA)*, IBRA7, Commonwealth of Australia. http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra#ibra [accessed 17 June 2015].

Ewart, A.J. & Morrison, A. (1913). Contribution to the Flora of Australia, No. 21. The Flora of the Northern Territory (Leguminosae). *Proceedings of the Royal Society of Victoria* n.s. 26: 152–164.

Gardner, C.A. (1930). *Enumeratio plantarum Australiae Occidentalis*. Fasc. 2. (Govt. Printer: Perth.)

Gardner, C.A. & Bennetts, H.W. (1956). *The toxic plants of Western Australia*. (West Australian Newspapers Ltd.: Perth.)

Green, J.W. (1985). *Census of the vascular plants of Western Australia*. 2nd edn. (Western Australian Herbarium: Perth.)

Jones, A. (2014). *Threatened and Priority Flora list for Western Australia*. (Department of Parks and Wildlife: Kensington, Western Australia.)

Maconochie, J.R. (1980). Three new species of Fabaceae for the Flora of Central Australia. *Journal of the Adelaide Botanic Gardens* 2: 323–328.

Maconochie, J.R. (1981). *Indigofera*. *In*: Jessop, J. (ed.) *Flora of Central Australia*. pp. 157–158. (Reed: Sydney.)

Schrire, B.D. (1992). New combinations and resurrected names in *Microcharis* and *Indigastrum* (Fabaceae–Papilionoideae). *Bothalia* 22: 165–170.

Schrire, B.D., Lavin, M., Barker, N.P., Forest, F. (2009). Phylogeny of the tribe Indigofereae (Leguminosae-Papilionoideae): Geographically structured more in succulent-rich and temperate settings than in grass-rich environments. *American Journal of Botany* 96: 816–852.

Western Australian Herbarium (1998–). *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. http://florabase.dpaw.wa.gov.au/ [accessed September 2015].

Wilson, P.G. & Rowe, R. (2004). A revision of the Indigofereae (Fabaceae) in Australia. 1. *Indigastrum* and the simple or unifoliolate species of *Indigofera*. *Telopea* 10: 651–682.

Wilson, P.G. & Rowe, R. (2008). A revision of the Indigofereae (Fabaceae) in Australia. 2. *Indigofera* species with trifoliolate and alternately pinnate leaves. *Telopea* 12: 293–307.

Wilson, P.G. & Rowe, R. (2010). New taxa and typifications in *Indigofera* (Fabaceae) for South Australia. *Journal of the Adelaide Botanic Gardens* 24: 67–73.