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Dodonaea crucifolia (Sapindaceae, Dodonaeoideae), a new species from north-eastern New South Wales, Australia

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Abstract

Dodonaea crucifolia I.Telford & J.J.Bruhl (Sapindaceae, Dodonaeoideae), endemic to north-eastern New South Wales, Australia, and previously confused with *D. hirsuta* (Maiden & Betche) Maiden & Betche, is described as new. *Dodonaea hirsuta* is recircumscribed with the *D. crucifolia* components removed and with male flowers described for the first time. The distribution, habitat, and conservation status of both species are discussed and a table is provided comparing selected morphological attributes. Images of the new species and *D. hirsuta* are provided. The identification keys in *Flora of Australia* and NSW FloraOnline are modified to include the new species.

Introduction

During on-going investigations of taxa occurring on the New England Tableland of north-eastern New South Wales, Australia, and exhibiting disjunct patterns of distribution, differences became apparent between montane and coastal plants of *Dodonaea hirsuta* (Maiden & Betche) Maiden & Betche (Maiden and Betche 1902, 1913; Wilson and Scott 2002). Plants on the montane granite country at Torrington, New South Wales, and the Granite Belt, Queensland, and those from the coastal sandstones of the Grafton area, New South Wales exhibited differing attributes.

Under *Dodonaea hirsuta* in her revision of the genus in Australia (West 1984) and subsequent treatment for *Flora of Australia* (West 1985) West noted that coastal plants from Copmanhurst differed from tableland plants in longer, almost sessile leaves with attenuate bases. The circumscription of *D. hirsuta* presented by West (1984, 1985) broadened that of Maiden and Betche (1902, 1913) to include these plants from the Grafton area. In the study reported here, morphological comparisons indicated that the disjunct populations exhibit consistent, and distinct, morphological differences (Table 1), and as a result the North Coast populations are assigned to a new species, below. With the segregation of the new species, the circumscription of *D. hirsuta* needs emendation and this provides the opportunity to describe male flowers of this species for the first time.

Table 1. Comparison of selected morphological attributes of *Dodonaea crucifolia* and *D. hirsuta*.

Character	*D. crucifolia*	*D. hirsuta*
Glands	present on branchlets, leaves, pedicels, sepals, ovaries	present on pedicels
Leaf length (mm)	4–10	2.8–5
Lamina dissection	rarely 3-toothed, mostly 3- or 6-lobed, lobes 3-toothed	3-toothed
Leaf margin	±plane	recurved
Petiole length (mm)	0–0.3	0.5–0.8
Female pedicel length (mm)	9–13.5	4–9
Female sepal length (mm)	2.4–3.5	1.6–2.5
Seed length (mm)	2.2–3	3.5–3.8

Taxonomy

Dodonaea crucifolia I.Telford & J.J.Bruhl, **sp. nov.**

Similar to *Dodonaea hirsuta* but differs by being glandular-viscid on most of its parts, including leaves and stems; by the mostly 3-, 5- or 6-lobed leaves, rarely 3-toothed (vs always 3-toothed) whose margins are plane (vs revolute); and by the female flowers with longer pedicels (9–13.5 mm vs 4–9 mm).

Type: New South Wales: North Coast: Sandstone Drive, 14.5 km NNW of Glenreagh, 13 Oct. 2008, *I.R.Telford 13242, J.J.Bruhl*, *P.Rose & M.Stimpson*; holo: NSW; iso: BRI, CANB, CNS, K, MEL, MO, NE (NE 92724).

Dioecious shrub to 2 m tall, mostly sparsely branched. Stems hispid with white patent hairs, glabrescent, red-brown with yellow-brown glands. Leaves sessile or petiole to 0.3 mm long; lamina obovate to narrowly obovate in outline, 4–10 mm long, 2–5 mm wide, 3-toothed or pinnatifid with 3–6 lobes, the lobes mostly 3-toothed, the base attenuate, hispid, particularly on margins and towards base of lamina, sparsely pustular with yellow-brown glands. Male flowers: pedicels 1.4–4.5 mm long, hispid, glandular; sepals 4, ovate, 2–2.2 mm long, c. 1 mm wide, acuminate, glandular, minutely hispid abaxially, red-brown; stamens 8, filaments c. 0.3 mm long, anthers narrowly ellipsoidal, 2.3–2.5 mm long, connectives with subglobose, minutely hispid apicula. Female flowers: pedicels 9–13.5 mm long, hispid, glandular; sepals 4, lanceolate, 2.4–3.5 mm long, 1–1.3 mm wide, acute to acuminate, minutely hispid, glandular, recurved; ovary subglobose, 2–2.5 mm long, 1.8–2.3 mm wide, 4-lobed, rarely 3-lobed, apically depressed, pubescent, glandular; style 8–9 mm long, caducous. Capsule 4-lobed, rarely 3-lobed, 10–16 mm long, 12–19 mm wide, shortly pubescent, green and pink to cherry red; wings 3–4.5 mm wide; sepals persistent, reflexed. Seeds compressed, elliptical, 2.2–3 mm long, 1.8–2 mm wide, yellow-brown–red-brown. (Fig. 2).

Additional specimens examined (selection): NEW SOUTH WALES: North Coast: Above Shannon Creek, c. 5 km NW of Coutts Crossing, c. 30 km S of Grafton, 10 Apr. 2000, *Edwards s.n. & Edwards* (NSW); Saltwater Fire Trail, 0.8 km E of Sportsmans Creek Fire Trail, just S of Banyabba Nature Reserve, 15 Sep. 1996, *Richards 648 & Wrigley* (CFSHB, NSW); 8 km S of Coaldale, *Clarke 1891, Pickard & Coveny* (BRI, MEL *n.v.*, NSW); Mt Mullengen, 6 km E of Ramornie, Jul. 1922, *Blakely & Shiress s.n.* (NE, NSW); Flaggy Creek Nature Reserve, c. 7 km N of Glenreagh, 31 Jul. 2004, *Telford 12766 & Bruhl* (CANB, BRI, NE, NSW).

Distribution: *Dodonaea crucifolia* occurs within the South Eastern Queensland Bioregion, which counterintuitively extends into north-eastern New South Wales (Department of the Environment 2013), where it is restricted to the Coaldale, Copmanhurst and Glenreagh areas from 35 km NNW of Grafton to 7 km N of Glenreagh, New South Wales (Fig. 3).

Habitat and ecology: the species grows in sandy soils on sandstones of the Grafton Formation and Kangaroo Creek Sandstone (Brunker and Chesnut 1976) in hilly, dissected plateau country at 80–180 m altitude. It has been recorded from Eucalypt layered to shrubby open forest and woodland with *Eucalyptus planchoniana, E. baileyana, E. pyrocarpa, E. psammitica, Corymbia gummifera, C. trachyphloia* and *Angophora robur* dominant, with a layered or heath understorey. Other associated species include *Doryanthes excelsa*, *Caustis blakei*, *Melichrus* sp. Newfoundland State Forest (P.Gilmour 7852), *Hibbertia acuminata*, *Lambertia formosa, Banksia collina, Hakea laevipes* subsp. *laevipes, Boronia hapalophylla, Bursaria cayzerae* and *Bossiaea rhombifolia.*

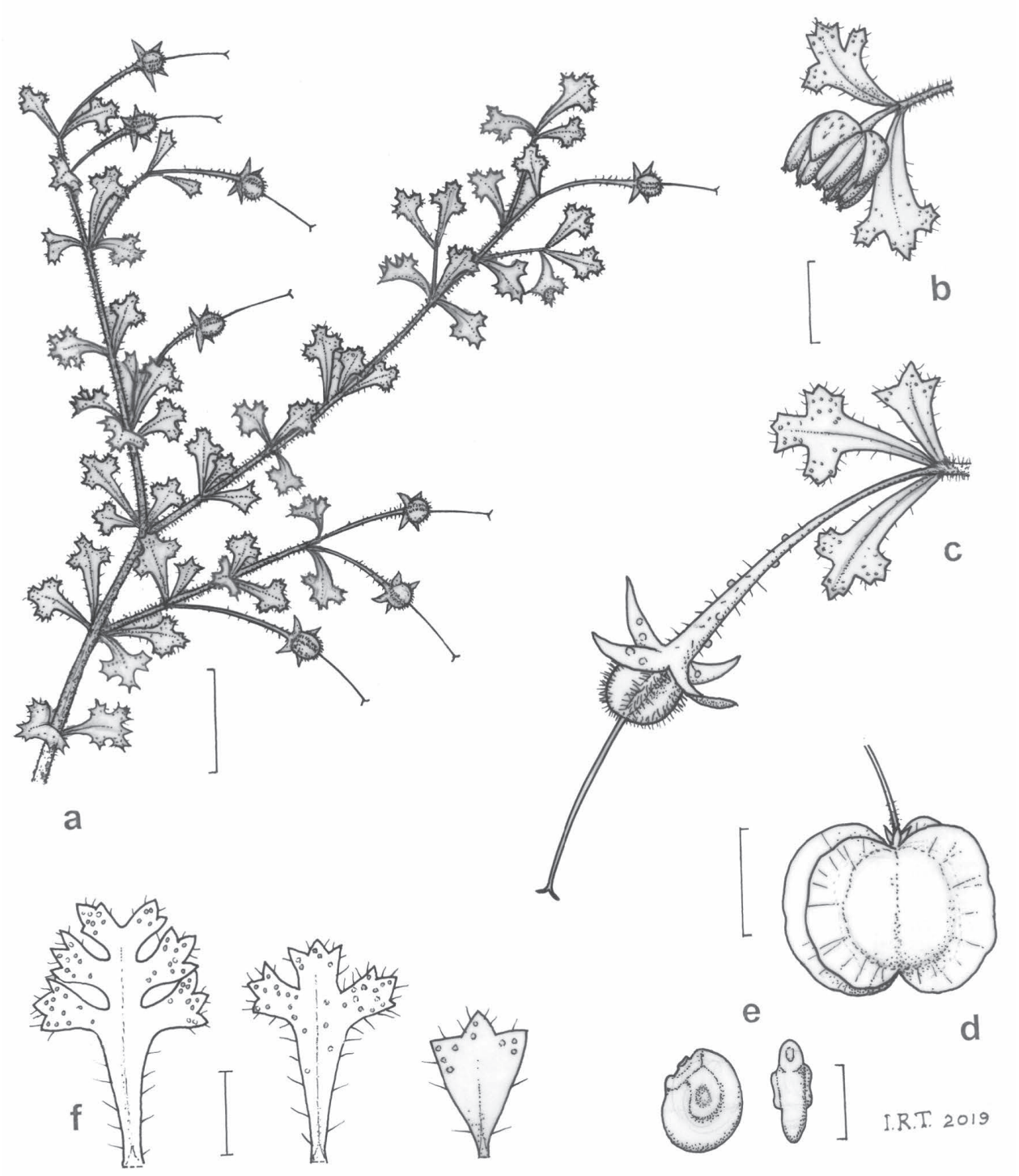

Fig. 1. *Dodonaea crucifolia*, **A.** leafy branchlet; **B.** male flower; **C.** female flower; **D.** fruit; **E.** seeds; **F.** leaf variation. A, C, F from *Telford 13169*; B from *I.R. Telford 13168*; D, E from *I.R. Telford 13242 et al.* Scale bars: A, D = 10 mm; B, C, F, E = 2 mm. Illustration by I.R. Telford.

Fig. 2. *Dodonaea crucifolia.* Fruiting stem, from *I.R.Telford 13242 et al.* (type gathering). Scale bar=10 mm. Image by J.J. Bruhl.

The Kangaroo Creek and Grafton Sandstones define an important area of endemism, the restricted species (several gazetted as endangered, several undescribed) often occurring sympatrically on rocky sites. Taxa include *Hibbertia acuminata*, *Grevillea banyabba*, *Prostanthera sejuncta*, *Angophora robur, Eucalyptus psammitica*, *E. pachycalyx* subsp. *banyabba*, *Homoranthus floydii, Melichrus* sp. Newfoundland State Forest (P.Gilmour 7852), *Boronia chartacea*, *B. hapalophylla, Philotheca papillata*, *Bursaria cayzerae, Bertya* sp. Chambigne Nature Reseve (M.Fatemi 24), *Lasiopetalum* sp. Glenreagh (J.B.Williams NE36942). Also occurring here are the northern disjunct populations of *Doryanthes excelsa*.

Phenology: flowers recorded July; fruit recorded October.

Conservation status: *Dodonaea crucifolia* is known from eight populations. Given that the species could be easily overlooked and most populations are of unknown size, its status must be regarded under IUCN criteria (IUCN 2019) as "Not Evaluated". Considering the extent of suitable habitat, the species is probably not at risk. At the type locality, the population was spread over several hectares of ridge top and slopes and consists of more than 100 individuals. The Flaggy Creek population contained c. 50 plants at the time of collection, all young and even-aged, apparently recruitment after a fire five years earlier. Fires occurring too frequently would pose a severe threat to the survival of any population. The species is conserved in Fortis Creek National Park and Banyabba, Tallawudjah and Flaggy Creek Nature Reserves.

Etymology: the specific epithet is from the Latin *crux* (cross) and *folium* (leaf), in reference to the cross-shaped, lobed leaves.

Notes: populations show an imbalance in sex ratio with c. three-quarters of plants in populations studied being female. Female plants appear to be more robust than males. Specimens have been segregated in NE under the phrase name *Dodonaea* sp. Copmanhurst for some time and duplicates have been distributed under that phrase name.

Dodonaea hirsuta (Maiden & Betche) Maiden & Betche, *Proc. Linn. Soc. New South Wales* 38: 245 (1913)

Dodonaea peduncularis var. *hirsuta* Maiden & Betche, *Proc. Linn. Soc. New South Wales* 27: 57 (1902). Type: Jennings, New South Wales, Oct. 1901, *J.L.Boorman*; holo: NSW; iso W *n.v.*

Dioecious shrub to 120 cm tall, densely branched. Stems red-brown, hispid with white patent hairs. Leaves: petiole 0.5–0.8 mm long; lamina ±triangular, 2.8–5 mm long, 2.4–4.5 mm wide, apically 3-toothed, the central tooth often reflexed, margin strongly recurved, the lamina evenly hispid on both surfaces with tubercle-based hairs. Male flowers: pedicels 2.3–5 mm long, hispid, sparsely glandular; sepals 4, ovate, 2.3–2.5 mm long, 1.2–1.6 mm wide, obtuse, hispid abaxially, yellowish green with red-brown margins; stamens 8; filaments 0.4–0.8 mm long, anthers narrowly ellipsoidal, 2–2.8 mm long, connectives with rounded minutely hispid apicula. Female flowers: pedicels 4–9 mm

long; sepals 3, rarely 4, ovate, 1.6–2.5 mm long, 1.2–1.5 mm wide, obtuse, yellowish green; ovary subglobose, 2.2–3 mm long, 2–3.5 mm wide, apically depressed, 3-lobed, rarely 4-lobed, pubescent; style 8–13.5 mm long, glabrous, red. Capsule 3-or 4-lobed, 8–16 mm long, 10–18 mm wide, shortly hirsute, green and pink to red; wings 2.5–4 mm wide; sepals persistent, reflexed. *Seeds* compressed, elliptical, 3.5–3.8 mm long. (Fig. 4)

Additional specimens examined (selection): QUEENSLAND: Darling Downs District: Amiens, 10 miles [16 km] NW of Stanthorpe, 30 Oct.1963, *Pedley 1491* (BRI, MEL *n.v.*); Bald Rock Creek, Girraween National Park, Junction Track, 21 Jan. 2009, *Telford 13283 & Bruhl* (BRI, CANB, NE). NEW SOUTH WALES: Northern Tablelands: 12 km N of Torrington, 17 Dec. 1961, *Williams NE78239* (BRI, CANB, NE, NSW); Bismuth Falls, c. 7 km NW of Torrington, 18 Aug. 2007, *Telford 13177 & Bruhl* (CANB, NE); 2.7 km along Flagstone Creek Trail from Gulf Road, c. 18 km just W of N of Emmaville, 12 Oct. 1990, *Coveny 14633, Makinson & Quirico* (CANB, MEL *n.v.*, NSW).

Distribution: *Dodonaea hirsuta* is restricted to far northern parts of the New England Bioregion (Department of the Environment 2013) between Amiens, The Summit and Wallangarra, Queensland and disjunctly in the Torrington area, New South Wales (Fig. 3).

Habitat and ecology: the species inhabits sandy soil associated with granite outcrops at 900–1150 m altitude. Vegetation recorded is *Eucalyptus* shrubby woodland or open forest with *E. andrewsii, E. youmanii, E. brunnea* and *E. prava* dominant. Other associated species include *Callitris endlicheri, Grevillea viridiflava, Hakea macrorrhyncha, Leptospermum trinervium, Bossiaea rhombifolia*; and in Girraween National Park only, *Phebalium whitei* and *Cassinia wyberbensis*.

Phenology: flowers recorded April–May and August–September; fruit recorded November–December.

Conservation status: *Dodonaea hirsuta* is known from several populations in the Wallangarra and Torrington areas, but most population sizes are unknown. At the Bismuth Falls site, c. 15 plants were observed in 2007. Following IUCN criteria (IUCN 2014) the status of the species must be considered as "Not Evaluated". The species is conserved in Girraween National Park in Queensland and Torrington State Conservation Area in New South Wales.

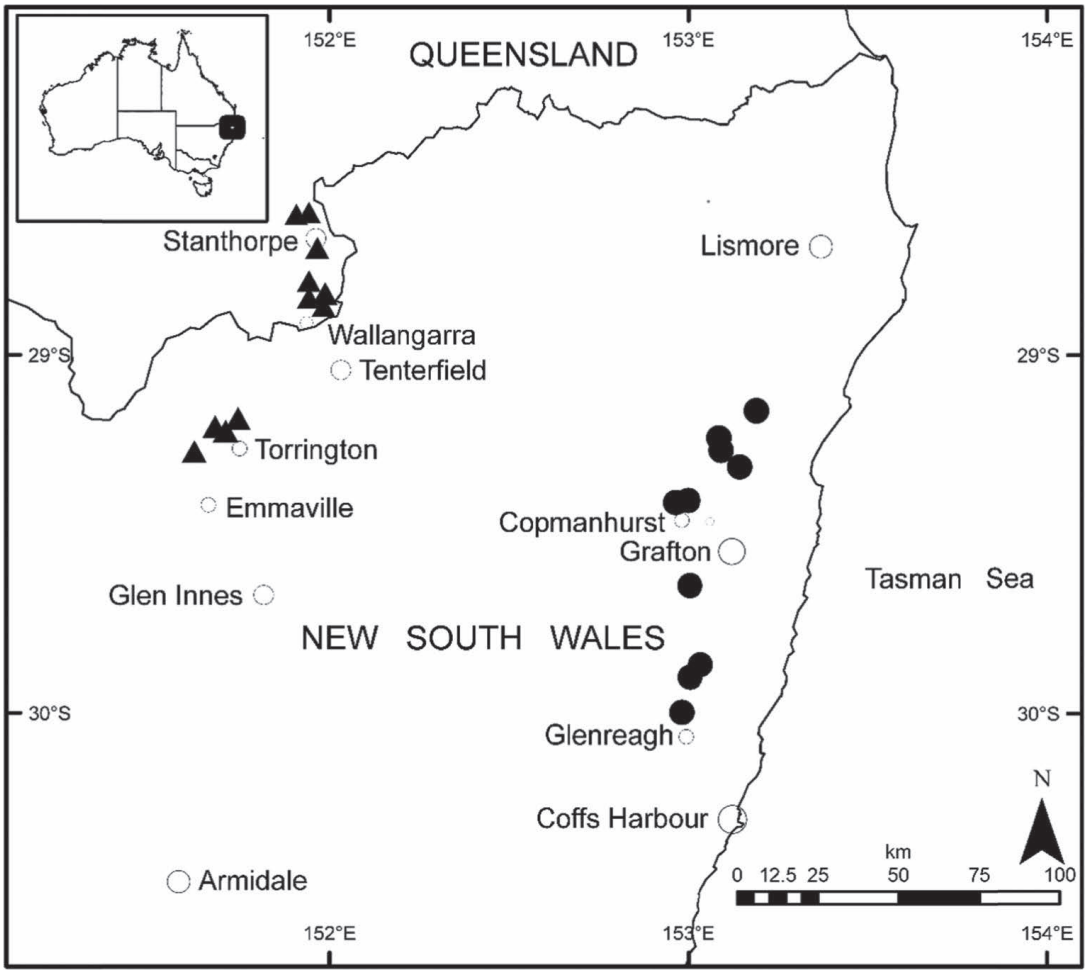

Fig. 3. Distributions of ● *Dodonaea crucifolia*; ▲ *D. hirsuta*.

Fig. 4. *Dodonaea hirsuta*. A. male flower, from *I.R. Telford 13177 & J.J.Bruhl*; B. female flower, from *I.R. Telford 13177 & J.J.Bruhl*. C. fruit, photographed 9 Oct. 2010 at Bald Rock Creek, Girraween National Park, Qld. Scale bars: A=2 mm; B=5 mm; C=10 mm. Images by J.J. Bruhl.

Modification to identification keys

The key to *Dodonaea* in "Flora of Australia" (West 1985: 116) may be modified to accommodate the new species as follows:

19 Leaves hirsute; capsule hirsute; inflorescence axillary

19a Leaves 3-toothed, margin recurved ..... **30. D. hirsuta**

19b Leaves 3-toothed or 3- or 5-lobed with lobes apically 3-toothed, margin not recurved ..... **D. crucifolia**

19: Leaves glabrous; capsule glabrous; inflorescence terminal ..... **16. D. peduncularis**

The key in NSW FloraOnline (PlantNet 2020) may be modified as follows:

12 Leaves linear to oblong, decurrent at base; sepals not persistent ..... *D. camfieldii*

Leaves angular-obovate to obovate, not decurrent at base; sepals persistent 13

13 Leaves hirsute, petiolate or sessile, 3–10 mm long; capsule hirsute; inflorescence axillary 13a

Leaves glabrous, 5–18 mm long; capsule glabrous; inflorescences terminal 14

13a Leaves 3-toothed, margin recurved ..... *D. hirsuta*

Leaves mostly 3- or 5-lobed with lobes apically 3-toothed, rarely unlobed and 3-toothed, margin not recurved ..... *D. crucifolia*

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